THE CONTRIBUTION OF ENVIRONMENTAL EDUCATION IN RAISING STUDENTS' KNOWLEDGE, ATTITUDE AND PRACTICE IN SELECTED FIRST CYCLE SECONDARY SCHOOLS

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ACRONYMS

AOE- Ministry of Agriculture

ANOVA – Analysis of variance

CSA – Central Statistics Authority

CSTC- Community Skill Training Center

EE- environmental education

EEP-Environmental Education Project

EPA- Environmental Protection Authority

ICDR- Institute of Curriculum Development and Research

KSTF- Keep Sweden Tidy Foundation

MOE- Ministry of Education

GDP- Gross National Product

Abstract

With the objective of investigating the contribution of the General Secondary Education for raising students' knowledge, attitude and practice in environmental issues, the research employed both qualitative and quantitative methods. Scores of students on a mastery test, opinions of both students and teachers through questionnaires and content analysis by teachers were the main data sources. In addition to the overall analysis, comparisons were made in terms of gender, location and schools for students' knowledge.

Though the method of integration varies from one subject to the other, the investigation was able to find objectives that could let the curriculum integrate adequate and relevant environmental issues. Unlike the case in Chemistry, the integration of contents In Geography was in a multi-topic approach which is in line with what is recommended for environmental education. Students better performance in geography-related environmental issues was attributed to this method of integration.

Despite the positive evaluation on the integration of environmental issues, students' knowledge, attitude and skills were found to be below the standard. Assessed through a criterion referenced test, only 24% of the students who were found to have the required level of knowledge in the issue. The evaluation against attitude and skill inventories using a five point rating scale indicated only 18% and 46 % of the students with acceptable degree of achievement in the respective domains. The linear relationship that was expected to exist between knowledge, attitude and skill was not maintained.

The assessment of students' knowledge using open-ended items showed a different result as compared to what was obtained through the test scores. The difference could have happened due to methodological differences; students' competence in the medium instruction (as the instruments were conducted in different languages) or due to the different in the statistical measurement techniques employed in each case.

The research revealed that performance in environmental issues in terms of location and sex, and schools. The findings was not different from the previous findings. Males were found to be more knowledgeable but less concerned. Rural students were more knowledgeable and skillful but less positive towards the environment.

CHAPTER ONE

Introduction

1.1 Background

Education is a means for ensuring development and thus for quality life. In order to serve as a reliable source of quality life, development should prove its sustainability and that is by making all the activities be environment friendly. The best means to do this is education. There is a positive relationship between awareness in environmental issues and a concern for the environment. For an educational system to accomplish this heavy task, the key lies in orientating the curriculum with environmental issues (Agbola 1988, MOE 1994). This in turn shows the interdependence between education, sustainable development and the environment. For a developmental attempt to be sustainable, therefore, it has to be attentive to the environment and care for its wellbeing which is possible through education (Balbech, Jain, Stacy and Urban 2002; Filho 1993).

This importance of environmental education got a worldwide acceptance in the 1970s when countries agreed to take the issue of the environment into their education system. Since then, many countries have oriented their curriculum with environmental education (Eckholm 1992). However, the environment has continued to degrade even more seriously than before. Many of the landscapes in the world have changed their natural state mainly due to humans' activities (MOE 1990) the root causes of which have been poverty and technological advancement (Babech et al 2002). The former for subsistence which is mostly the feature of developing countries where as the latter for luxury in developed countries. The global environmental problems such as global warming and desertification are mainly caused by humans' unwise use of technologies to satisfy their ever increasing economic needs.

Obviously for the first reason the biophysical environments on which Ethiopian economy depends have been degraded seriously and if the damage continues in a similar way, the problem will be beyond humans' control (Gedion 2003). Although the global warming and the expansion of desertification at a continental level have their own impact, the

causes of national problems such as the periodic famine, epidemics and migration are attributed to environmental degradation (Demel 2003). If people were well informed about the effect of their unfriendly activity on the environment and understood that they were compromising the rights of both the present and the future generations, there would be no reason they continue with their unfriendly skills on the environment.

While the environment has been severely degraded as such, the education system in Ethiopia has barely served as a tool to alleviate this problem (Demel 2003). Though there were issues of the environment addressed in some subjects in the previous curricula, the integration was not in a way to bring a practical impact on the environment (Aklilu, 2006). The action taken in this regard did not go beyond setting a pilot project which was limited to a very insignificant number of schools (MOE 1992). This shows as no sound efforts were made by the education system to create environmental consciousness that helps stop the continuous environmental degradation in the country.

Today there seems to have been established a better ground to integrate environmental education in the education system (Aklilu 2006). There have been measures that could help form initiatives for sustainable protection of the environment. These range from policy formulation to integrating environmental issues into the education system. To start with, Articles 43 and 44 of the constitution are about ensuring sustainable development and healthy environment for citizens which indicate education as one of the means for addressing the issue .

The establishment of Environmental Protection Authority (EPA) with a full mandate for formulating, regulating and implementing environmental policies is the foremost achievement to be mentioned. Besides its multi-dimensional responsibilities to carryout on environmental issues of the country, EPA has clearly indicated in Article 4.10 of the policy the need for environmental education and awareness, and how it should be delivered. Of the strategies devised for raising awareness in environmental education, the

policy has given priority to the integration of environmental issues in the formal curriculum.

> "... promote the teaching of environmental education on a multi-disciplinary basis and to integrate it into the on going curricula of schools and colleges and not to treat it as a separate or additional subjects..." (EPA 1997: 24)

Based on the above legal grounds, the 1994 Education and Training Policy has given emphasis to environmental issues and one of the general objectives (Article 2.1.5) is all about this. It is about cultivation of personalities concerned for environmental protection and wise exploitation of natural resources.

> "Cultivate the cognitive, creative, productive and appreciative potential of citizens by appropriately relating education to the environment and social needs" (MOE 1994).

The policy in its specific objective (Article 2.2.14) and adjoined strategy has clearly priscribed how students should develop both theoretical understanding and be in touch with practical problems of the environment. It is also intended that the integration need to consider environmental issues at the different environmental.

> "..provide education that can produce citizens who possess national and international outlook on the environment, protect natural resources and historical heritages of the country" (MOE 1994).

Teaching environmental issues could be done either in a multi-disciplinary or an interdisciplinary way (Filho 1993, MOE, 1992), UNESCO-UNEP 1988). What is accepted in the Ethiopian case where there are no teachers trained is the former: integrating the issues in all subjects wherever the contents are found relevant. This does not mean that all subjects are equally important and suitable. Subjects such as Chemistry, Geography and Biology, whose subject matters are essentially environmental, are more important to address the issues (Filho 1993).

Discovery, exploration, observation and experimentation are the recommended methods for teaching environment education. Applying this both in and outside the schools, the children will come to see how knowledge, skills and attitudes can make a difference in people's lives (UNESCO / UNHCR 1999). The recommended methodologies are in line with the 'active learning' (learner centered) approach which the education system is pursuing.

Whether the integrated environmental issues have been effective in raising student's knowledge, attitude and skills, no evaluation has been done so far (Aklilu 2006). Evaluation on such burning curricular issues is very important and it should be done frequently as changes on the environment are dynamic due to humans' continuous influence (ICDR, 2002). The evaluation can provide curriculum developers and teachers with inputs to fill in the gap.

1.2 Statement of the problem

Environmental problems due to technological advancement have a relatively little impact on the Ethiopian environment as compared to the case in developed countries where poisonous and toxic gas emission is high. Yet, the environments in Ethiopia, particularly that in the north and eastern part, have been degraded to the extent that is difficult to reverse (Gedion 2003). The ecologies in many parts of the country have lost their natural state. Land degradation in all its forms has been most striking challenging the Ethiopian agriculture (Demel 2003). Millions of tones of the fertile top soil have been washed away every year due to the removal of land cover and unsystematic farming (EPA, 1997). It is within this generation that that the forest cover has dwindled from (40%) to less than 3% as a result of which many species of wild lives have either migrated to the neighboring countries or ceased to exist on earth MOE (1985:34).

Unlike the case before, the present curriculum has given attention to environmental issues. The need to integrate environmental issues is well reflected in the general and

specific objectives of the Education and Training Policy MOE (1994) based on which the curricula at different levels are expected to have integrated the issues.

The presence of environmental objectives in the lists of level and unit objectives of the subjects Geography and Chemistry in the General Secondary Education indicates the integration of the issues in the level. This way of integrating environmental issues lets subjects such as Geography and Chemistry to be more important for they are essentially environmental (Filho 1993). The analysis of the issues against these two subjects could help estimate to what extent environmental education has been the concern of the level.

Active learning is the guiding methodological principle of the present Ethiopia education system which is concurrent with the exploratory and participatory methods recommended for environmental education. The curricular guides in the system allow teachers to relate issues to the practical problems around. Local, regional and global issues are expected to have been integrated in the curriculum.

If all these have been done so, citizens, who have passed through this curriculum, should have been proactive to the environment. The knowledge, attitude and skills gained should have helped them bring positive changes on the degraded environment. It is the observation of the researcher that the environmental issues (environmental education) integrated in the General Secondary have not been able to bring the intended behavioral changes in the learners. A scientific investigation has to be made to prove this.

1.3. Objectives

The general objective of this research was to evaluate the contribution of the General Secondary curriculum (with respect to the subjects Chemistry and Geography) for raising students' knowledge, attitude and skill in environmental education.

In order to achieve this general objective, the research focused on the following specific objectives:

- evaluate the integration, relevance, adequacy and methodology of environmental issues in the General Secondary curriculum with a particular reference to Chemistry and Geography subjects;
- assess students' knowledge, attitude and skills in environmental issues;
- investigate if there were differences in students' performance in terns of location, gender and school.

1.4 Research Questions

To achieve the intended general and specific objectives, the following basic research questions were raised:

1. What were the main environmental issues addressed in grades 9 & 10 Chemistry and Geography curriculum? Were these issues relevant and adequate?
2. Were the methods employed for teaching environmental matters linked to the immediate environmental issues?
3. To what extent has the curriculum helped students in raising their knowledge, attitude and skills?
4. Were local, regional and global environmental issues addressed in the level?
5. Were there differences in students' performances on environmental issues in terms of gender, location and school?

1.5 Significance of the Study

Environmental education is integrated in the General Secondary curriculum with the objective of cultivating citizens who are competent in environmental issues at the end of the level. As the main focus of the research was on content integration and students' performance in these issues, the findings will help particularly curriculum experts working in the area. To this end, the curricular issues addressed in the recommendations could be used as one of the inputs for the curriculum revision the MOE has planned to carry out in this same year.

Sample schools and teachers are the most beneficiaries of the research finding. Each sample school can compare the findings with what is actually there and make use of them as recommended. Teachers who are teaching Chemistry and Geography in the same level could also adapt the findings to their environment in a way suitable for their teaching. Besides this, the research attempt can motivate teachers particularly those who were not sensitive to the environment specially in integrating issues in their teaching.

As the records show, not enough evaluations have been made on the same issue in this particular level. Thus, the study could serve as a secondary source for those who want to work on the same or similar issues.

1.6 Limitations of the Study

Evaluating commitment and skill is such a practical task that a researcher should take a considerable amount of time to observe students' true behavioral reflections. Due to time constraint, however, the evaluation was made using inventories against which respondents were asked to express their agreements. For a seminar reason, it was not possible to go one step further to find out the factors that caused differences between the sample schools, locations and gender.

Aa the main objective of the content analysis was to evaluate if major environmental issues were addressed in the respective subject areas, there were no detail technical discussions made on relevant subject matter contents. The integration was evaluated using percentages scale based on teachers' agreement on the issues set with the help of teachers themselves and developers.

CHAPTER TWO

Review of the Related Literature

2.1. Conceptual Background

2.1.1 Definition

"Beauty as well as environmental values is very much in the eye of the beholder" (Balbech et al. 2002). This is to emphasize how defining an environment is a matter of personal observation and appreciation. Environment means many different things for different people. Some take it as a woodland scene with fresh, clean air and pure water. For others it is a pleasant suburban neighborhood or a quiet habitat. Still others relate it to ecology and think of the plant-animal relationships.

Agbola (1988) views the environment from a different perspective. For him the environment is a composite set of behavioral settings in which individuals within a community act with diverse consequences. This is viewed from the point of view of humans' influence on the community. The community for him is all the constituents in the ecosystem which indeed include all the natural and man-made resources that make up the system, the organic and inorganic components.

The definition given below seems comprehensive. It is a combination of many other definitions by different scholars.

> "Environment does not include only the areas of air, water, plants and animals but also natural and human-modified features which constitute the totality of our surrounding. In other words, it is made up of a combination of our natural and physical surroundings and the relationship of man with these surroundings. It must also include aesthetic, historic, economic, cultural and social aspects" (Balbech et al 2002: 4-5)

The definition is so comprehensive and elaborative to express how the environment is everything; the organic and inorganic as well as all the natural and man-made processes that make the environment a self-sustaining system. In other words, it is all the natural and man-made resources with all activities made to affect the environment in someway. Though this evaluative research is limited to environmental issues associated only to two subject areas, Chemistry and Biology, the researcher uses this definition for the this particular purpose.

2.1.2 Components of the Environment

Anyone with a preliminary knowledge of science would speak of the two explicit components of the environment: the living and the non-living. The definitions given above from different sources are similar to this understanding. The environment includes the organic-the living aspects (animals and plants) and the inorganic the non-living ones (air, water, energy, soil, topography, geological substratum and fire) as its components (MOE 1990: 192).

Components of an environment are essential ingredients for its self-sustenance. The presence of only one aspect of the environment - the organic or the inorganic component, does not guarantee this sustainability. Thus, there should be a mechanism whereby these two main components go in harmony and this is possible through systematic interactions accomplished mainly by humans. These interactions (activities) and processes between and/or among the components are, thus, another intrinsic part of the environment. All aesthetic, historic, economic, cultural and social aspects are reflections of humans' interactions in and with the environment and are part and parcel of the environment.

2.1.3 Environment and Development

The for and against relationship

Today the term development is never uttered alone but with a modifying term sustainable - sustainable development. At the centre of sustainable development is a concern of environment. This is to emphasize how a development endeavor needs to be sensitive to

environmental matters without which its long lasting effect would be questionable. Development and environment are inevitably affecting one another because development is nothing but the result of the interaction of the components of the environment. We don't think of development outside of the environment if at all there is anything outside of the environment.

> "The issue of economic growth, poverty and environmental protection are intertwined in an inseparable way. Lasting economic growth is based on managing natural resources in a sustainable manner" (Balbech et al 2002 : 3).

In support of this idea Filho (1993) expresses the prevalence of a growing consensus that separating the issues of economic and social development from those of the environment is not that desirable or realistic. The scholar strongly comments that any developmental endeavor that does not consider the environment inevitably erodes the environmental base necessary for its sustainability and such deterioration of the environment in turn has a negative impact on economic growth.

Thus, it has become an established fact particularly among environmentalists that the mismatch between environmental management and development or lack of sustainable development has lead many parts of the glob to environmental poverty. Development is a means for quality life but its improper handling results in an irreversible catastrophe the effect of which would lead to total destruction of the environment and the development effort itself. The global heat change due to the devastating effect of polluting gases from huge industries is a case in point.

> "Sustainable economic growth provides both the means to address world poverty and solve environmental questions. Industrialization and economic development are essential to provide basic facilities of life and to sustain and improve our standard of life: how to determine the direction and level of development that is not limited by what is most expedient for the present, but will benefit future generations as well as provide for the immediate needs of society. Poverty is both a cause and an effect of environmental problem" (Balbech et al 2002: 3-4)

The need for the inseparable attachment of the environment and development emanates mainly from the nature of environmental resources especially of the non-renewable ones. Once these resources are exhausted or depleted, there is no way to replace. It will not be that much easy to restore even the renewable resources once they are desperately utilized; they could take decades and even hundreds of years. Whatever is provided by nature is scarce and can deplete easily including the renewable ones unless we use them wisely. The description below by Eckholm (1992) warns how we should be sensitive in using and managing our resources.

> "A few thin meters of soil, a few mile up into the sky and a similar depth down into the oceans, encompasses virtually the whole of the biosphere in which we and other living things can survive" (Eckholm 1992: forward)

Industries which are responsible for the emission of harmful chemicals and gases causing environmental problems such as global warming, acid rain, desertification and other related problems are the results of technological advancements. How would one dare to take these industries as development achievements while they are against the faith of humans? It is at the same time difficult to take development agents as ignorant of the interdependence between sustainable development and the environment. In this regard, it would be enough to look into the reason why American leaders have been resistant to accept the Kyoto agreement on the control of polluting gases. Here lies the paradoxical relationship between development and environment. In fact, technology should have brought a means of alleviating environmental problems along with the invention of industries at least from the time the problems were perceived.

The environmental pollution (water and land pollution) one could observe around industrial areas and cities in Ethiopia too is due to solid and liquid wastes thrown out from industries which in turn are due to the unwise management and handling of development attempts. Chemical fertilizers, selective seeds, and mechanized farm technologies are other technological achievements invented to increase the quantity of agricultural products. However, unwise use of these technologies ultimately results in a

devastating impact on the environment. This is an experience developing countries specially those with low level oh human resource development could not escape. Bangladesh was the case in point. With a goal of increasing food crops in the 1950s for the large population, Bangladesh had no options other than using organic fertilizers as is the case in Ethiopia today. Indeed, the country was able to produce even well and above the domestic need. However, sixty percent of the chemical fertilizers were absorbed into the open water system and brought a catastrophe in the country's fish product (Safiullah and Haider in Filho 1993).

Ethiopian agricultural environment may not escape from a similar problem as the present practice in the area is not different from that of the Bangladesh. Unless the harmful water soluble fertilizers of nitrogen and phosphorus are well treated and made compatible with the soil and other ecological components, the consequence will be of much devastating because the present Ethiopian environment is more degraded than the then Bangladesh. The adoption, adaptation and implementation of technologies both in the urban and rural environments have to be aplied with a detailed analysis of environmental accounting and management. If not, the environment will be damaged to the extent Ethiopia could not afford reversing.

2.2 The State of the Environment

2.2.1 Global perspective

When we say global environmental issues we are referring to large scale environmental issues that have a cross boundary effect. To view the state of the environment at the global level, it would be important to look into the issues that have brought world leaders together to worry about. Global warming, the greenhouse effect, ozone depletion, acid rain, desertification and conflicts are the main global problems. There is no way for each of these problems to remain a problem of one part of the glob though the magnitude of the impact could vary from the immediate source to a distant place at a corner of the planet. The flood calamities, hurricane, conflicts at different parts of the glob and the wholesale destruction of aquatic life in international water environments are all global in effect.

It would not be that much difficult to notice changes on the global environment that have happened over the last few years. Human activities have changed the primary landscape of the environment replacing with man-made ones. This is a reality almost allover the world though all places are not equally affected (MOE 1990).

> "It is difficult to find landscapes anywhere that are completely natural. Most landscapes throughout the world have been altered to a lesser or greater extent, through human activities. Most landscapes are therefore cultural or secondary, sometimes called anthropogenic, technogenic where technological impacts are high" (MOE, 1990 : 191-192).

The case is particularly true in the urban environment. The urban environment differs drastically from the rural environment for it is the place of man's greatest impact on nature. Urbanities remove the natural environment in a way irreversible creating a new man-made environment. Urban areas are centers of development and at the same time sources of most environmental problems such as pollution and waste damping. They are not self-contained in that the impacts of these problems go beyond their territories affecting the neighboring. Environmental changes, the change of natural landscape to the man-made, are more rapid in cities and thus the state of the urban areas is completely different form what it was before the settlement (UNESCO 1983).

Thus, the state of the global environment is at a stage where the forces of poverty and 'development' at two opposite polarities have strained. The poor in developed nations are totally dependent on readily available natural resources for subsistence. Almost all sorts of environmental degradations in developing nations are due to unwise use of the land, forests and animals by the poor majority for existence. The environment in developed regions too is suffering from an ever increasing economic need of the rich. The emissions of harmful gases which are the immediate causes of problems such as global warming, acid rain and greenhouse effect are mainly from highly developed regions only to satisfy their greedy economic development.

2.2.2 National (local) perspective

Although there has not been sound technological pressure, the state of the environment in Ethiopia seems even more alarming than that of the environment where poisonous gas emission is high. The poor in developing nations are as destructive as the rich for they are highly dependent on the readily available natural resources and exploit them exhaustively for their survival. In a similar way, Ethiopians are virtually dependent on the biophysical environment (soil, water, air, flora and fauna) which easily subject to depletion (Gedion 2003). This total dependence on such delicate components of the environment has degraded the environment particularly in the northern and eastern parts of the country to the extent that is difficult to revert within a short period of time.

> "Some of the components notably land, forest, water and biodiversity are in more desperate situations than others more so to date than ever. If degradation continues so, our environment will be damaged so seriously to the extent that would go beyond human's control" (Gedion 2003: 21)

2.3. Environmental Problems

Environmental problems are problems that place any negative impacts on any of the constituents of the environment. They are changes caused mainly by humans on any resources without being fair and considerate for the right of generations to come as well as those living in the other part of the planet.

2.3.1 Global Perspective

Based on what causes them, environmental problems can be divided into two - that occurred by natural catastrophe and that caused by humans. Problems such as drought, famine, flood, hurricane, earthquake, volcanic eruption, are those usually caused by

natural phenomena. Problems such as pollution, unwise waste disposal, deforestation, global warming, unemployment, conflict, desertification, etc are due to humans' interference. Many of naturally occurring problems could have an essentially caused by human activities. Desertification, which causes a climatic problem and consequently a problem in agricultural production, may seem a natural phenomenon. In fact, humans are essentially the root causes of the problem. In a similar manner, flood could happen due to the effect of global warming due to the emission of chemicals into the atmosphere through 'developmental' achievements which n turn is the result of humans' activities.

While analyzing environmental problems in Nigeria, Agbola (1988) divides the problems as primary and secondary. The primary problems are those associated with underdevelopment and its attendant living conditions such as general poverty, apathy towards the environment, living in slum houses and areas, inadequate water supply, lack of solid and liquid waste disposal, and related others. The secondary ones are massive in scale and complex in dimension and are associated with the process of accelerated economic development resulted for inadequate attention given to the physical environment. These include pollution (air/land/water), global warming, acid rain, and depletion of the ozone layer.

Still others look into the type of the problem from geographical perspective though a problem observed in a particular area could have a way to affect other environments found away from the source of the problem and possibly contributing to global ones. Accordingly, they divide the problems as local, regional and global. What is local refers to the problem the effect of which is limited to that particular (specific) environment. An environmental problem caused by the harmful traditional skills in a particular environment, for example, is a local problem because it may not have a trans-boundary effect. A problem that affects places found in one geographical region are termed as regional. Problems that are common to the area in East Africa, the Sahara, etc could be taken as regional. This, however, does not mean that the impact of local and regional problems is limited to their respective localities. What is local could have a regional and even a global dimension and scale unless it is managed and controlled in the right time.

2.3.2 Environmental Problems (issues) in Ethiopia

As the Ethiopian economy is predominantly agrarian, the major environmental problems are those affecting this major economic activity. Thus, land degradation in all its forms-water and soil erosion, stalinization and alkalization, chemical degradation, physical degradation and biological degradation has been the main environmental problem facing the Ethiopian agriculture (Demil 2003).

Similarly, Girma (1994) states the environmental problems as the major constraints to the country's development. Environmental issues especially those related to natural vegetation, soil and wild animals are major constraint to the current development and more seriously threatening future prosperity of the country.

The state of general poverty, which has been the image of the country for long, is the consequence of these environmental problems. Though they are indicators of poverty, plague specially HIV/AIDS and malaria are series problems that are devastating the precious human capital.

Unmanageable population size has been another threat to the Ethiopian environment. While the agricultural sector remains the major deployment area, land degradation has deteriorated the productivity of the soil the major causes being the size of the human and livestock populations which have gone beyond the carrying capacity of the land (MOE. 1990), CSA. 2006). The problem is more serous in urban areas. Unless strict measures are taken, the rate of urban population is estimated to rise to 30% by 2020. This, coupled with the deficiencies in sanitation facilities, sewerage systems, pollution management, would make life in the urban environment of poor quality (EPA 1997)

Renewable natural resources (land, water, wood) on which the national economy depends have deteriorated to a low level of productivity: annual expansion of deforestation has grown to 80,000 – 200,000 hectares and about 40,000 tones of crop production is lost due

to soil erosion. This is estimated to grow to 170,000 by 2010. The amount lost in 1990 was estimated to be Birr 59 million. An estimate of 2 million livestock units will have been lost by 2010. About 17% of the potential agricultural GDP was lost because of physical and biological degradation whereas that lost by forest depletion was 25% of the potential forest GDP in the same year. Only less than 2% of the water resource has been utilized for irrigation and power generation. The genetic diversity of Ethiopia's domesticated plants and its flora and fauna is increasingly eroded due to humans' interference (EPA 1997)

While tourism is an area that requires maintaining an attractive and healthy environment, most of the rich, natural and cultural heritages are at risk due to neglect, decay, removal and destruction. These resources could have served as cohesive forces in the national consciousness and be important elements in the development of the national economy (EPA 1997). This is another problem facing the Ethiopian environment that demands the responsibility of every citizen.

2.4 Causes of Environmental Problems

As discussed above, environmental problems can happen due to natural phenomena or unwise human activities. The environmental problems that the world is suffering from are mainly due to human activities. Humans have created and brought strange substances to the environment which have changed the environment to the extent that is difficult to reverse (Demel 2003). In fact, some of the naturally caused problems such as flood strike, storm hits, may directly or indirectly be consequences of humans' activities.

It is when people push the issue of the environment aside and give the priority to the timely economic demands that they stop to be friendly with the environment. As a result economic advantages become more important than environmental considerations (Axen, 1999). The demand could be for sustenance as in the case of the majority poor in developing countries or for luxury in developed ones. This ascertains the belief of most environmentalists who take poverty and development as the most enemies of environment (Gedion, 2003). The poor in developing countries exploit the readily

available resources using the unwise and traditional way. This brings about the depletion of resources to a stage where reversal to the original state would be beyond the ability of these poor. It is in this way that the environment specially (the flora and fauna) in the developing nations have been degraded even more seriously than those in developed ones. How the poor in these regions are desperate in handling and run only for their daily needs is best elaborated by Eckholm's metaphor.

> "One of the saddest of all metaphor is surely that of eating the seed corn. Yet the inexorable pressure of population on the limited environment and its resource is forcing hundreds of millions of people to do just this, to burn cow dung instead of using it to enrich the soil, to cultivate steep slops until the precious earth is washed down the rivers" (Eckholm 1992: 7)

Indeed, it is difficult to accept the rich as less destructive than the poor. The present world environmental issues such as global warming, acid rain, and the greenhouse effect are all mainly consequences of developments. It is the chemicals from industries in the developed nations that cause these global problems.

The planet provides us with limited resources that would be over after going a short distance up and down in the dimensions. Besides this, any harmful treatment of them at a point on the planet can affect the other irrespective of its distance and thus requires a careful handling. The statement by Eckholm (1992) is all about this:

> "Within this tiny realm the seaborne wastes of one continent become the marine pollution of distant beaches. Toxic fumes from an industrial complex fall as acid rain hundreds of miles away, poisoning lakes and streams. A few greedy nations can over fish the sea wealth and can deprive all man kind of valuable food stacks. The desperate search for farmland and fuel wood in many parts of the Third World leads to the destruction of forests then soil erosion, floods and droughts" (Eckholm 1992)

All what have been discussed so far are only the immediate causes of poverty. The real cause for all the problems is lack of environmental literacy-literacy that goes beyond awareness to affect people's attitude and commitment (UNESCO-UNEP 1988). So long as people, regardless of their economic status, are well aware of the long effect of harmful environmental skills and develop the values that help them become pro-active, there would be no way their economic demand derives them to leave environmental concerns aside. Thus, the root cause for all the aforementioned environmental problems is lack of education in which lays the sustainable solution for the problem.

Agbola (1988) tries to give the root causes of environmental problems by way of analyzing his definition of the environment 'the environment as a composite set of behavioral settings in which individuals act with diverse consequences.' Thus, the causes of environmental problems for him are that imbibed behavioral patterns and acquired values super-imposed on the environment.

2.5 Solution for Environmental Problem

Before discussing how it is used as a sustainable means for addressing environmental issues and thus as a sustainable solution for environmental problems, it is important to look at how scholars define environmental education. Different scholars have defined environmental education in different ways. The difference seems to have been caused by its mode of delivery. Based on this some define it as a process Lucko (1982), others as a theme UNESCO and UNHCR (1999), and Cartese (1992) as a discipline.

According to UNESCO and UNHCR, environmental education is a theme that deals basically on the relationship between humans and the environment as well as prepares humans how to live in harmony with the environment.

> "Environmental education is a theme that deals with the issue of human beings in relation to the environment, its utilization and conservation. It is

> one of the means of preparing individuals to live in harmony with the environment and take care of it" (UNESCO and UNHCR 1999)

Preparing an individual to live in harmony with the environment and care for it requires the development of all sorts of learning domains. The education should help the individual acquire these behavioral domains which eventually develops a sense of ownership (value) that could go to the extent of saying ' it is mine and for my people to come, for the people in other parts of the environment; let us not spoilt it'.

For Lucko (1982) environmental education is a process in which issues of the environment are dealt **in, for, and about** the environment. It is an intellectual endeavor whereby both environmental and issues of other subject areas could be addressed. It is a subject that is capable of addressing immediate and remote environmental issues.

Though the essence is not different from the above definitions, the following seem more comprehensive and elaborative.

> "Environmental education is a process aimed at producing a citizenry that is: knowledgeable about the biophysical and socio-cultural environments of which man is a part, aware of environmental problems and management alternatives of use in solving those problems and motivated to act responsibly in developing diverse environments that are optimal for living a quality life Lucko et al as quoted in Aklilu (2006: 19)

The definition seems to have been given from the point of view the objective of curriculum development. It reflects the basic learning or behavioral profiles learners have to achieve. This could be a preferable definition for curriculum developers who want to integrate issues of the environment in the education system.

2.5.1 Environmental Education as a Solution for Environmental Problems

As a common property and concern for all people across the world the environment needs a coordinated effort to be saved from the danger that it has faced. In this regard, nothing has brought countries all over the glob together more than the issue of the environment-to search sustainable solutions for their common problems (Eckholm, 1992). It is interesting that their discussion did not take them long to find the solution – taking environmental issues into the education systems. Many of them, including Ethiopia, were in the commitment (Aklilu 2006). Accordingly, a few of them have oriented their curriculum with environmental issues. It is only when we create the awareness in all sections of the society, from the kid to the old, in all parts of the globe, we can control the problem (Axen, 1999).

While expressing the state and the cause of the environment, Demel (2003) has stressed on education as a solution to the problem.

> "Thousands of chemicals unknown to the environment before are being poured to the air, water, and soil. In many places the physical environment is no more habitable and all these have created a fear of doomsday for humans. Though the situation is getting worse, it is still possible that the application of an understanding of the functioning of nature and its limitation may rescue human beings' (Demel 2003)

Describing how worst the state of the environment is, the scholar suggests education as a solution to the problem- creating awareness and commitment how the environment with all its constituents works as well as the limitations in doing so. The knowledge is not a simple conceptualization but an understanding that should enable citizens develop the attitude and values to enforce them take actions. In deed education is so powerful to bring about a concerted change; in this respect, in developing values in people to be concerned more for the wellbeing of the environment than for their economic demands.

The need for environmental education emanates from the need for ensuring sustainable development. As discussed in the topics above, environment and development are highly interwoven in such a way that whatever happens on one inevitably affecting the other. A number of research findings show the positive correlation between education and positive behavioral changes (Aklilu, 2006).

> "The goal of sustainable development will be feasible if proper educational strategies aimed at promoting awareness on the relevance of environmental conservation are undertaken" (Filho. 1993: 3)

The wise utilization and conservation of natural resources implies the proper understanding of the processes in the environment. This understanding should go beyond the cognitive knowledge and be expressed in actions. Environmental education deals with such action-oriented issues that enable individuals to positively affect their environment and thereby contribute for sustainable development (MOE 1990).

The complex and multi faceted nature of environmental problems inevitably demands an education system suitably organized to affect the behavior of stakeholders who are acting on the environment. Offering environmental education at all levels of the system can affect all bodies with no natural and social boundaries so that they should be responsible to the conservation of the environment in which the live in.

> "Education to prepare people, young and old, to assume a more responsive and responsible attitude towards the environment, to equip policy makers and planners with the knowledge to make informed decisions, and to provide managers and professionals with the skills to implement sound environmental strategies, can clearly make a significant contribution towards redressing the failures and neglect of the past" (Filho 1993: I)

In addition to this, the relationship between man and his environment is a function of culture, level of technological development, education status and the perceived

magnitude of the existing environmental problems. Thus, understanding the effect of these factors and developing sensitivity to the environment is possible but through education (Agbola, 1988: 23).

According to Hale mentioned in Filho (1993), the need for environmental education can also be viewed from methodological perspective. This emphasizes the importance of *teaching environmental education in the environment*. In promoting environmental education, attention must be given to the fact that environmental education can enhance and serve as a vehicle for the delivery of all subjects of the curriculum. It is true that whatever issues raised in any discipline have to be looked and addressed with a close reference to the environment both immediate and at a distance.

2.6. Historical Developments of Environmental Education

2.6.1 Global Perspective

Humans' awareness of environmental problems dates back to the 13 century when Edward I of England proclaimed to ban the burning of coal by craftsmen to protect air pollution (Eckholm 1992). However, concerted efforts to care for the environment started in the early 1970s when governments allover the world agreed to take education as a sustainable means for environmental problems (UNESCO 1989, Aklilu 2006, Filho 1993). Thus, environmental education being a reliable and sustainable means for the problem is not as old as the time humans started to pollute and degrade their environments. It is not even as old as the time when they became conscious of the problems. Efforts seem to have started only when the impact of humans' unfriendly activities and technologies on the environment reached its climax to the extent of threatening their existence. The ever increasing global warming, the green house effect, water and air pollution, land degradation in all its forms and an extravagant utilization resources were serious problems that forced countries both developed and undeveloped to come together and discuss for a sustainable solution.

Though there were other important international and regional events held on environmental education, the intergovernmental conferences of Nevada (1970),

Stockholm (1972), Tbilisi (1977), UK (1988) and Rio de Janeiro (1992) were very crucial landmarks for the development of environmental education (Aklilu 2006, Filho 1993, Eckholm 1992). The 1970 Nevada of USA conference was the first event to discus on the definition and goals of environmental education which were later well done in 1977 of Tbilisi in Russia to which all participant countries were committed. The 1972 Stockholm's conference was a special and historic event for it recommended education (environmental education) as a sustainable means for solving environmental problems. The Tbilisi conference was able to spell out the mutual relationship between development and the environment. At the Tbilisi conference, countries agreed on goals, objectives and principles of environmental education. One year after Tbilisi, a resolution passed by European countries on the content and methods of environmental education that all member countries had to apply which helped all member countries adapt in their education systems (Eckholm 1992).

The Rio de Janeiro's 1992 Conference on Environment and Development by United Nation gave a new momentum to the development of environmental education. While discussing and prescribing the detail measures necessary for achieving sustainable development, the conference devoted one full chapter (Chapter 36) to environmental education (Aklilu 2006), Filho 1993). Accordingly, many of the countries have taken the issues of the environment into their curriculum with a common perception that development without considering and sustaining the environment is not sustainable (MOE 1985).

2.6.2 Environmental Education in Ethiopia

Although the introduction of environmental education to Africa dates back to 1961, the time African education ministers agreed to liberate African education from colonial domination, it started in Ethiopia late in 1985 in a form of a project - Environmental Education Project (MOE 1992). It is believed that the project was a further improvement of the Soil Conservation Project Initiative which had been run by Ministry of Agriculture

in collaboration particularly with SIDA the main objective being to teach farmers on the then environmental problems and take protective measures (Aklilu 2006)

Thus, it is difficult to attribute the start of environmental education and related actions in Ethiopia mainly to the international calls such as the 1961 Addis Ababa's conference on African education, the Stockholm (1972) and the Tbilisi (1977) conferences. Yet it is at the same time difficult to totally reject the international influence as environmental subjects such as Agriculture, Geography, Chemisty, Biology, home sciences that were offered in the 1970s and 1980s could have been affected in some way Girma (1994). And this was the case in many of African countries too (Riedmiller and Mades). The inception of environmental education or the introduction of the initiative, EEP, was rather highly related to the efforts made by governmental and non-governmental agents with the motive to control the then severe environmental degradation in the country (Aklilu 2006).

Though the program, EEP, was run using schools as centres of the project, the issues addressed were not taken in the formal curriculum. Only primary school teacher trainees in the project areas (Awassa, Harar, Debre Birhan and Dessie), students in 24 primary and 15 secondary schools, the community around project areas, 21 Community Skill Training Centers and 3 Basic Education Development were beneficiaries of the project. It could have brought a remarkable change at a national level if the curriculum had been oriented with the issues of the environment (Aklilu 2006, Gebeyehu 1992).

The education system before 1994 was largely based on foreign curriculum. Thus, its usefulness to the objective situation was debatable (MOE 1994). one could imagine how addressing environmental issues could be difficult in a situation where the curriculum was not attentive to the local reality. As the researcher was the product of this education system, the only opportunities were he is able to trace in this area were offering Agriculture as a subject in both upper primary and secondary schools and running Labor Education programmes schools used to practise on environmental mattrs. Schools had to run the Labour Education programme on regular basis and every teacher and student had to participate. In most cases, Labor Education programmes actions started within the

school compound usually by planting trees and went out to the nearby environment usually for a similar action. It is expected that the guideline the schools were using for their Labour Education programmes might have been supplied by EEP for this was one of its strategies for disseminating environmental awareness (MOE 1992). As a participant of the Labour Education programme in both primary and secondary schools, it is the knowledge of the researcher that LEPs were not accompanied by awareness raising except that integrated in subjects like Agriculture as subject matter issues.

Unlike the case with the LEP, the methodological approach in Agriculture was rather theoretical though the subject was not designed to teach environmental issues approach. The subject is essentially environmental but it was about agricultural science. With the exception of a very small plot for model (experimental) skills done in the school compound, the teaching learning process was theoretical. Surprising yet, the content and method of the subject matter were not based on the local (Ethiopian) context. As what was true in other subject areas, the curriculum was foreign oriented (Tekeste 1996). It is to be recalled that the model garden plots in the schools compound had a contribution particularly in growing and distributing seedlings to the community. After all, schools could have contributed more than this to their environment if there had been aware of their real business-serving the community being as centre of change in all aspects.

2.6.1.1 Environmental Education Project (EEP)

Environmental Education Project was a six year long pilot prgramme (1985-1992) practised in four centers. It was launched after a survey was made on the contents, methods and materials necessary and relevant to the Ethiopian environment. In addition to this it was built on important lessons gained from MOA's previous rural initiatives and SCPI. Base on this EEP had a clearly articulated objective, strategies and organizational set up which was established to involve all stakeholders in the educational structure (MOE 1992).

General objectives:

1. to raise the capacity of the education system through training and dissemination of technical information;
2. to promote widespread pattern of community based actions in the formal and non-formal education systems;
3. to ensure the relevance of education in solving the problems faced by the rural population by promoting greater understanding of the environment.

Specific objectives:

1. To promote better understanding of the relationship between man and nature and develop a better grasp of the scientific principles, which can be drawn from these experiences;
2. To strengthen and enlarge the areas of cooperation between schools and the community in rising the conditions of life;
3. To strengthen the concept and implementation of Labour Education.

Strategies

With the objective to produce a multiplier effect down to the grassroot level, EEP had three way of information dissemination:

1. **Training and orientation of the education staff**;

   EEP was conscious of the importance of orienting coordinators and decision makers at different levels of the system for its implementation. To this end, many seminars and workshops were organized on different environmental issues both by MOE and project centers at all levels. Relevant sections such as trainees, Awraja Pedagogical Centers (APC), teachers, community skill Training Centers (CSTC) were involved in these seminaries and workshops (MOE, 1992)

2. **Information dissemination and production of instructional materials**

   MOH, MOA and other institutions were involved especially in the production of materials. Books, fact sheets, pamphlets, posters, magazines, education minimedia and videos were commonly used (Aklilu, 2006, MOE, 1992).

3. **Practical actions**

   Although there was a problem at the beginning of the project time, the theoretical classroom lessons on the environment had a practical end in the field around the schools.

The summative evaluation made on the EEP at the end of the project time was able to point out the strengths and drawbacks of EEP (MOE 1992).

2.6.1.2 Achievements of EEp

As a pilot project, EEP did sound achievements that had a practical impact particularly in the project areas. These include:

- Schools gave emphasis to the already existing environmental issues in the curriculum;
- The practical actions on the environment led pilot schools to start research attempts on the surrounding problems;
- Motivated farmers around the project areas to take actions on environmental problems; and
- Set grounds whereby the education system could take the issues in the curriculum.

2.6.1.3 Limitations of EEP

Almost all the limitations with EEP were directly or indirectly attributed to its poor connection with the curriculum. As to (Aklilu 2006), the project could have affected areas around the country if it were able to take even the issues in the guideline. The limitations include:

- A limited scope for it covered a very insignificant portion of the country;
- Dealt only some aspects of the environment;

- It was donor oriented; and
- Little effort to affect the secondary curriculum.

2.7 Goals, Objectives and Principles of Environmental Education

For Eyre (1989) ignorance in environmental issues is 'not a bliss', rather a 'suicide'. This is to emphasize that the aim of environmental education must not merely to learn **about** the environment but to foster the concern that could lead to committed action to care **for** the environment. This clearly shows how goals and objectives of environmental education should be action oriented.

The 1977 Tbilisi intergovernmental conference on environmental education came up with goals, objectives and principles for environmental education which have been used by countries as guidelines for curricular integration (UNESCO / UNEP 1985). The goals as it is true in other subject areas are general (broad objectives) the achievement of which is ensured by accomplishing the specific objectives. In other words, they are overall targets learners are expected to achieve learning environmental education. Whereas, objectives refer to the specific outcomes that could be obtained after a particular lesson is conducted. Principles are theoretical frameworks based on which the goals and specific objectives are derived.

Goals of Environmental education

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

Objectives:

- to help social groups and individuals acquire an awareness of and sensitivity to the total environment and its allied problems;

- to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in the environmental improvement and protection;
- to help social groups and individuals acquire the skills for identifying and solving environmental problems;
- to help social groups and individuals with an opportunity to be actively involved at all levels in working toward the resolution of environmental problems.

2.8 Environmental Education in the Curriculum

2.8.1 Philosophical View

There are many ways other than the formal educational system whereby people can acquire knowledge, attitude and skills in environmental issues. But these ways are not as effective as the formal way of delivery for the latter is more systematic in integrating the aspects in a promising way to bring a positive change to the environment (UNESCO-UNEP 1989). Learning in environmental education is more than the cognitive study of the relationships of components in the ecosystem and of the symptoms. Environmental education should help the learners explore the issues around and their root causes to make a meaningful intervention.

The following are internationally accepted principles of environmental education that an education system need to reflect in the goals and objectives of the respective curriculum. Environmental education should:

- consider the environment in its totality- all natural and man made;
- be a continuous or life long process;
- emphasize active participation ;
- examine major issues from local, regional and global perspective;
- focus on current and potential situations;
- be interdisciplinary or multidisciplinary in its approach;
- emphasize the complexity of environmental problems and thus develop critical thinking;

- utilize diverse learning environments;
- focus on the learner's own community'
- relate environmental sensitivity, knowledge, problem solving and value clarification at every grade level to the learner's community;
- enable learners to play a role in planning their learning experiences and provide an opportunity for making decisions and accept their consequences.

Thus, it is clear that the general philosophical direction with environmental education seems some what constructivist for it encourages active learning placing the learner at the center of the learning process. Learners are required to explore the environmental issues at the different levels and try to understand the root causes as well as possible methods of alleviating the problems.

2.8.2 Contents of Environmental Education

The aim of environmental education is to enable individuals to gain knowledge, attitude, and skills to live in harmony with their environment (Aklilu 2006, UNESCO, UNEP 1988). Environmental issues are contents of environmental education that should be addressed at all levels of the environment - local, national and global O'Donoghue and Naught in Aklilu (2006). An education system becomes environmental only when it adequately reflects these issues in relevant contexts Chelliah in Filho (1993).

Though most environmental problems have a global character, the contents of the curriculum should start with the nearest and familiar environmental concerns. The nearest and the most familiar environment for the learner is the family which in fact begins with his/her individual situation. A learner in rural areas should first be taught of rural issues that are around and then go to the remote regional and global issues. Pollution from huge plants, wastage from industrial by-products, acid rain in developed areas may not be a primary national environmental concern for countries like Ethiopia while there are series local problems as land degradation, deforestation, unmanageable population growth and HIV/AIDS are devastating the environment. Thus, it is apparent that the content should

start with personal hygiene of the learner and goes to the global issues as global warming and green house effect.

Education becomes environmental only when it adequately reflects problems and issues of the society Chelliah in Filho, A. (1993).

> "Each country has its own peculiarities, resources, problems and requirements to which individual aims, the contents and methods to be adapted so that men and women may be enabled to play their full role in the life and development of a nation" (Demel 2003:18).

Hence, we can understand as each country has its own local realities and priorities. The focus in developed countries would be more with respect to the impact of technologies whereas those in developing countries like Ethiopia could be on the preservation of agricultural resources. Besides this every environmental content should be built in and reflect cultural and social values of the community. In this regard, integrating indigenous knowledge and strategies for instance is crucial as it could have a naturally built in system for managing environmental problems. Ignorance of these will ultimately aggravate the problem for there would be a loss of interest on the learner or actor's side (Demel 2003).

Environmental issues (contents) in Ethiopia according to Demel (2003) are classified into two: **resource management and conservation and environmental degradation.** These are issues about causes of environmental problems and the means to solve these problems. In a similar way Aklilu (2006) expresses his concern that environmental education in the Ethiopian context should help the realization of conservation based agriculture. This is quite important to note where the curriculum should focus.

2.8.3 Approaches and Methods to Integrate Environmental Issues

An educational system may help bring about prosperity to a particular generation or to certain section of a society. If this is done at the expense of the benefit of future generation and of societies in other part of the globe, the system is not in a way it is expected to be. What makes a curriculum relevant and effective in addition to its contents, therefore, is the method it has employed. This entails the need for making thoughtful efforts in selecting appropriate approaches and methods of teaching. Methodology is central and very fundamental for achieving goals of a curriculum.

There are two ways of addressing environmental issues into the curriculum: Interdisciplinary or multi-disciplinary (Filho, 1993; MOE,1992, UNESCO-UNEP, 1988). In the former approach, contents are treated in a separate subject whereas in the latter they are integrated across relevant disciplines. In integrating issues in a cross-curricular approach, the lion share of the contents is addressed in subjects which are essentially environmental such as Chemistry and Geography (Filho 1993: 44).

The choice of using a particular approach depends on the ease of implemcntation, teachers' competencies, curriculum load, etc. Treating the issues in a separate subject could let students and teachers give more emphasis than the case otherwise. Cartese (1992), for example, strongly supports this approach for he believes the system is more helpful to develop critical thinking, problem solving and decision making skills towards achieving sustainability.

Professionals like Ali (1990) do not advise to use the multi-disciplinary approach for the issues in this approach are usually treated as secondary themes. The problem they raise is in relation to teachers' competence. If teachers are not trained how to teach on environmental issues, they would take them as secondary issues even though they are aware of the problems. Besides this cross-curricular approach does not force the system to provide the necessary learning resources as there would be no a separate resource allocated to environmental education (Fliho 1993)

There are scholars who prefer the multi-disciplinary approach raises also methodological advantages. For Axen (1995), the diverse nature of the environmental problems and of the environment itself, the understanding, attitudes and skills that we want to develop in environmental education cannot be attended by teaching in single subject. Besides addressing certain issues pertaining to each subject area, every discipline could use the environmental education as means for creating a contexts for every subject matter issue. The following quotation by Flint (1999) emphasizes these methodological important of the multi-disciplinary approach:

> "Cross- disciplinary education enlarges the students' awareness of issues and methods beyond their own disciplinary inquiry, enabling them to explore the interrelations of these issues and methods, and encouraging students to regard their own studies in a broader social and ecological perspective" Flint (1999: 161).

Curriculum, designers should be aware of factors that affect students' knowledge, attitude, and the practical involvement they need to develop in environmental issues. Different research findings show that curricular focus and teaching strategy, age/grade level, sex, academic stream, source of information and place of residence as the factors influencing students' performance (Aklilu 2006).

Through discovery, exploration, observation and experimentation, the pupils can learn about the environment in practical ways. Applying this both in and outside the schools, the learns could come to see how knowledge, attitudes and skills can make a difference in people's lives (UNESCO / UNHCR ,1999).

Environmental education should be developed locally and cannot be imported from outside Filho and Hale (1992). By saying so they advise curriculum developers to treat

environmental education from three perspectives- education **for, about,** and **in** the environment. With education **about** the environment we can address the cognitive aspect necessary for a particularly understanding of the relationships between components of the environment. With education **for** the environment, the curriculum addresses attitudinal aspects and this in turn could include two tiers-awareness and commitment. Education **in** the environment is all about using the environment as an inevitable context for addressing issues of the environment-it is using the environment. In the case of education for the environment, attaining the second tier, commitment, is more difficult as it requires a personal life style which is consciously disciplined to take decisions and perform actions in favor of the environment Eyre (1989).

What is more important but difficult in environmental education is developing learners' attitude and skill. To this end, Eyre (1989) advises to give particular focus to these domain.

> "We know what has gone wrong with our environment. We know in theory and in technical terms how to put it to right, at least where possible and feasible. Only when the psych of the population can incorporate a truly crusading attitude is there likely to be much hope. That crusade might as well begin where there is some chance of its being effective: in the area of education Eyre (1989: 84)."

In designing a environmental education, the Tbilisi International Conference on Environmental Education recommended that curriculum objectives be set to develop the five basic profile elements - awareness, knowledge, attitude, skills and participation. Learner's activities need to be developed with great emphasis given to problem solving skills and values. The method of learning should be exploratory and learners need to employ problem solving skills UNESCO-UNEP (1989: 7-11). The following are procedures each with a profile learners are expected to acquire in the learning process.

- recognizing environmental problems;
- defining the problem;

- comprehending the problem;
- collecting information;
- organizing information;
- analyzing information;
- generating alternative solutions;
- developing a plan of action;
- implementing a plan of action.

All this is done to help learners be aware of their beliefs, attitudes, values and actions related to environmental problems and enable them explore the consequence of their own actions (valuing process) and finally to generate alternative solutions. The valuing process can follow the following steps UNESCO-UNEP (1989)

- presenting an issue
- suggesting alternative solutions
- consider the consequence of each alternative
- expressing feelings about the alternative
- making a choice regarding one's own behavior

2.8.4 The Confluent Approach

For a meaningful environmental education to take place, there should be a methodology that helps the behavioral domains influence each one another. The Confluent Approach is believed to be an effective alternative for this purpose KSTF (1994). This approach involves four elements; theory, experience, evaluation and action. Each of the elements should be addressed with a clearly defined aim, method and basic questions.

This element (Theory) primarily involves a 'traditional' teaching to convey information in the form of background data. In the second element (Experience), personal experiences in the issues are brought to the classroom to make the learning practical and tangible. The experience could be from the learners themselves of the anyone else. The third element (Evaluation) deals with learners' attitudes towards the issue under consideration and this

is an important step check if they have owned the required values. The fourth element (Action) is about the relationship between the theme of the issue, the learner and the reality-expressing this relationship in actions. What to begin with, is not prescribed; what maters the start is the nature of the issue.

Table 1: Confluent Approach to environmental education

Elements	Aim	Method	Key question
Theory	Acquire fundamental understanding as well as key terminologies	Various forms could be employed including interviews, lecture, studying literature, films	What is…?
Experience	Use learners' experience and reflections	Field work, visits, group discussion, reading, laboratory experiments, nature studies etc	How does it work?
Evaluation	Promote self awareness and increase learners' attitudes and values; Develop insights into the standards they live and finally; Adopt a position on the issues	Self evaluation, group evaluation	What do I think? What do the group think?
Action	Promote the ability and will to act and bring the desired changes (commitment)	Involving learners to solve practical problems (eg. writing letters to the press, training others)	How can I apply my knowledge, my insight, my experience in a way that contributes to societies?

CHAPTER THREE

Research Methods

3.1 Data Sources

The data sources employed include students, teachers, documents and the school environment. A total of 348 grade ten students and 38 teachers Chemistry or Geography all from the sample schools participated in the research. The syllabi and learners' texts of the respective subjects were the main documents inspected for content analysis. Observations on the school environment and records on co-curricular activities were also made to collect data.

3.2 Sampling

Environmental education is offered as a single subject in the general secondary level. As what is the case with the issue of HIV/AIDS, family planning and others, environmental matters are expected to have been integrated in a multidisciplinary way across all the subject areas. The researcher selected Chemistry and Geography for the reason that these subjects are believed to be most relevant to treat environmental issues for they are essentially environmental UNESCO-UNEP (1989). The major environmental problem in Ethiopia is land degradation in all its forms caused mainly by unwise handling of the flora and fauna Demel (2003) which is more of an issue of Geography. Major global and regional problems as global warming, acid rain, desertification and others caused due to chemicals are very much the subject matter of chemistry. Thus, a thorough evaluation into these two subject areas could give evidence fair enough to evaluate how far the curriculum at this level was relevant to affect learners' knowledge, attitude and skill.

The research was conducted in three schools (Abayminch, Injibara and Ghion) in Amhara National Regional State. The schools were selected from different

administrative zones with different environmental realities. Though there were no records on how much, a large part of West Gojjam and Awi was covered with indigenous flora very few decades before. A considerable area of ranged land in Awi has been covered by reforestation skill. This was not the case in West Gojjam as a result many parts of the region were bare the most affected area being that around Abayminch. Ghion is an urban school in Bahir Dar where the environment is substantially different from that of Injibara and Abayminch. Thus, the purpose of taking samples from different environments was to evaluate how capable the curriculum was in addressing problems pertaining to the different learning environments.

Selection of students was both purposive and random. It was purposive in that students in the urban school (Ghion) were only those with urban background and those in rural areas with a rural background. More than 15% of the students were randomly selected with almost equal gender proportion. This proportion of a population can fairly represent such a homogeneous population Cates (1985).

3.3 Instruments

Three instruments were used for data collection: criterion referenced (mastery level) test, questionnaire and content analysis checklists. The criterion referenced test and the questionnaire were prepared for students and the content analysis checklist for teachers. Two content analysis checklists were prepared one for Chemistry and the other for Geography teachers (Appendix C).

All the instruments were prepared with the help of experts in the area. All the instruments were piloted and improved accordingly. The test items were evaluated for reliability, credibility and level of difficulty (Appendix D). Accordingly some of the items in the test were changed, improved and many other items were added. The pilot test was helpful to indicate students' problems in responding to a questionnaire. Due to this open-ended items on detail issues were reduced. The pilot test showed that all

teachers were not equally aware of environmental issues and this was an obstacle in collecting reliable information. To tackle this problem in the actual data collection, the researcher had to discuss the issues with sample teachers to increase the reliability and feasibility of the data.

3.4 Data Collection

Data were collected from all Geography and Chemistry teacher on a number of research issues using the checklists included in teachers' questionnaire. Teachers were provided relevant topics against which they evaluated the issues. The categories for evaluation included: contents' integration, relevance, adequacy and method. All the topics were taken from the syllabi and students' texts (grades 9 and 10). The evaluation was made using a four point rating scale (very good, good, poor and never). Based on the lesson gained from the pilot test, teachers were given brief explanation both about environmental and what they had to do on the evaluation. This helped a lot to collect data on all the items addressed.

All the items addressed in criterion referenced tests were on students' knowledge. Based on the specifications prepared with help of test developers, a total of 60 items drawn from Geography (40) and Chemistry (20) were administered. The items were set from grades 9 and 10. As the purpose of the research was to test performance in a particular issue, the test was criterion referenced with 80% mastery Borich & Kubiszyn (2003), David and Robert (2003). Students who scored 80% and above were considered to have accepted level of knowledge. As a supplementary to the data obtained on the test, open-ended items were also administered for students for collecting additional data on their knowledge. The data were collected in Amharic to avoid language barriers in expressing their ideas.

The data on students' attitude and skill were collected using inventories (12 items for attitude and 7 for skill). In both cases students were asked to rate their agreement on a

five point scale (strongly agree, agree, difficult to decide, disagree and strongly disagree) for attitude (always, usually, sometimes, seldom, never) for skill.

3.5 Data Organization and Analysis

Data were organized against the main research variables - content integration, knowledge, attitude and skill. For all variables, organization was made by schools, gender and location. Frequency and percentage tables, graphs and charts were used to present the data. Both descriptive and inferential statistics were used for data analysis and the computations were done with the help of SPSS package. If the differences between the categories were statistically significant, independent samples t-test and ANOVA were used at 95% confidence.

Data from the test were organized and analyzed to evaluate students' knowledge at 80% level of mastery. Only students with scores 48/60 (80%) and above were evaluated to have the required knowledge in environmental issues. Data from the open-ended question were also used as a supplementary for evaluating their knowledge. Student's knowledge was compared by school, gender, location and subject area. If the differences in students' performance were significant, 'independent samples t-test' was computed for two independent variable (gender and location) and one-way ANOVA between the schools.

CHAPTER FOUR

Data Presentation and Discussion

Introduction

Data organizations and discussions were made around the four major research issues (variables) - content integration, students' knowledge, attitude and skill in environmental issues. The data on content evaluation were organized and analyzed to answer questions on the integration, relevance, adequacy and methodology of environmental issues. The data through the mastery test were used to evaluate the status of students' knowledge and the those through the questionnaire, for measuring attitude and skill. Data on students' knowledge, attitude and skill were analyzed in terms of location, school and gender using both descriptive and inferential statistics.

Before the presentation and discussion of the data and the findings, a general description is given on the courses under consideration (Chemistry and Geography). This is important for it helps readers draw a clear picture of the background of the courses (curriculum) for their evaluation on the research processes and findings.

4.1 An Overview on the Courses

As the general education system requires students to attend all subjects from social and natural science streams, the subjects Chemistry and Geography are delivered to all students in the level. This is done so with the belief that such an exposure to different disciplines would help to cultivate citizens with all-round personality (MOE 1994). Besides this, the system of the curriculum allows the integration of important issues as issues of the environment, HIV/AIDS, family planning and others in a multi-disciplinary way. This approach is accepted appropriate in a situation where there is a shortage of

curricular facilities particularly teachers with the required training in specific areas (Cartese 1992).

Although it is possible to integrate the issues in all subjects, for reasons mainly attributed to pedagogical and nature of the subject matter, some subjects are most appropriate for the integration of such issues. For the same reason, Geography and Chemistry are considered suitable subject areas to address environmental issues as their subject matter is essentially environmental (Filho 1993). Unless there is a methodological gap in designing the contents, for curriculum developers usually forget the issue of 'teaching for the environment', almost all contents in both areas are either essentially environmental or have the room to entertain environmental issues Whether the curriculum had relevant and adequate objectives and contents for affecting students behavior in environmental issues was one of the objectives of this research. The investigation on the syllabi and texts identified the objectives and contents summarized in the tables below.

Table 3: Environmental objectives and contents addressed in Geography syllabi

Objectives	Contents
-Develop basic skills in understanding, using maps -Analyze processes and factors of land formation; -Comprehend the elements of weather and climate and the mechanisms that create discernible climate pattern in Ethiopia and the world at large; -Distinguish the major natural resources and associated problems and thereby develop a set of values and feelings of concern for the resources and the motivation for actively participating in their protection; -Understand some basic concepts, measures, theories and impacts of population growth on socio-economic development and the environment and measures taken to harmonize in Ethiopia in particular and in the world in general; -Recognize major types of economic activities skilld in Ethiopia and the world at large, factors affecting their distribution as well as their levels of distribution.	-Making and using maps; -Weather and climate – factors, controls and consequences of climate and weather changes; -Humans and the environment-how they affect each other; -Distribution and degradation of natural resources -Environmental hazards and drought -Environmental policies -Threats against the human resource HIV/AIDS, poverty, population explosion, illiteracy -Globalization- advantages and disadvantages -Self reliance and dependency

Table 2: Environmental objectives and contents addressed in Chemistry syllabi

Objectives	Contents
-use laboratory equipment and chemicals without affecting the environment; -appreciate problem-solving attitudes; -realize the humanistic objectives of science; -develop personality characteristics such as neatness, diligence, responsibility and carefulness; -understand the cause and problems of environmental pollution and know the methods used in environmental protection	-environmental pollution (air/water/land pollutions) -global warming; -greenhouse effect; - waste disposal

The syllabi for the level have clearly set objectives on environmental issues which students are expected to achieve at the end of the level. Many of these objectives were not included in the list of level objectives given on the first pages of the documents. Rather they were included in the list of unit objectives. Including the objectives in the list of the general objective of the level shows the emphasis given to the issues. However, this should not be taken as a big gap as long as the required contents are addressed with the specific unit objectives and discussed accordingly.

If we pay a critical look on each of the objectives, we could imagine how comprehensive they are to address important environmental issues. Population, land degradation in all its forms, environmental issues related to whether and climate, resource management, economic activities and other issues are usually addressed in Geography (UNESCO/UNEP 1988). The objectives reflect all the issues though what is important in education particularly for such action demanding curricular issue is what is done by the schools in the actual teaching learning process.

The worry of the present world in relation to environmental degradation is due to the action of chemicals which is more of the subject matter of chemistry (Demel 2004). The objectives seem to have been set with this in mind. Particularly the last objective could let teachers discuss these issues all together. The major issues as pollution, waste disposal, global warming which are more of the effect of chemicals were addressed in this subject.

This shows the presence of a curricular ground for cultivating students who are environmentally conscious.

4.2 Content Integration

As indicated in the methodology part, the content analysis was made based on subject matter topics. Teachers were given a lists of unit topics taken from the syllabi of the respective subjects to express their agreement in terms of topic's relevance for integrating environmental issues, relevance of the integrated issues, adequacy, methodology, and incorporation of local, national and global issues. The first two variables were evaluated using Yes- No option the rest using a 4 point scale (very good, good, poor and never).

Subject matter topics in which environmental issues were analyzed

Geography:

map reading	natural regions of the Earth
humans and the environment	population geography
economic systems and activities	weather and climate

Chemistry:

classification of the elements	chemical bonding	hydrocarbons
physical states of substances	electrochemistry	chemistry and industry
inorganic compounds	chemical reactions	

Whether these topics were relevant for the purpose, the selection was made with the help of curriculum developers and subject teachers. Topics with similar contents were put together for methodological convenience.

4.2.1. Topics' Relevance for Addressing Environmental Issues

The fact that the subjects are essentially environmental is self-evident to accept all the topics in the list as relevant for integrating environmental issues. But the evaluation on topics' relevance was done for two purposes: to check if all subject teachers were aware of this and to save teachers' time letting them focus only on topics they accepted relevant.

In this regard, Geography teachers seem to have been well aware of the fact that contents in the subject are essentially environmental. With the exception of 4 (36%) teachers who did not agree for 'map reading', all agreed the relevance of topics for integrating the issues. Whereas teachers in Chemistry unanimously agreed as all the topics were relevant for integrating the issues.

Map reading is a topic where students can learn important knowledge, attitude and skills which they could use for different purposes. A comprehensive knowledge in map reading can help one explore any place on the planet without facing any problem. This being so it would be surprising to expect a teacher in the subject area who was not aware of this. Those who did not accept the importance of integrating the issues in 'map reading' had taught the subject only for one year. Perhaps one's experience of teaching in the subject could affect one's critical reflection on such issues. The researcher was aware of this; he involved all the teachers irrespective of their service with the intention of gathering a variety of data from a large number of participants.

4.2.2. Content Integration

The next issue evaluated was 'whether the subjects integrated environmental issues' in the selected topics. In this regard, all teachers evaluated as environmental issues were addressed in all the contents of Geography. What seems paradoxical in this case, however, was those teachers who did not agree the relevance of the topic "map reading" for integrating the issues evaluated the same topic as it had integrated issues. If their disagreement on topic's relevance were acceptable, there would be no possibility for developers to integrate the issues as witnessed by all teachers including themselves. The researcher would like to make the readers be aware that such inconsistency with these particular participants may also prevail in the evaluation they made against other variables too. However, this does not hold true for all teachers with a similar experience as many of the participants from both Abayminch and Injibara schools were very critical with short experience in the profession.

Table 5 : Missing environmental issues in Chemistry-(teachers' response)

Topics	Issues that could have been integrated
Classification of the elements	-abundance of elements - advantage and disadvantage -hazardous elements -whether renewable or not -handling hazardous element
Chemical bonding	-the problems with atomic bombing on the environment -conflicts around the globe due to the action of chemical bombing -its relevance in Ethiopia (practical examples)
Physical states of substance	-the importance of substances in humans' day-to-day activities
Hydrocarbons	-how hydrocarbons pollute the environment -abundance in Ethiopia -precaution during production and utilization -practical examples observed in the world -raisin the issue degradable and non-degradable substances
Chemical Reactions	-the effect of reactions on the environment - chemical reactions harmful to the environment -the effect of by-products on the environment
Inorganic compounds	- application in agriculture -comparison of inorganic and organic fertilizers -how the misuse could pollute the soil and water
Electrochemistry	- pollutant gases and how they pollute the environment
Chemistry and industry	-more practical example both local and global -mechanisms of preventing pollution from industries

One could see how teachers were able to identify important issues that would have been addressed in each topic. All the teachers agreed for the integration of the issues in the last two topics (Electrochemistry and Chemistry and industry) as indicated in table 5. At the same time there were very few missing issues mentioned by teachers for these topics.

The researcher had to look at the materials if the integration was in line with teachers' evaluation and it was found that a number of issues were addressed particularly in the last topic (Chemistry and industry). In fact developers in Chemistry seem to have chosen the method of addressing environmental issues in one unit. The researcher had a thorough look at the methodological aspect of the issues in these units and it was found that the presentation was theoretical. The cause and effect relationship on the environment should have been verified by showing the activities carried out in the industrial (pollution) process. This could more effective if assisted whenever possible with a practical visit to the nearby industrial sites (KSTF 1994).

Integrating issues in a single of few units is not single subject approach different for the technical knowledge in the prior lessons as 'chemical reaction, chemical bonding, hydrocarbons, etc were not taught integrated with possible environment problems they could cause. Teachers' list of possible issues for each topic also indicates the need to have such an approach.

4.2.3. Content Relevance

Overloading a course with plenty of contents does not guarantee relevance of a curriculum. Contents addressed in a subject should be relevant and this has to be justified by desired behavioral changes observed in learners. Addressing and discussing issues of natural disaster that usually occur in the Far East Asia or the boarder conflict between nations in remote parts of the globe in the Ethiopian curriculum may be considered as a waste of resource while there are burning issues as poverty, illiteracy, HIV/AIDS and deforestation to be given priority. Whatever issues addressed in the curriculum need to benefit the learner, and thus, the immediate environment (Filho and Hale 1992)

Table 6: Content relevance in Chemistry (teachers' response)

Topics	Response in %			
	V good	good	poor	never
Classification of the elements	20	7	73	0
Chemical bonding	0	20	7	73
Physical states of substances	7	13	13	67
Chemical Reactions	13	20	47	20
Hydrocarbons	13	33	40	14
Inorganic compounds	20	47	20	13
electrochemistry	33	67	0	0
Chemistry and industry	73	27	0	0

In this case too, teachers' evaluation favored the last two topics (Electrochemistry and Chemistry and Industry) the latter being the most favored one. No teacher evaluated these topics as *poor* or *never*. Whereas 73-87% of the teachers evaluated issues' relevance either as *poor* or *never* for the first four topics.

Relevance of an issue is nothing but forming a meaningful attachment to the real and practical environment (KSTF 1994). In a similar manner, the environmental issues addressed should be important for learners so that they could understand and affect the environment in some way positive and this should start with what is immediate. Almost all environmental contents required to be addressed in chemistry (those mentioned above) were integrated in the subject. Pollution, global warming, green house effect, waste disposal issues were addressed in the subject. However, the issues were presented in a theoretical way. How the poisonous gasses cause pollution, the industrial process should have been discussed along with the knowledge and attitudinal aspects. The issues would have been effectively addressed if they had been integrated in all relevant topics. While it is possible to integrate knowledge attitude and skill at the same time KSTF (1994), the issues were discussed in a theoretical manner.

In the case of Geography, the evaluation on relevance was favorable except for the first topic (map reading) for which a large number of teachers (45%) expressed their disagreement.

Table 7: Content relevance in Geography- (teachers' response)

Topics	Response in (%)			
	V. good	good	poor	never
Map reading	17	36	36	11
weather and climate	54	46	0	0
Natural regions of the Earth	64	27	9	0
humans and the environment	82	18	0	0
Population geography	33	58	9	0
economic systems and activities	18	64	18	0

The response was 100% favorable against the second and fourth topics (weather and climate, humans and the environment) the former being the most relevant topic. The number of teachers (18%) evaluated contents' relevance as poor for the fifth and seventh topics as poor.

As the contents in Geography are environmental Agbola (1988), the only thing curriculum developers could do is to systematical integrate the contents with relevant environmental issues. In this respect, the topics were found to have integrated relevant issues. The most striking issues as soil erosion, deforestation, overgrazing, and population growth, drought, natural resources, pollution, HIV/AIDS, desertification, global worming were addressed in the topics.

4.2.4. Content Adequacy

An education system may not bring about the desired behavioral change only for it has integrated relevant contents. The curriculum should ensure that the issues addressed are adequate. Addressing only one aspect of the environment will leave the learner with an

incomplete competence. Tables 8 and 9 below show teachers' evaluation on the adequacy of environmental issues integrated in Chemistry and Geography respectively.

Table 8: Content adequacy in Chemistry - (teachers' response)

Topics	Response in %			
	V adequate	adequate	inadequate	Very inadequate
Classification of elements	0	0	27	73
Chemical bonding	0	13	13	74
Physical states of substances	0	22	38	40
Chemical Reactions	0	18	45	37
Inorganic compounds	0	26	60	14
Hydrocarbons	0	55	34	11
Electrochemistry	27	73	0	0
Chemistry and industry	61	39	0	0

Teachers' evaluation did not favor the first five topics for adequacy of environmental issues integrated. It was in the last two topics that the issues seem to have been integrated adequately.

As long as the subject is essentially environmental Filho et al (1993), it is certain that the contents have a lot of important issues to be addressed. The missing contents listed out in table 5 above clearly show that adequate environmental issues were not addressed in the units. As a supplementary data the researcher asked curriculum developer if the issues addressed in the last two and three units were adequate and it was found that the last unit in grade ten (Chemistry and Industry) was purposely designed to address environmental issues. This was proved from curriculum developers.

Though they were not integrated in each and every topic, there were adequate environmental issues in Chemistry. This, however, may not help bring the required behavioral changes in students as the integration was very theoretical separated from the

technical aspect that is important for developing skills. While the issues are action oriented, the discussion was less attentive to local environmental issues. It lacks eliciting practical problems observed at different levels of the environment such as the effects of chemicals on local, regional and global environments.

Table 9: content adequacy in Geography- (teachers' response)

Topics	Response in %			
	V.adequate	adequate	inadequate	V.inadequate
Map reading	0	92	8	0
Weather and climate	5	75	20	0
Natural regions of the Earth	0	71	29	0
Humans and the environment	40	60	0	0
Population geography	21	70	9	0
Economic systems and activities	33	47	20	0

As what was the case with other variables (relevance and integration), adequacy of contents in Geography. The number of teachers with favorable response ranges from 71% for the third topic (Natural Regions of the Earth) to 100% for the forth (Humans and the Environment). Topics as 'population and geography' and 'humans and the environment', which are highly linked to environmental matters UNESCO/UNEP (1989), had adequate environmental issues. The topics 'weather and climate, economic systems and activities are highly environmental but only 20 % of the teachers evaluated them issues for their integration of adequate issues.

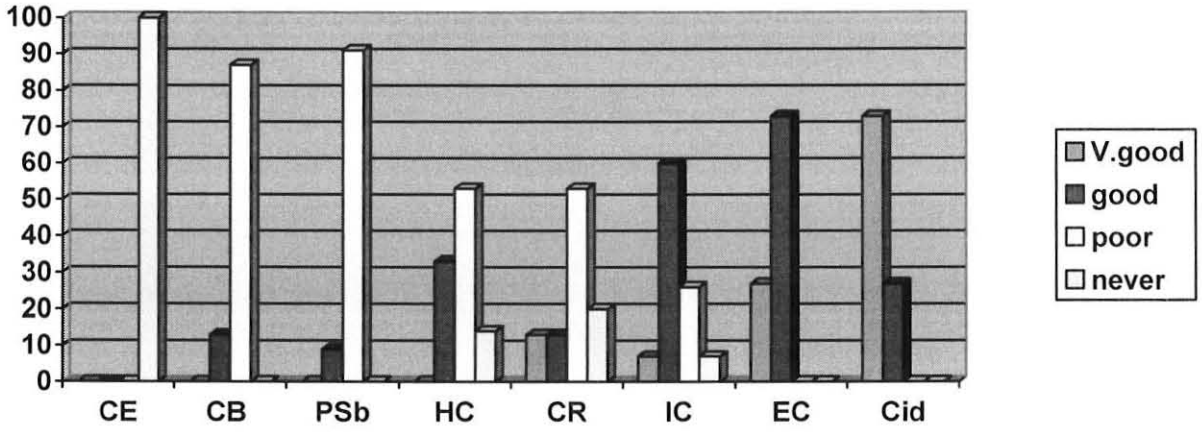
Although the method of integrating the issues in Chemistry was not in a way expected, the contents addressed in both subjects could be taken as adequate enough to develop important environmental values. As the issues were integrated in a multi-disciplinary way, there could be a possibility to find the missing issues in subjects other than these. It

is the belief of the researcher that adequacy like all other curricular issues is in the hands of the teacher. As long as the curriculum creates a room for the integration, it is the teachers who could make the best out of it. This is particularly possible in an education system like ours where teachers are asked every time to localize and make their teaching active (MOE, 1994).

4.2.5. Method of Integrating Environmental Issues

As a general approach of the Ethiopian education system, the curriculum allows teachers and textbook developers to use practical and relevant examples (MOE 1994). 'Active learning for problem solving' is the guiding principle for the present Ethiopian education. This approach is a characteristic feature of action oriented issues such as issues of the environment where learning takes place in a way that helps learners understand and act up on matters in the nearby surrounding. Evaluated in this regard, it was only for three of the topics in Chemistry that the methodology was evaluated to be accepted. In the rest of the topics the issues were not addressed based on the practical local environment.

Figure 1: Method of contents' integration in Chemistry- (teachers' response)



Key

CE- Classification of the elements
CB- Chemical bonding
PSb- Physical states of substances
HC- Chemical Reactions
CR-Hydrocarbons
IC- Inorganic compounds
EC- Electrochemistry
CId - Chemistry and industry

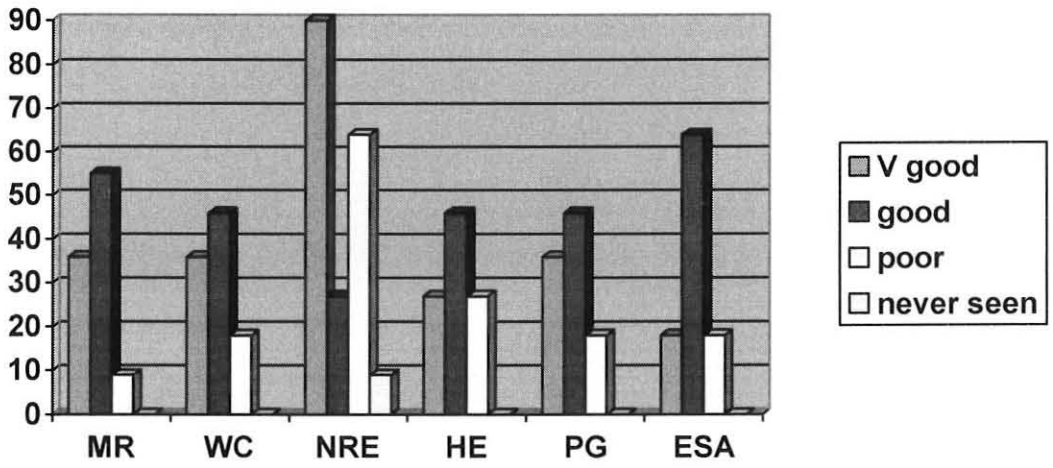
Environmental education is such an action oriented process that learners become committed and proactive to their environment through a continuous exposure to the observable local issues (KSTF 1994). However, it was only in the last three topics (Inorganic Compounds, Electrochemistry and Chemistry and Industry) the issues were favorably linked to the local environment. The syllabus and teachers' guide had clues for teachers to relate the issues to the objective reality (ICDR, 2004). In the methodological column of the syllabus, teachers were informed to give practical examples and can contextualize the teaching of contents by relating to the immediate environmental issues. However, their evaluation did not reflect this for most of the topics.

Though addressing issues in every relevant topic is a preferable option for integrating environmental issues, the integration of issues in a single unit does not necessarily imply mythological problems. A similar result in Chemistry for almost all variables discussed so far could have happed perhaps for two reasons: The first could be that issues which were evaluated to have poor methodology were also evaluated as poor in terms of

relevance, integration and adequacy of environmental contents. Thus, we may not expect teachers to talk about methodology for topics with such deficiencies. The second reason could be that the favorable evaluation for the last two and three topics might have integrated relevant and adequate issues. Though the researcher does take this as a good option, he wants to note this as one of the possible approaches as long as all the required issues are addressed in a desired way way.

Unlike the case in Chemistry, topics in Geography were evaluated to have been addressed with a better practical attachment to the immediate environment. Many of the teachers (73-91%) evaluated contents as good or very good for this methodological aspect. Significant number of teachers (9-27%) evaluated the attachment as poor.

Figure 2: Method of contents' integration in Geography



Key

MR - Map reading

WC - Weather and climate

NRE-Natural regions of the Earth

HE - Humans and the environment

PG - Population geography

ESA- Economic systems and activities

Although pollution and unwise waste disposal have started to be series problems in the urban areas EPA (1997), the major environmental problems are those observed in the agricultural sector. Such issues as deforestation, soil erosion, overgrazing, climate change and related others are relevant issues of Geography. Addressing these issues in the subject could contribute to the development of students' competence that would help them play their role for managing and conserving the ever degrading environment. It is encouraging that quite a large number of teachers (46-64%) and (18-36%) evaluated the practical attachment of the issues to the immediate environment as good and very good respectively. This would enable learners to understand the major environmental problems in the Ethiopian environment.

Although it is the duty of teachers to closely follow up and adapt current environmental issues into the teaching learning environment, lack of current and up-to-date information on environmental issues was the comment of many Geography teachers. On the other hand, the researcher was able to find tasks that ask learners' to explore on their own. This was particularly a feature to Geography for there were tasks at the end of every unit. The researcher could see an opportunity for it could let learners to bring current environmental issues by designing projects that could develop their skills of exploration.

Teachers are not expected to totally depend on the teaching materials. Curricular materials provide them with starting ideas that teachers can expand, amend, supplement based on the learning environment. In a similar way, values in environmental education are developed more by the interaction created between the teacher and students with a close reference to the actual issues observed in the near and remote environment. Here the role of the teacher is paramount for he/she has to create contexts whereby addressed contents could be treated in relation to environmental issues which learners could explore by themselves (Girma 1994).

4.2.6. Integration of Local, Regional and Global issues

Environmental education should help one to look into the environment in its totality (UNESCO/UNEP 1989). This is a very diverse view that could be interpreted and used in many different perspectives. One of the perspectives is the idea of integrating local, regional and global issues (Agbola 1988). This was another point raised for teachers' evaluation- to what degree these issues were integrated in the subjects under discussion.

The respondents were provided with the list of the major issues in the three levels. This was helpful to make the data collection process easier as there could be teachers who may decline from giving genuine information for time constraint. Poverty, illiteracy, deforestation, soil erosion, HIV/AIDS and waste disposal were among the local environmental problems included in the list. Poverty, conflict, desertification, disease were included as regional problems and the global problems were global warming, desertification, terrorism, ozone depletion and HIV/AIDS. As almost all teachers did not respond to regional issues for they were not able to identify one from the other, the evaluation was only for national and global issues.

Table 10: Integration of national environmental issues Geography

Topics	Response in %							
	National issues				Global issues			
	V good	good	poor	never	V good	good	poor	Never
Map reading	27	64	9	0	9	27	55	9
Weather and climate	45	46	9	0	46	45	9	0
Natural regions	27	46	27	0	56	27	17	0
Humans and the environment	45	55	0	0	46	36	18	0
Population geography	27	56	17	0	36	46	18	0
Economic systems and activities	9	73	18	0	9	64	27	0

As it is shown in the table, more than 72% of the teachers witnessed for topics' incorporation of national environmental issues. Though all topics in geography are highly attached to the environment, the evaluation on 'humans and the environment' was found to be more important. If this unit was devoted only to addressing environmental issues as was the case with the last topic 'Industry and Chemistry' in Chemistry, document analysis was made and it was found that the major national issues expected were found integrated.

With the exception of the fist topic 'map reading' against which the majority of of the respondents (73%) were not favorable, global issues were addressed in all other topics even better than that of the national ones. More than 73% of the teachers were in favor of the integration of global issues.

Table 11: Integration of national environmental issues Chemistry

Topics	Response in %							
	National issues				Global issues			
	V good	good	poor	never	V good	good	poor	never
Classification of elements	0	13	13	74	0	13	13	74
Chemical bonding	0	13	13	74	0	13	13	74
Physical states of substances	8	13	13	66	8	13	13	66
Chemical Reactions	7	13	60	20	7	13	60	20
Hydrocarbons	0	27	60	13	6	28	53	13
Inorganic compounds	0	54	33	13	13	47	26	14
Electrochemistry	27	73	0	00	27	73	0	0
Chemistry and industry	73	27	0	00	73	27	0	0

Here, evaluations on the integration of both national and global issues indicated a similar result. The last two topics 'electrochemistry, and chemistry and industry' were evaluated

as 'very good' or 'good' for the integration of national and global issues. The incorporation of both national and global issues was evaluated as never for three of the topics by 66-74% of the respondents. While topics 'hydrocarbons' and 'chemical reactions' deal with chemicals and polluting by-products that cause national and global environmental problems, only 27% and 20% of the teachers evaluated them favorably. The researcher had to check the last two topics (electrochemistry, and chemistry and industry) in the texts and all the topics in Geography and the following issues were found to have been addressed.

Table 12: National and global issues addressed in Chemistry and Geography

Subject	National issues	Global issues
Chemistry	pollution waste disposal	desertification climate change global worming ozone depletion
Geography	deforestation Soil erosion HIV/AIDS population growth poverty famine drought desertification	desertification climate change global worming

Unlike the case in Geography, the issues in Chemistry were addressed in not more than two unit topics. Besides this the presentation of the issues in Chemistry was not systematic in integrate knowledge, attitude and skill. The discussion on 'chemical bonding, chemical reactions, and hydrocarbons' should have included the side effects chemicals could bring to the environment. What is important in environmental education is not knowing the effect, for example, of carbon dioxide for environmental pollution but the root cause of the problem (Demel 2004). This was not a series problem in the case of

Geography. Here, there is no any unit designed only for addressing environmental issues. Almost all the global and national issues were discussed integrated with the related subject matter contents though the weight varied according to the nature of the contents.

The method by which issues were integrated in Chemistry was different from that of Geography. In the former case, issues were addressed in one or two units designed for this purpose whereas in the latter the integration was in all relevant topics. The researcher does not want to comment for and against as long as each of them addresses relevant, adequate issues with effective methodology. What worried the researcher is rather was a theoretical method employed in Chemistry; the presentation was done separating the flesh from the soul. Discussion of global problems such as global worming and green house effect should have been integrated with the actual discussion of the chemical processes which are helpful for building skill.

Thus, although there are other subjects equally important as Chemistry and Geography for addressing these environmental issues, the observation on these two subjects can let one help evaluate how far the curriculum in the level was oriented with environmental issues. The overall evaluation of contents made so far in the subjects under consideration has shown evidences to accept as there were curricular grounds in the general secondary education for raising students' knowledge, attitude, and skill in environmental issues. What is prescribed in the policy and strategy document about the need to deliver environmental education was thus put into effect. How the integrated issues helped in raising awareness, attitude and change their skill in the learners is discussed below.

4.3 Learners' Knowledge in Environmental Issues

As specified in the methodology part, two methods were employed to investigate students' knowledge in environmental issues- a criterion referenced test and a questionnaire. The test consisted of 60 items; 40 items on Geography and 20 on Chemistry. Using the questionnaire, students were asked open-ended questions to know their knowledge in local, national and global environmental issues. The test was analyzed

at 80% mastery level and this was done with the assumption that the environmental issues integrated in the curriculum were well treated.

Table 13: Test scores by interval

Score interval	Chemistry		Geography		Total**	
	F	%	F	%	F	%
< 50	67	19.2	64	18.3	65	18.6
50-59	51	14.6	69	19.8	64	18.3
60-69	75	21.6	69	19.8	84	24.1
70-79	81	23.3	47	113.5	51	14.6
>79	74	21.2	99	28.4	84	24.1
Total	348	99.9*	348	99.8*	348	99.7*

* -the total is not 100% due to rounding off

** -The total is not a simple sum of the score. It is computed on its own by combing the 60 items together.

While the average mastery level on such type of test is expected to be at least 80 %, only 84 (24.1%) of the students were able to do this. When we look this in terms of the subjects, the performance was 74 (21.2%) and 99 (28.4%) in Chemistry and Geography with a better performance in the latter. More than 65 (18.6%) of the students scored even below the national passing grade (50%) agreed for achievement tests. In cases when qualities as reliability, validity and others are proven, tests are reliable instruments to measure knowledge (Oppenheim 2003). In fact the items were set with the help of test developers and they were improved based of the pilot result.

As discussed in the content evaluation part above, the curriculum was found to have integrated relevant and adequate environmental issues. This should have helped students develop the intended knowledge in the area. But the students' test performance did not prove this. More than 75% of them scored below the expected level (80%). Whatever adequate and relevant contents are addressed, the curriculum may not result in what was intended: What matters students' even more than the content is the method they are addressed (KSTF 1994). In the same way, the methodological problems pointed out by teachers particularly in the case of Chemistry could have contributed for the problem.

As one of the objectives of this paper was to study if students' performance was different in terms of school, location and gender, their knowledge in environmental issues was compared in this regard.

Table 14: Comparison of students' knowledge by school

Schools	Chemistry				Geography				* Total			
	Accepted		unaccepted		accepted		unaccepted		accepted		unaccepted	
	F	%	f	%	f	%	f	%	f	%	F	%
Abayminch	30	29	75	79	37	34	68	66	34	32	71	68
Ghion	17	16	91	84	23	21	85	69	16	14	92	86
Injibara	27	20	108	80	39	29	96	71	31	23	104	77
Total	74	21	274	79	99	28	249	72	81	21	267	77

Nt =348: Abayminch = 105, Ghion = 108, Injibara = 135

*Total scores were not the simple sum of the scores of the subjects; they were computed from the combined 60 items

When we compare the performance by schools, there were more students with acceptable performance in Abayminch than in the other three. While 34 (32%) of the students in Abayminch and 31(23%) in Injibara were able to score 48 and above (out of the 60 items) achieving the required mastery level (80%), those in Ghion were only 16 (14%).

The fact that each school was surrounded with its own environment, differences were expected in students' performance. However, it is at the same time difficult to expect such a large gap between schools as shown between Ghion and the other two. Perhaps students' background and schools' extra curricular interventions in Injiara and Abayminch schools might have contributed for their better performance. Co-curricular initiatives such as environmental club, females' club, HIV/AIDS club were in effect in these schools. The two schools had regular programs specially for raising awareness in and outside the school community. Besides this, learners in these respective schools were from rural areas where the land was highly degraded particularly due to soil erosion and

deforestation. This was not the case in Ghion though there were similar initiatives established.

It is expected that the afforestion practice around Injibara and the continuous migration of farmers from Abayminch due to environmental degradation could have contributed for students' knowledge. In fact, the frequent flood strike due to overflow of Lake Tana, urban unemployment, the waste disposal problems, and other health related problems in the Bahir Dar should have similarly affected students' consciousness in Ghion.

Table 15: Comparison of students' knowledge by subject

Schools	Chemistry		Geography	Total
Abayminch	Mean	68.5	70.4	70.2
	Std	13.56	14.51	12.33
Ghion	Mean	60.6	59.6	59.7
	Std	14.30	17.01	14.96
Injibara	Mean	62.8	63.7	63.6
	Std	14.94	17.19	14.97
Total	Mean	63.8	64.4	64.4
	Std	14.65	16.87	14.78

Here too, the average performance of students in Abayminch was relatively higher (70.2) than that of Ghion (59.7) and Injibara (63.6). The mean performance of students in Ghion was less than those in Abayminch and Injibara by 10.5 and 6.6 respectively. Students in Injibara and Abayminch had better knowledge for issues in Geography than in Chemistry. As could be seen from the standard deviatio, there were more students in Abayminch than in other schools whose scores were closely scattered around the mean score.

If the differences observed between the schools were statistically significant, one-way analysis of variance (ANOVA) was computed.

Table 16: Analysis of variance between and within schools

Comparison	SS	df	MS	F	Sig
Between groups	6020.951	2	3010.773	14.875	.000*
Within groups	69824.122	345	202.389		
Total	75845.037	347			

* $P < 0.05$

The analysis shows as the difference observed between the means was statistically significant ($P < 0.05$). In other words, there was a difference in the knowledge of environmental issues between students of the three schools the possible cause of the difference being beyond a certain methodological error. Thus, students in Abayminch had better knowledge in environmental issues than those in the other two schools.

As this is a case in other curricular contents, student's performance in environmental education could be affected by a multitude of factors including location, gender, age and others (HMSO 1984). The table below is a summary on the performance of students by location and gender. The evaluation labeled as 'acceptable' or 'unacceptable' was computed based on the standard (80% mastery level) agreed for criterion referenced tests.

Table 17: Coparion of students' knowledge by location and gender

Location	Chemistry				Geography				Total			
	Accepted		unaccepted		accepted		unaccepted		accepted		unaccepted	
	F	%	f	%	f	%	f	%	F	%	F	%
Urban	17	16	91	84	23	21	85	69	17	16	91	84
Rural	57	24	183	76	76	32	164	68	67	28	173	72
Male	43	27	124	74.3	60	36	107	64	49	29	118	70.3
Female	31	17	150	83	39	21	142	79	35	19	146	81.0

As per the frequency distribution, the achievement of students with rural background was better than those with urban background. Of the 240 rural students only 67 (28%) were able to achieve the acceptable mastery level (80%). The performance of those with a background otherwise was very low (16%). Although the general performance was very

low in both cases, students with urban background were found to perform very low. This was also reflected in terms of subject, urban students had lower performance than rural ones in both subjects. In both cases, the achievement was better in Geography than in Chemistry. When we see the achievement in terms of gender, it was males who had a relatively better knowledge in environmental issues than females. In this case too, females were less knowledgeable than males. The number of females with acceptable performance was less by 10% than that of males.

Table 18: Comparison of means by location and gender

Pair group	Mean	N	Std
Urban	59.76	108	14.23
Rural	66.54	240	14.96
Total	**64.44**	**348**	**14.78**
Male	66.81	167	14.71
Female	62.25	181	14.55
Total	**64.44**	**348**	**14.78**

The average performance was found different in both cases (location and gender). Males' performance was higher than that of females'. Students with rural background had a better performance than those with urban background. The standard deviations in both cases were close to the respective group means indicating a small distance each score had from the group mean. This also tells us that individual scores were distributed not far away from the mean which in turn indicates the small difference between each score (individual differences).

If the differences observed in the means of the groups (urban-rural, male-female) were statistically significant, an independent samples t-test was computed.

Table 19: Achievement by location and gender

Groups	t-test for equal variance assumed				
	Sig	t	df	Mean difference	Standard error of difference
Urban-rural	0.000	4.048*	346	6.7849	1.6763
Male-female	0.004	2.911*	346	4.5695	1.5695

As could be observed from the table, mean differences between urban and rural as well as male and female were found to be significant ($p<.05$). Thus, the performance differences observed in terms of location and gender was acceptable as a result males and those with rural background had better knowledge. There could be others other than those related to the implementation of the curriculum. Yet, there would not be such a big difference in the performance of students if there were a similar way of implementing of the curriculum in the three schools.

With the objective of making the finding more reliable, students were also asked open-ended items on local, regional and global environmental issues. If a curriculum was supposed to have integrated environmental issues, it should have included the intended issues in the environmental levels- local, regional and global. Thus, open-ended items were administered to check if students' knowledge had been affected holistically. The local environmental issues include those in the students' nearest environments. In this regard, they were asked both rural and urban issues in a way they could reflect the problems found in their immediate environment. The regional issues include the issues in the region Ethiopia belongs to- Sub-Sahara and East Africa. Global issues are those as global warming, climate change, desertification, terrorism that have a global environmental impact. Students were asked to respond to four common items on each environmental level. On each item they were asked to list:

- major problems in each environmental level(local, regional and global);

- consequences of each problem;
- possible causes of the problem mentioned; and
- methods of alleviating the problem.

In the table below are the environmental problems students identified in the three levels. The percentages were computed based on the number of counts. The problems were listed in their order of frequency-from what is most frequent to the least.

Table 20: Environmental problems identified by students

Environmental problems at different levels					
Local problems	%	Regional problems	%	Global problems	%
Infrastructure	20.4	poverty	23.5	Conflict	19.5
unemployment	15.8	P/government.	17.5	Poverty	16.3
Disease	12.6	illiteracy	10.0	G/Warming	15.3
Pollution	10.0	disease	9.5	Disease	5.5
Poverty	8.3	L/degradation	7.7	P/growth	2.9
Harmful skills	18.9	Others	25.8	Others	25.8
Missing	14.0	Missing	6.0	Missing	15.3

One who is aware of environmental issues is expected to be equally aware of the major problems observed in the respective environmental level. When we look at the overall responses of students in this regard, it seems encouraging that the majority of them were able to identify the expected environmental problems in each level. The problems listed were problems students were supposed to be aware of and they are similar to those indicated at the binning of this chapter.

According to the mastery test, many of the students (76%) were found to have poor knowledge in environmental education. The response obtained through the open-ended items, however, indicated as many of the students (>80%) were able to identify relevant issues with the possible causes, consequences, and alleviating methods.

However similar the treatments were in the schools, students' knowledge in environmental education is highly affected by the objective realities prevailing in the respective surrounding. While pollution and wastage disposal were series problems in Bahir Dar, students in Ghion were not expected to prioritize erosion as the most problem in that particular locality. With this in main, the researcher tried to analyze the relevance of the issues identified by students. An issue was accepted if it was observed in that level of the environment. A problem was labeled relevant if it was not observed in that particular level. Irrelevant was labeled for a wrong answer.

Table 21: Relevance of students' knowledge in local, regional and global environmental issues

Evaluation	Scale	Local		Regional		Global	
		F	%	F	%	f	%
Accepted	V/relevant	310	89	276	79.3	260	76.4
	Relevant	7	2.0	28	8.0	14	4.0
unaccepted	Less relevant	6	1.7	4	1.1	6	1.7
	Irrelevant	2	0.6	--	--	15	4.3
Missing		19	5.5	40	11.5	53	15.2
Total		348	99.9	348	99.9	348	99.9

Thus, more than 80% of the students were able to indicate acceptable issues. Students were able to tell more acceptable issues for local problems than for regional or global. This is natural and expected as one's observation and reflection is more critical for what is around than those at a distance.

If the knowledge in this regard differed in terms of both school and location, relevance of the identified issues (problems) was assessed as is summarized in the table below.

Table 22: Relevance of issues by school and location

Evaluation	Scale	Rural						Urban		
		Abayminch			Injibara			Ghion		
		L	R	G	L	R	G	L	R	G
Accepted	V/relevant	89.5	80.0	74.9	92.1	78.3	70.2	79.6	82.2	72.6
	Relevant	4.2	12.4	10.4	4.1	5.5	14.2	6.4	3.1	-
unaccepted	Less relevant	--	2.0	3.5	--	2.9	7.2	5.5	2.7	3.4
	Irrelevant	--	--	--	--	--	--	-	--	---
Missing		5.3	6.6	11.4	3.8	13.3	8.4	7.4	12.0	24.1

When we look at the rating both by school and location (rural-urban), students' knowledge shows a similar trend in all the three environmental levels- relevance increases as we move from local to the global level. In all the schools students identified relatively more relevant local environment issues. The evaluation showed a decreasing trend from left to the right across the schools. Students in rural schools were better than those in urban areas in identifying more relevant local problems. In this regard all the identified local issues were evaluated as acceptable and it was 89% in Abayminch and 92.1% in Injibara.

The ability to identify relevant issues alone does not make one's knowledge complete. Though the fact holds true for all curricular contents, Knowledge particularly in environmental issues as it is expected to lead to concerted actions (KSTF 1994) , should include aspects as causes, consequences, and the possible methods of alleviating environmental problems. To this end students were asked to list the causes, consequences and methods of the identified problems. To evaluate their level of knowledge in this regard, responses against each variable were organized using a four point scale (very relevant, relevantant, less relevant and irrelevant).

Table 23: Consequences, causes and methods of alleviating environmental problems

Evaluation	Scale	Consequences			Causes			Methods of protection		
		Local	Regional	Global	Local	Regional	Global	Local	Regional	Global
Accepted	V/relevant	64.2	60.2	48.5	77.4	66.2	41.5	65.1	61.7	40.7
	Relevant	19.0	16.4	12.3	11.4	11.3	6.1	13.3	14.4	5.3
unaccepted	L/ relevant	2.3	4.8	17.6	3.1	6.6	18.6	2.3	4.2	20.5
	Irrelevant	5.0	6.4	11.4	4.5	3.3	13.8	3.6	7.1	6.9
Missing		9.5	12.3	20.2	3.4	13.6	19.8	15.9	13.2	26.8

As we could see in the summary table, the evaluation on the relevance of the identified consequences, causes and methods of the issues show a decreasing trend along the columns. Students were able to list relevant consequences (83.2%), causes (89.9%) and methods (78.7%) of local environmental problems. A large number of students were unable to identify acceptable consequences (29%), causes (32.4%) and methods of alleviation (27.4%) for the global environment.

Thus, it was difficult to indicate the status of students' knowledge in environmental issues because the results obtained through the mastery test and that through the questionnaire were not consistent. The achievement result clearly indicated that the majority of students (76%) were poor as the average performance was found to be less than the required standard. On the other hand, students were found to have been aware of environmental issues as assessed through open-ended items. The majority of students (>80%) were able to identify problems, causes, consequences and methods of environmental problems in the three environmental levels. Students' knowledge was different both in terms of their location, gender and school. Males and students with rural background had better performance though the overall achievement was poor in all cases. Based on the achievement test result, students had better knowledge in the issues addressed in Geography than those in Chemistry. The curriculum was evaluated for a better integration of global issues but students were better aware of local issues.

For almost all items, students' attitude towards environmental issues was positive for the means were found to be above the average (>3). How the individual scores were scattered or close to the mean can be judged from the standard deviation. In this regard, the deviations of individual scores from the mean were not large. How many of the students had a favorable and unfavorable attitude towards each item is indicated in the table below.

Table 25: How favorable students' attitude was

Items	Favorable				neutral		Unfavorable			
	Strongly agree		Agree				Disagree		Strongly Agree	
	F	%	F	%	f	%	f	%	f	%
1	28	8.9	29	9.2	1	0.3	88	27.8	170	53.3
2	32	10.0	31	9.7	1	0.3	127	39.7	129	40.3
3	40	12.9	32	9.9	4	1.2	87	26.9	160	49.5
4	18	5.6	15	4.7	--	--	135	42.2	152	47.5
5	33	10.6	18	5.8	2	0.6	122	39.1	135	43.9
6	16	5.0	14	4.4	--	--	132	41.6	155	48.9
7	34	10.9	23	7.4	4	1.3	112	36.0	138	44.4
8	40	12.8	27	8.6	1	0.3	105	33.5	140	41.4
9	31	9.9	24	7.7	1	0.3	100	32.1	156	50
10	24	7.7	25	8.0	4	1.3	144	46.2	115	36.9
11	30	9.6	23	7.4	--	--	96	30.9	162	52.1
12	30	9.5	29	9.1	3	0.9	142	44.8	113	35.6
Total	356	10.6	290	7.6	21	0.55	1390	36.7	1727	45.6

As could be seen in the table, only 18.2% of students were found to have a favorable attitude towards the environmental issue. The majority of them (82.8%) did not show a positive interest of whom (45%) with a strong disagreement. More than half of the students strongly disagreed the first and the second statements- 'protecting an

environmental problem begins with individual actions' and 'world climate change contributed for the 2006 Dire Dawa flood strike'. This does not seem to go with the result shown in table 24 . One may be surprised of this and even may tend to view as a contradiction. That actually seems true though it is not. In the latter case, the analysis was made taking the first two positive points favorable and the other two points on the opposite side as unfavorable. Means from 3.6 -3.9 which were taken as acceptable are not considered in the second case. Only points 4 (agree) and 5 (strongly agree) were considered as favorable.

Table 26: Students' attitudinal difference by schools

Schools	Items												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Abayminch	3.9	3.5	3.9	4.2	3.9	4.2	4.1	3.9	4.1	3.8	4.0	3.6	3.93
Ghion	4.2	3.8	4.1	4.1	4.2	4.3	3.9	3.7	4.2	3.9	3.8	4.1	4.05
Injibara	3.5	4.2	3.9	4.3	3.8	4.2	3.9	3.9	3.8	4.1	4.3	3.8	4.02

With the exception of two items (1, 2) whose means were below the favorable mean (3.6) for Injibara and Abayminch respectively, the average performances of students for almost all items were in the favorable zone. Though the means between the schools were close to each other, it would be difficult to conclude that the attitude of students was similar in the sample schools. For this ANOVA was computed if the difference was statistically significant.

Table 27: Analysis of variance on students' attitude between and within schools

Items	Groups	SS	df	MS	F	Sig.
1	B/ Groups	10.184	2	5.092	3.027*	.050
	W/Groups	526.509	313	1.682		
	Total	536.693	315			
2	B/Groups	28.369	2	14.184	8.802*	.000
	W/Groups	510.819	317	1.611		
	Total	539.188	319			
3	B/Groups	7.704	2	3.852	1.920	.148
	W/Groups	641.869	320	2.006		
	Total	649.573	322			
4	B/Groups	2.530	2	1.265	1.123	.326
	W/Groups	357.020	317	1.126		
	Total	359.550	319			
5	B/Groups	9.238	2	4.619	2.862	.059
	W/Groups	498.762	309	1.614		
	Total	508.000	311			
6	B/Groups	1.208	2	.604	.568	.567
	W/Groups	334.104	314	1.064		
	Total	335.312	316			
7	B/Groups	.512	2	.256	.146	.864
	W/Groups	538.858	308	1.750		
	Total	539.370	310			
8	B/Groups	2.871	2	1.435	.739	.478
	W/Groups	602.215	310	1.943		
	Total	605.086	312			
9	B/Groups	7.003	2	3.501	2.063	.129
	W/Gs	524.369	309	1.697		
	Total	531.372	311			
10	B/ Groups	6.904	2	3.452	2.494	.084
	W/Groups	427.708	309	1.384		
	Total	434.612	311			
11	B/Groups	9.960	2	4.980	2.997*	.051
	W Groups	511.866	308	1.662		
	Total	521.826	310			
12	B/Groups	14.298	2	7.149	4.646*	.010
	W/Groups	483.147	314	1.539		
	Total	497.445	316			

* $p<0.05$

As indicated in the significance column, the difference between the schools was significant only for items 1, 2, and 12. The issues against which meaningful differences observed were 'environmental protection starts with individual actions, the advantage of collaborative efforts over individual actions for protecting the environment, and the difficulty of covering a bare land with a forest once it is seriously damaged'. In deed, the mean differences between the three schools against these points as shown in table 23 were relatively large. Thus, we can say that students in Ghion had better attitude towards the environment in relation to ideas raised in item 1 and 2.

Of the three schools, students in Injibara had a positive attitude towards 'the importance of collaborative efforts for an effective environmental protection'. The afforestation programme practsed around this school could have its own contribution. It seems that students in Abayminch were less committed as far as their interest in 'valuing individual actions as a starting point for the overall protection of the environment' is concerned. While the environment around their school was highly degraded letting the inhabitants migrate to other fertile lands of the country, students in this school did not look to have understood how difficult recovering a damaged landscape within a short period of time could be.

However, as the mean difference between students of the three sample schools was observed only for 3 (25%) of the 12 items. Thus, the researcher found it difficult to conclude that students' attitude was different in terms of school.

Table 28: Disparity in attitude by location

Category	Items												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Rural	4.0	3.9	3.8	4.0	3.9	4.2	3.9	3.9	3.9	3.9	4.1	3.7	3.93
Urban	4.1	3.8	4.1	4.1	4.2	4.3	3.9	3.7	4.2	3.9	3.8	4.1	4.05

The total mean performance of students in both rural and urban school was above the expected favorable point (3.6). This was also true in the case of individual items. Except

in the case of items 2 & 11 'the importance of collaboration over individual efforts for protecting the environment' and 'protecting historical, cultural and religious relics should be everybody's responsibility', the mean average of urban students was either greater than or equal to that of rural students for all other items.

Good knowledge in an issue is expected to result in good attitude towards the same issue. It is to be recalled that rural students were found to have a better knowledge in environmental issues than that of urban students as measured through the mastery test. But their attitude towards the same issues was found to be less favorable than urban students'. This is not surprising as there have been a lot of research findings showing a poor relationship between environmental knowledge and attitude (Aklilu 2006). The afforestation skill in Awi Administrative Zone around Injibara, for instance might not have been conditioned by environmental consciousness created in a formal education. This does not mean such attitudes have no knowledge grounds. One should not forget the role indigenous knowledge could play in developing such values. What the researcher wants to stress, however, is related to the role of formal education. In fact the deficiencies observed in the mythological aspect of the issues as discussed in section 3.2.5 particularly in Chemistry, could have its share for the problem.

Table 29: Disparity in attitude by gender

Category	Items												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Male	4.1	3.9	3.9	4.1	4.0	4.2	3.9	3.8	4.1	3.9	4.1	3.9	3.98
Female	4.0	3.8	3.9	3.9	3.9	4.2	3.9	3.9	4.0	3.9	4.0	3.8	3.95

Even though the differences for each item were not large in the items, males had a better performance in almost all attitude items than females. Such a very close similarity between groups may not be common especially in a situation where there are cultural and social hindrances to widen gender disparity (as indicated by many of the respondents in the open-ended items). This could let one tend to pose a question of reliability

particularly in data administration. In deed, this was the most rigorous task the researcher had in the research process. However, the pilot test was very helpful to inform this challenge based on which strategies were devised for a successful administration of the questionnaire. Thus, the researcher was conscious of the problem as a result it was systematically tackled. Problems encountered in this regard were attributed to students' lack of interest and experience in providing information through a questionnaire.

To check if the differences between urban and rural, male and female were not attributed to some methodological factors, the independent samples t-tests were computed as summarized in tables 31 and 32 respectively.

Table 31: Comparison of attitude by gender

t-test for Equality of Means			
Items	T	df	Sig
1	.078	314	.938
2	.882	318	.378
3	.051	321	.959
4	.281	318	.779
5	.177	310	.860
6	.177	315	.860
7	.244	309	.807
8	.975	311	.330
9	.110	310	.913
10	.444	310	.657
11	.215	309	.830
12	.805	315	.422

The t-test between the groups showed that the difference between male and female students was not significant for all items. Thus, the attitude of male students towards the environment was not different from that of females'.

Many of the students commonly raised 'harmful social and cultural skills' as a major local environmental problem which was qualified by 'early marriage, kidnapping, priority

for males'. With this ground, the researcher had the expectation that this harmful practices could cause performance differences between males and females. But it is interesting that there was no significant difference in their attitudes towards the environment. The overall gender strategy practised in the education system could have contributed for this.

Table 32 : Comparison of students' attitude by location

t-test for Equality of Means				
Items	t	df	Sig.	Mean Difference
1	.876	314	.382	-.1383
2	.593	318	.553	.0926
3	1.598	321	.111	-.2697
4	.889	318	.375	.1129
5	2.282	310	.023	-.3496
6	1.065	315	.287	-.1326
7	.138	309	.890	-.0221
8	1.217	311	.225	.2058
9	1.605	310	.110	-.2519
10	.468	310	.640	.0676
11	2.017	309	.045	.3137
12	2.836	315	.005	-.4221

Looking at the values along the significance column, we find only three attitudinal issues (items 5, 11 & 12) against which the test statistics showed a significant difference. The issues for which the students differed significantly include 'the need for taking care of the environment for sustainable development, the contribution of world climate change to the 2006 Dire Dawa flood strike, and the difficulty of recovering a bare land with forests once it is seriously damaged'. Thus, we can say that urban students had better attitude towards the environment as evaluated in terms of the first and the third points and rural students were better for the second.

Students' attitude towards the environment was not consistent with the knowledge they had in environmental issues. Rural students were evaluated to have relatively better knowledge than urban students. But their attitude towards the environment was to the reverse- urban students had a relatively positive attitude. Though it is not always true, one with better knowledge in an area is expected to show a positive attitude. This, however, does not mean that urban students had a positive attitude. As measuring attitude is not such a simple task, students' rating may not necessarily reflect their true personality. This is not without evidence for the researcher was able to observe this during the data collection process. Students in Injibara and Abayminch were very responsible to provide all what was required by the researcher. On the contrary, those in Ghion were very reluctant and some of them unwilling to cooperate. From this it would not be wrong to doubt their integrity in providing genuine information.

4.5 Students' Skill in Environmental Issues

A true behavioral change is proven through practice which is supposed to be accomplished with the help of the acquired knowledge and the desired attitude attached to it (MOE 1990). This idea sounds more important in environmental education for the learning process in the area is expected to be accomplished on practical basis. To what extent the integrated environmental issues addressed in the subjects under discussion were practical was discussed in the content analysis part.

Students were asked seven skill demanding items to express their agreement as how often they practised them (Appendix B). A five point scale (always, usually, sometimes, seldom and never) was used. To decide the accepted and unaccepted performance, the same method used for the attitude was employed here too.

Table 33: Students' skill in environmental issues

Items	Favorable				sometimes		Unfavorable			
	always		Usually				seldom		never	
	F	%	f	%	f	%	f	%	f	%
1	48	14.8	145	44.6	107	32.9	15	4.6	10	3.1
2	22	6.6	132	39.9	137	41.4	36	10.9	4	1.2
3	33	10	119	36	115	34.7	46	13.9	18	5.4
4	11	3.3	77	23.1	103	30.9	99	29.7	43	12.9
5	20	6.2	105	32.3	112	34.5	59	18.2	29	8.9
6	190	60.3	104	33.0	15	4.8	5	1.6	1	0.3
7	67	2.2	134	40.4	85	25.6	34	10.2	12	3.6
Total	291	12.7	786	34.2	774	33.7	294	12.8	117	5.1

Computed in this way, 46.9% of the students were found to have made acceptable degree of skill in environmental education of which 12.7% were most acceptable (always) and the rest 34.2% with frequent skills (usually) in favor of the environment. About 17.9% of the students had no or very little practical contribution to their environment. Unlike the case in their attitude (section 3.5) where only very few of them were found to take the middle position, a very large number of students (33.7%) were found to fall in this boundary. As a positive attitude in environmental education means developing a sense of commitment to care for the environment UNESCO/UNHCR (1999), the development of such attitude inevitably leads to a sound skill. However, the presence of such a large number of respondents both in the neutral and unacceptable region seems somewhat contradictory with their performance on attitude as observed in section 4.5.

Looking at the performance across the addressed issues, many of the students (90.3%) were found to have participated in the 'adult literacy programme'. With the desire to know if this was if there were any grounds for such active participation in this particular activity, the researcher had to go further to ask the respondents. Accordingly, it was found that the Alternative Basic Education program which was extensively implemented in the Region gave them the chance to participate in the literacy programme.

The usual and in fact the most difficult problem faced in the implementation of an educational program is to maintain a positive relationship between the three learning domains-knowledge, attitude and skill (UNESCO/UNEP (1977), Eyre (1989). With this in mind, the favorable achievement (46.9%) may be taken as encouraging.

Lack of teachers' qualification, material facilities, educational management, public participation and poor economic background of learners are among the frequently mentioned factors in almost every summative evaluation for schools' disparity in educational performance (ICDR 2005). In addition to these, location of schools (the type of environment the school is found in) is another source of variation for students' skill in environmental education (Agbola 1988). It is natural that one is more sensitive to a problem or an issue that is immediate than those in the remote.

Table 34 : Comparison of students' skill by schools

Schools	Items							Total
	1	2	3	4	5	6	7	
Abaymi nch	.23	1.27	3.06	2.36	2.54	2.92	3.14	2.50
Ghion	2.09	1.77	2.32	2.33	2.80	2.34	1.98	2.23
Injibara	2.70	1.41	2.66	3.02	3.30	3.47	2.00	2.65
Total	2.36	1.48	2.68	2.6	2.91	3.25	2.36	2.52

When we look at students' skill in environmental education, it was only in one of the seven items (participation in adult literacy programmes) that the total mean was found acceptable. In all the three schools, the means were below the minimum achievement level, 3.1 (21/35) those from Ghion with the lowest performances.

Eventhough the performance was below what was required, students in Injibara were relatively better in their skill with a total mean of 2.65. Investigating across the columns, it was only in one of the seven items (participation in adult education programmes) that the mean was found to be above the agreed up on average. In this regard too, the

performance of students in Injibara was better as they had acceptable means in three of the items (advising people to cooperate with HIV/AIDS patients, advising people to stop doing harmful cultural skills, and participating in adult literacy programmes). If the observed differences between the schools were statistically significant, analysis of variance was computed as shown in the table below.

Table 35 : ANOVA between and within schools

Items	Groups	Sum of Squares	Df	Mean Square	F	Sig.
1	B/Groups	22.909	2	11.454	15.464*	.000
	W/ Groups	238.519	322	.741		
	Total	261.428	324			
2	B/Groups	35.115	2	17.558	31.257*	.000
	W/ Groups	184.244	328	.562		
	Total	219.360	330			
3	B/Groups	28.749	2	14.375	15.298*	.000
	W/ Groups	308.199	328	.940		
	Total	336.949	330			
4	B/Groups	18.320	2	9.160	8.600*	.000
	W/ Groups	351.470	330	1.065		
	Total	369.790	332			
5	B/Groups	34.353	2	17.177	17.111*	.000
	W/ Groups	323.234	322	1.004		
	Total	357.588	324			
6	B/Groups	13.322	2	6.661	15.129*	.000
	W/ Groups	137.364	312	.440		
	Total	150.686	314			
7	B/Groups	96.609	2	48.304	62.430*	.000
	W/ Groups	254.560	329	.774		
	Total	351.169	331			

* $P<0.05$,

As we can see from the ANOVA table, the difference between schools was found to be statistically meaningful. Thus, the skill of students in environmental education was different in terms of school. Though the average means in all the three schools were

below the expected level, students in Injibara had relatively better skill than those in Ghion and Abayminch. Students' in this school had acceptable skill in items 4, 5 and 6 (participation in environment management protection programmes, advising people to stop harmful skills, and participation in adult literacy programmes). Students in Abayminch had better skill for items 1, 3 and 7(discussing environmental issues in the classroom, advising people to cooperate with HIV/AIDS patients, and organizing people for environmental protection initiatives) than those in the other two sample. Except for the second item (advising people to conserve and protect the environment), students in Ghion were relatively poor in their skill for all raised environmental issues.

Every environment has its own objective reality of which the inhabitants are aware of and expected to be practically involved. We do not expect students with urban background to perform in the same way as those from the rural areas. In the same way, as long as there are social, economic and cultural factors that cause differences between males and females, the difference in skill in environmental education is still expected to exist in terms of gender. This is also true for other curricular contents. The table below is a comparison of means both in terms location and gender.

Table 36 :Comparison of students' skill in environmental issues by location

Location/sex	Items							Total
	1	2	3	4	5	6	7	
Rural	2.42	1.58	2.51	2.71	3.08	3.41	1.99	2.52
Urban	2.23	1.27	3.06	2.36	2.54	2.92	3.14	2.50

The mean total for each group was below the required average and the difference in environmental skill was not large. Looking across the items, rural students had better skill than urban students for the fifth and sixth items (advising people to stop harmful skills, and participation in adult literacy programmes). Whereas urban students had better skills for the third and forth items (advising people to cooperate with HIV/AIDS patients, and participation in environmental protection initiatives such as waste disposal).

Table 37 : Comparison of students' skill by location

Items	t-test for Equality of Means		
	df	T	Sig.
1	323	1.781	.076
2	329	3.639*	.000
3	329	4.816*	.000
4	331	4.053*	.000
5	323	4.396*	.000
6	313	3.771*	.000
7	330	11.188*	.000

*P<0.05

With the exception of item one (discussion of environmental issues in the classroom), the differences between the means were found significant. Thus, students in rural areas had better skill than those in urban areas.

The difference in environmental skill in terms of location seems acceptable for the issues they were good for were expected to be problems mostly prevailing in the respective localities. The problem related to HIV/AIDS and waste disposal are commonly experienced in urban areas and those related to harmful cultural skills and illiteracy in rural areas. This could also indicate how they were more sensitive to the nearest (local) environmental problems which is natural to happen. If the curriculum were strong enough to equally affect students skill irrespective of where they were, such differences might not be reflected in student's performance.

In cases where harmful cultural skills such as early marriage and gender disparity were prevailing (as witnessed by about 18% of the respondents through the open-ended items), it would be difficult to expect parity in students' performance in environmental issues. In a community like those found in the study areas, expressing practice in environmental issues such as stopping harmful practices as early marriage and deforestation requires commitment for it is a confrontation with a long lived cultural 'values'. It was with this in mind that the researcher wanted to see if there was any difference in environmental skills between males and females.

Table 38 : Comparison of students' skill by gender

Sex	Items							Total
	1	2	3	4	5	6	7	
Male	2.32	1.54	2.74	2.55	2.90	3.28	2.42	2.53
Female	2.40	1.43	2.63	2.64	2.93	3.22	2.32	2.50

With the exception of item 6 (participation in adult literacy programme) both males and females were poor in their skill for all items. Although males were relatively better than female, the difference between the means was very small for individual items.

Table 39: Comparison of students' skill by location

Items	t-test for Equality of Means		
	Df	t	Sig.
1	323	.756*	.450
2	329	1.052*	.294
3	329	.998*	.319
4	331	.513*	.609
5	323	.068*	.946
6	313	1.328*	.185
7	330	.886*	.376

*P>0.05

Unlike the case with location, the mean difference observed between males and females was not significant. Thus, males were not more skillful than females in environmental issues.

As discussed above gender disparity was found as one of the major environmental problems in the sample areas. According to many of the respondents, the communities in all the three sample areas were found to be male biased. Males are privileged over females at the family level. The demand for child labor was more a problem of girls than boys. In a situation like this where there are such cultural ills, females' performance in education is usually poor (ICDR, 2002). This was not reflected here and this could be due

to the overall effort the Ministry of Education has been doing to prove gender parity in the education. The sample schools have implemented this effectively to bring about gender parity in terms of this particular curricular issue.

CHAPTER FIVE

Summary, Conclusions and Recommendations

5.1 Summary

Today is a time when humans have become conscious of the inevitable interdependence between development and the environment. Any local, regional or international summits on sustainable development have never missed discussing the accompanying issue, the environment. This concern has helped governments all over the glob to identify the causes, consequences as well as devise sustainable solutions of environmental problems. As a result, it has become clear that pollution particularly due to the emission of harmful gases from industries, vehicles and other activities, deforestation, over and unwise use of resources and poor governance are accepted as direct causes of environmental problems. Each of these is driven by either of the two big forces- over consumption due to selfishness or by poverty for subsistence.

It is the belief of many environmentalists that these driving forces (poverty and development) are essentially caused by lack of the required awareness for the environment. Attending a high educational level may not guarantee one's concern for the environment; as long as one's handling of the environment is poor, one is illiterate for this particular issue. People need to learn ***for*** the environment which helps to think and act holistically for the environment (Filho and Hale 1992). There is a positive correlation between environmental awareness and peoples' concern for the environment.

It was with this understanding that almost all countries unanimously agreed to use education as a sustainable means for alleviating environmental problems. Many of the countries have integrated issues of the environment in their curriculum since the 1972 Stockholm conference on environmental education at which they agreed on the principles, objectives and methods of integrating environmental education.

Though Ethiopia was in the Stockholm international commitment, environmental education was not systematically taken into the curriculum for a long time. It was in a form of a project (Environmental Education Project) that environmental education was in effect. The project was limited to very few pilot schools and four teacher training institutes the main purpose was not to integrate environmental issues in the curriculum (MOE 1992). Rather it was driven by the then environmental problems as solution to the prevailing drought. Though it had a good start, the project was not able to sustain its effort and the main reason for this as to many of the authorities was that it was not integrated as part of the formal curriculum (Gebeyehu 2003, Demel 2003).

The present education system has set an objective in the policy document that permits the integration of environmental issues in the curriculum. There is nothing separately prescribed as how environmental issues should be delivered in the general secondary education. From the general methodological approach, the system for such issues pursues a multi-disciplinary way of integration.

The objective of this research was thus to evaluate the contribution of the general secondary curriculum for raising student's knowledge, attitude and skill in environmental education in three schools in Amhara Regional State. Three schools were selected from different administrative zones (West Gojjam, Awi and Bahirdar) where the environments of the surrounding community in the respective sample areas were different. The purpose to select schools from different environments was to see how the curriculum was helpful in addressing the different realities the learners are found. A total of 348 students (15%) participated in the research. Students in the rural schools were those with rural background and those in the urban school with urban background. Gender participation was almost equal. All Geography and Chemistry teachers participated in content evaluation. They evaluated the integration of environmental issues for relevance, adequacy and methodology.

A criterion referenced test for students and questionnaires for both students and teachers were the main instruments for data collection. Students' awareness was evaluated through

a criterion referenced achievement test and some open-ended items conducted through a questionnaire. Students' knowledge, attitude and skill were evaluated using inventories administered through students' questionnaire.

Data were organized and analyzed against the main variables- awareness, attitude, skill and content integration. Both descriptive and inferential statistics were used for data analysis. Percentages, mean, and standard deviation were used for data organization and analysis. Independent samples t-test and one-way ANOVA were computed to determine students' performance differences between and within different categories.

5.2 Content Integration

In evaluating multi-disciplinary curricular issues such as the issue of the environment for which objectives and contents may not be specified for each subject, it would be important to check if the contents have really been integrated. For the same reason, the researcher found it important to conduct content analysis by teachers to evaluate the integration objectives and contents in terms of contents' adequacy, relevance and methodology. Teachers were also asked to evaluate if national and global issues were addressed as it was important to evaluate how holistic the approach was.

It was found that environmental adequate and relevant objectives were indicated in Geography in the list of level objectives. This case was not similar in Chemistry; there were very few objective indicated in the level objectives. The objectives in Geography were addressed both in the level, grade and unit objectives.

Teachers' content analysis indicated as adequate and relevant environmental issues were integrated in both subjects. The major contents addressed in Chemistry include environmental pollution (air, water and land pollutions), global warming, ozone depletion waste disposal and greenhouse effect. The major issues integrated in Geography include consequences of climate change, humans and the environment, natural resources, threats

against the human resource, the impact of globalization, self- reliance and sense of dependency.

Environmental issues are essentially the subject matters of both Chemistry and Geography (Filho 1993). But the ways the issues integrated were different. In Geography the issues were distributed in all relevant topics. Whereas in chemistry the integration was made mainly in one unit designed for this purpose.

Exploratory activities (learners' tasks) are given at the end of the unit in Geography. These activities were designed with the intention to make learning active and problem solving by forming a practical relation to the objective reality. Although the nature of the subject matter may not be as suitable as the case in Geography, there was this gap in Chemistry. Many of the evaluators also had a strong comment on this gap- poor relation of contents to the nearby environment.

National and global environmental issues were found to have been integrated in the topics. In both subjects there were more global issues than national ones. More than 73% and 72% of the teachers in Geography favored for the respective integration of national and global issues for every topic. Less number of teachers was in favor of the integration of national issues. This was more so in the case of Chemistry. Almost all the issues addressed were related to the global issues. Issues as abundance of the elements, identification of hazardous elements, waste disposal problems in local industries, and miss use of drugs and inorganic fertilizer were some of the missing national issues that should have been addressed in Chemistry. There were no missing issues identified in Geography except some methodological matters. This could be an indicator how the integration in this very subject was good.

Students' Knowledge in Environmental issues

The data for evaluating students' knowledge were obtained through a criterion referenced test at 80% standard and a questionnaire. The test was set with the help of test developers

and it was piloted for reliability, validity and power of discrimination. Scores below this level were considered a failure.

Of the total .students, only 84 (24.1%) were able to attain the mastery level. The performance was 74 (21.2%) in Chemistry and 99 (28.4%) in Geography with a better performance in the latter. More than 65 (18.6%) of the students scored even below the minimum national passing score (50%) set for achievement tests. Based on this, we can understand that the integrated curriculum was not able to bring the required knowledge in the learners.

Comparing students' knowledge in terms of schools, those in Abayminch 34 (32%) were relatively more knowledgeable than those in Injibara 31(23%) and in Ghion 16 (14%). The mean performance of students in Abayminch was (70.2) for those in Injibara (63.6) and Ghion (59.7). Checked using ANOVA, the difference was found significant. The co-curricular club activities on environmental protection, females' and HIV/AIDS both in Injibara and Abayminch could have contributed for students' better performance.

Disparity in students' knowledge was found significant both in terms of gender and location. The majority of students scored below the agreed up on level. Students with rural background were relatively better in their performance (28%) than those with urban background (16%). Males were better aware of environmental issues than females. A t-test was computed to check if the differences between these groups were statistically significant and it was found that students' knowledge was different both in terms of location and gender.

Students' response to the open-ended items administered through a questionnaire showed a different performance in terms of their knowledge. Asked to list possible causes, consequences, and alleviating methods of the environmental problems, more than 80% of the students were able to indicate acceptable responses. More than 83% of the students listed relevant consequences, causes (89.9%) and methods (78.7%) of local environmental problems. A similar evaluation for regional issues was 76.5% for

consequence, 77.5% for causes and 77.1% for methods. A large number of students were unable to identify acceptable consequences (29%), causes (32.4%) and methods of alleviating (27.4%) for the global environment. Students' knowledge in global issues should have been better as content integration was evaluated to have had more environmental issues.

Though there were performance differences between locations and schools, it was not as large as that reflected in the mastery test. Here too, students with rural background were found to have better knowledge. Except for the local issues for which those in Injibara were better, students in Abayminch were relatively knowledgeable than others both in regional and global issues. In all the schools relatively more relevant issues were identified for the local environment. Students in rural schools identified more relevant local problems than students in the urban areas.

Students' Attitude towards Environmental Issues

Inventory was conducted to know if students had positive attitude towards environmental issues. The inventory was administered using a five point scale ranging from strongly agree to strongly disagree. Considering the labels 'strongly agree and agree' as positive responses and the other two at the opposite extreme as negative, it was found that only 18.6% of students had positive attitude towards the environment. The majority of them (82.3%) did not show a positive interest towards the issues with more than half of them (45%) with a strong disagreement. More than half of the students strongly disagreed the first and the second statements- 'Protecting an environmental problem begins with individual actions' and 'world climate change as a possible reason for the 2006 Dire Dawa flood strike'.

Even if there were individual issues for which students in Abayminch and Injibara were better, the overall performance on attitude showed that students in Ghion had relatively positive attitudes towards the environmental issues. However, the analysis of variance showed a statistically significant difference only for three of the items 'collaborative

efforts as a more effective strategy for protecting the environment than individual actions' and 'the difficulty of covering a bare land with a forest once it is seriously damaged)'.

The mean performances for both rural and urban schools were above the expected average point (3.6). This was also true in the case of individual items. Except in the case of items 2 & 11 'the importance of collaboration effort over individual efforts for protecting the environment' and 'protecting historical, cultural and religious relics as everybody's responsibility), the mean average of urban students was either greater than or equal to that of rural students for all other items.

Looking at their average performance, males had a relatively positive attitude towards all the issues addressed in the items. However, the difference was not found significant. This is not in line with their performance on knowledge. Males should have been more positive towards environmental issues than females. However this could not be out of the reality as there are similar research findings (Aklilu 2006). In many cases males are more knowledgeable but less concerned and less sympathetic for environmental issues (Blum 1987; Batter 1996).

In other words one with better knowledge is expected to show a better attitude and skill. Students with rural background had better knowledge in environmental issues than those with urban background. Though their skill was found still linear with their knowledge their attitude towards the environment was less positive than those in the urban area. Findings by Hausbeck (1992) and Lifteridge and James (1980) indicated rural students as more knowledgeable the possible reason for the disparity was students' exposure to out-of school practices. The researcher couldn't find a research finding that show the inconsistency of the linear relationship between knowledge and attitude in rural students. As attitude is liable to prejudice, there could be some students who might have not been genuine in expressing their feelings.

Students' Practice in Environmental Issues Issues

Measuring skill verbally could not be as effective as that obtained by observation. However, carefully designed items can help at least to decide learners' status. Skill inventory was administered through a questionnaire using a five point scale (always, usually, sometimes, seldom and never) to evaluate students' practice in environmental issues. The responses 'always' and 'usually' were considered as positive (acceptable) and seldom and never as negative (unacceptable). The responses labeled 'never' were not taken into the analysis.

More than 46 % of the students were found to have made acceptable degree of practice in environmental education of which about 12% with most acceptable (always) and the rest 34 % with frequent practice (usually). About 18% of the students had no or very little practical contribution to their environment. A very large number of students (33.7%) were found to fall in this boundary. As a positive attitude in environmental education means developing a sense of commitment to affect the environment, the development of such attitude inevitably leads to a sound practice (Mansary and Ajibye, 1997). However, the presence of such a large number of respondents both in the neutral and unacceptable region seems somewhat contradictory with their performance on attitude as shown in section 3.5. Still the same reason mentioned above for attitudinal difference could work here too; if there had been a prejudice in students' response to the attitude items, this could have affected the true relationship between their attitude and skill. What is shown with case of urban students in Ghion is a case in point for this: These students were found to be poor both in their awareness and skill but they were more positive towards the environment.

Many of the students (90.3%) were found to have participated in the 'adult literacy programme'. The Alternative Basic Education program which was extensively implemented in the Region is expected to have created the opportunity for this. However, comparison of students' practice based on the mean score seem to tell a different result. In all the three schools, students practice was below the minimum achievement level, 3.1

(31/35). It was only in one of the seven items (participation in adult education programmes) that the mean was found to be above the agreed up on score. In relative terms, students in Injibara had better practice (2.65) and the difference was found statistically significant. Students in this school had acceptable skill in items 4, 5 and 6 (participation in environment management protection programmes, advising people to stop harmful skills, and participation in adult literacy programmes). Students in Abayminch had better skill in terms of items 1, 3 and 7(discussing environmental issues in the classroom, advising people to cooperate with HIV/AIDS patients, and organizing people for environmental protection initiatives) than those in the other schools the means for the last two items being above the required score. Except for the second item (advising people to conserve and protect the environment), students in Ghion had relatively poor skill for all raised environmental issues.

Location is one of the factors affecting performances in environmental education and rural students are better than urban once (Hausebeck, 1992). This also repeated in this research attempt. Though urban students were found more skillful for third and forth issues (advising people to cooperate with HIV/AIDS patients, and participation in environmental protection initiatives such as waste disposal), the over all result shows as rural students were at a better position. Unlike the case in terms of schools and location, students' skill in environmental issues was not significant in terms of gender.

5.2 Conclusion

In an era when consideration of environmental issues has become a prerequisite for any sort of development endeavors, emphasis to environmental education is of paramount importance. Many of the countries have taken the issues into their educational systems and started orienting their citizens since early 1970s, the time environmental education was agreed up on to be a sustainable means for the protection and wise use of the environment.

While the environment was highly deteriorating, it was very recently, in the present education system, that environmental education was formally taken into the Ethiopian curriculum. The 1994 education and training policy has laid the ground for integrating environmental issues as one of the five general objectives which is about developing environmental values. The objective was well interpreted and adequate environmental issues were integrated in geography. Though the interpretation of a curricular issue is in the hands of schools and teachers, the integration in Geography was found to be in a way that enables students develop the required consciousness in the area. Thus, the method in Geography was found to be in line with the general philosophy of the system – encouraging active learning based on self exploration. The researcher attributes students' better performances in environmental education in Geography to this systematic integration.

Although there are serious issues related to the action of chemicals to be addressed in Chemistry, there were very few environmental objectives set for the level. Objectives were drawn at the unit or topic level. The method of integration employed in this subject is not convenient to teach the behavioral aspects in an integrated manner as all the issues were addressed in almost one unit. Besides this, more emphasis was given to global environmental issues while there are many local and regional problems to be prioritized. Still the subject was positively evaluated for its integration of adequate and relevant environmental issues.

Such an integration of adequate and relevant issues should have brought about the required behavioral change. Students' performances in all the three domains were very low. Only 24% of them were found to have the expected knowledge and about 18% and 46 % of the students were found to have made positive attitude and practice respectively. Though the overall performance was low in all cases (categories), males and rural students were more knowledgeable replicating previous findings by (Hausbeck,1992: Lifteridge and James 1980: Mansary and Ajibye, 1997).

An educational attempt is expected to maintain the linear relationship between knowledge, attitude and skill. There are many research findings that show this relationship in environmental education too (Roth and Peretz 1989: Ostman and Parker, 1987; Gifford, 1982). In this research, however, this did not happen. Students in the rural areas had relatively better knowledge and skill in environmental education but with poor attitude compared to urban students. But it is believed that attitude is more important than knowledge in bringing a change in an environment. Though this leaves a room for further investigation, the researcher attributes the reason to the uncontrolled factors due to the nature of the variable (attitude) under investigation. The researcher found rural students more honest, promising, and cooperative than the urban students: Unlike urban students they were happy and patient to take the test and fill in the questionnaire. For items they were not clear, they were open to ask questions. All these could be possible justifications to accept their response to attitude items as more genuine than that given by urban students.

Contrary to the result obtained through the achievement test, students were found to be well aware of the problems, causes, consequences and methods of alleviating environmental issues as through open-ended items. If the issues raised in the open-ended items were integrated in the curriculum, there could not have been observed such a gap in the results obtained in different instruments. Perhaps the difference could be attributed to methodological matters: Students' poor competence in the medium of instruction though the researcher did not face any problem during test administration could be the first problem. If this was the real cause, it is clear that their performance using their mother tongue, Amharic, must have helped them to do well on the open ended items. The statistical devices used for measuring their performances could be the second cause. The mastery level was based on mean score where as for open-ended responses a percentage was computed. Though this needs further investigation, the two methods may not be equally reliable to measure the same variable (knowledge) in a similar way. The percentage was computed by combing two positive but different responses (scales) which could be difficult to equate with mean scores.

5.3 Recommendations

Based on the lessons obtained in the research process, the researcher recommends the following points as it would help stakeholders take measures to fill the gaps investigated in delivering environmental education in the general secondary education. Researchers who want to investigate curricular issues in the area could also use the pointes suggested.

- The research has come up with a mismatch between the intention of the curriculum and students' performance. There were adequate and relevant issues addressed in the curriculum. Yet the overall student's performance in environmental education was below the expected level. Thus, the researcher would like to advise the sample and other similar schools to look at the findings in this research attempt and encourage teachers to take whatever step they believe important to alleviate this problem. Teachers should use practical and observable environmental issues in their teaching and most essential for this is to be aware of the possible environmental issues in every topic in their subject area. If the expected issues are not well addressed in the curriculum, it is up to the teachers to do to the best of their learners.

- In schools where practical initiatives (co-curricular activities) were not given emphasis, students were less knowledgeable and skillful in environmental issues as compared to students in the schools with the facility. Thus, teachers and schools should establish such initiatives on environmental issues to support the formal curriculum.

- The researcher was able to observe that many of the teachers were not well aware of environmental issues prevailing at different environmental levels. As observed from their response to content evaluation items still many of them want the text materials to provide them with everything. The researcher takes this as a very serious gap in the effective implementation of the curriculum and wants to

address this to teachers, schools, training institutes. Hence, teachers from the same or related of specialization could come together and discuss on issues to find out the missing element. It is this way that teachers can place their important input on the curriculum.

- The way environmental issues were integrated in Chemistry is less effective for cultivating knowledge, attitude and skill in an integrated manner. Almost all environmental issues that are expected to be integrated in the area were addressed in a single unit. Besides this, the presentation of the contents was theoretical, less attached to the issues around. Such a methodology is not different from that employed in the interdisciplinary approach. Thus, curriculum developers should revisit the methodology and integrate the issues in all relevant topics.

- Though there could be a possibility that the issues might have been integrated in some way in other topics and areas in the level or below, teachers listed a number of missing environmental issues. The researcher believes that the problem would have been minimized if teachers had been involved in curriculum development. Thus, teachers should be involved in curriculum development and revision processes.

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Appendix A

INSTRUMENT 1

A criterion referenced test

Instruction

Choose the correct answer and write the letter of your choice in the space provided.

_____1. Which one of the following is a non-renewable resource?

A. oxygen B. water C. soil D. fuel

_____2. Which of the following is the immediate cause of global warming?

A. emission of carbondioxide into the air B. removal of trees

C. the depletion of ozone D. the effect of acid rain

_____3. Which of the following elements is the **primary** source of acid rain?

A. Carbon B. Hydrogen C. Silicon D. Sulfur

_____4. One of the following is **not** caused urban development, extensive irrigation and overgrazing:

A. soil erosion B. salinization of topsoil C. destruction of vegetations D.volcanic eruption

_____5. Which of the following pesticides is **extremely** toxic?

A. malathion B. DDT C. Parathion D. carbondioxide

_____6. Which of the following is not an agent for environmental pollution:

A. transportation B. forest fire C. unwise waste disposal D. road construction

_____7. Which one of the following is not a good method of protecting metals from rusting?

A. oiling and greasing B. washing the metal with water continuously C.alloying D. coating

_____8. Which one of the following is used as a food preservative?

A. ascorbic acid B. bases C. sulfuric acid . D. carbodioxide

_____9. One of the following is **not** a good way of protecting the emission of a harmful gases from industries, factories?

A. complete combustion of the fuel B. using a catalyst to neutralize before emission

C. planting trees around the factories and industries

D. replacing the fuel with a harmless substance

_____10. Which of the following is not **correct** about dust and smoke?

A. They can be caused both by people's activities and nature.

B. They can increase the thickness of the ozone layer

C. They can cause climatic change and thus affect agricultural production.

D. They can be protected by spraying water and using electrostatic precipitation

__11. One of the following is **not true** about the ozone layer?

A. It protects the harmful solar radiation C. It has a chemical to absorb the radiant energy.

B. It is depleted with chlorofluorocarbon D. It is depleting with Nitrogen oxides

___12. One of the following causes of water pollution **does not** occur due to the effect of chemicals?

A. unwise handling and use of pesticides B. intense heat from factories

D. sewage waste and biological agents C. acid rain

__13. One of the following is **not true** about environmental management.

A. It is possible to produce plastics which are biologically degradable

B. Using wastes on farm fields can increase soil fertility

C. It is possible to find a polluted area of land in Ethiopia due to unwise chemicals

D. Using inorganic fertilizers is not a sustainable means of maintaining its fertility

___14. Which soil do you prefer for agricultural practice?

A. Loamy soil B. clayey soil C. sandy D. salty soil

__15. Which of the following is the safest place chemicals?

A. Hot and moist place B. Cold and dry place

C. Dry and hot place D. Cold and wet place

___16. Which of the following is the main use of alkanes?

A. As solvent B. As fuel

C. For making explosives D. for the production of alkenes

___17.Which of the following compound are used to make class

A. sodium carbonate and silcon oxide B. Aluminum oxide and potassium silicate

C. Sodium silicate and calcium silicate D. Bi-Alumimium silicate and silcon oxide

___18.Which of the following is used to form most acidic solution?

A. HI B. HCI C. HBr D. HF

___19. Which of the following ait pollutant causes acid rain?

A. Sulphur dioxide B. Heavy metals

C. Chlorofluorocarbons D Hydrocharbons

___20. Why do we apply brine to skin during the process of tanning?

A. To remove hair from the skin B. to make the skin soft

C. To remove flesh from the skin D. To dry the skin and kill the bacteria

___21. If your livelihood depends on forests, which way would be more appropriate?

A. Using the forest and protecting animals' intervention

B. Planting samplings for every felled tree

C. Burning the forest so that it could grow and replace the old

D. Replacing the indigenous ones with fast growing plants like the eucalyptus trees

___22. The equatorial rainforest is diminishing in size from time to time. What do you think will be the consequence in the long run?

A. global warming B. diminishing of forest resources C. loss of variety of forest resources D. loss of animal species

___23. Which one of the following may **not** be a relevant for pastoralist who are continuously moving in search of grass and water for their animals?

A. To use the grazing lands in rotation without any harm to the ecosystem.

B. To use the available water resources wisely.

C. To become sedentary farmers. D. To minimize the number of cattle

____24. Global warming is said to be **dangerous** mainly because--

A. it can cause overflow of land surface by melting ice.

B. people may oversweet, dehydrate and expire.

C. ice bergs may move towards the poles rapidly and devastate the area.

D. it causes a loss of biodiversity.

_____25. Which one of the following **is true** of the elements of the natural environment?

A. Elements of the natural environment exist independently.

B. Elements of the natural environment are dependent one another.

C. Humans intervention can affect the balance components of the environment.

D. Components of the environment may be destroyed fore ever if they are not preserved well

Read the following quotation and answer the question that follows.

"Things have always changed. Evolution is all about survival of the fittest, and some things must disappear. We humans are now the fittest and strongest and we have the right to use the world resources for our benefit. We need the space and we have to change environments. If some plants and animals suffer, hard luck."

_____26. What does the quotation imply? A. self-centered view C. environmentalists' view B. conservationist view D. Darwin's view of evolution

_____27. Which method of increasing soil fertility could have a negative effect on the environment?

A. green manuring B. adding inorganic fertilizers C. crop rotation D. adding cow dug

_____28. Which measure **is the best** to save the endangered animals from extinction?

A. keeping the animal in national parks B. keeping the animal in sanctuaries

C. keeping the animal in game reserves D. drawing a law for protecting them strict law

___29. Which one is **a better** solution for the hydro-political problem of the Nile river basin?

A. Leaving the Nile river unused till the problems are resolved.

B. Agreeing on the equitable utilization of the water among concerned countries.

C. Giving more opportunity to countries affected by the Saharan desert.

D. Overcoming problems at gun point is the last solution.

___30. At an individual level, which measure can you take to control or minimize water pollution?

A. Collecting water used for washing and cooking and spilling into waste disposal pipelines.

B. Spilling water used for household purposes into a near by streams.

C. Spilling water used for washing and cooking into a ditch so that it could be taken somewhere.

D. Spilling water used for washing and cooking into a ditch so that it could be taken somewhere.

____32. One of the following does **not** reflect an economic impact of HIV/AIDS?

A. Social disorder and stigma in relation to the incurable nature of the disease.

B. Lack of productivity due to luck of moral and physical strength.

C. Mobilizing a great deal of resource that would have constructed schools and roads for the development of the national economy.

D. Medical and nutritional expenses of HIV/AIDS victims

____33. The natural balance in a given environment is disturbed when--

A. natural resource are used for economic benefits.

B. the natural resources are misused.

C. the natural resources are unequally distributed.

D. there is a disturbance between the living and the non-living.

____34. When the vegetation cover is removed, all of the following happens except --

A. soil erosion B. a change in climate

C. loss of biodiversity D. an increase in agricultural production

____35. Why is Ethiopia frequently affected by drought?

A. Because Ethiopia is part of the Sahel zone, which is frequently stricken by drought.

B. It is because of the unique nature of its environment that drought strikes it.

C. It is because the effect of global warming has a severe effect on Ethiopia.

D. It is mainly because of our unwise handling of the resources and the environment.

____36. You are highly concerned with a rapid population growth in Ethiopia. Which one of the following do you think is agreeable to your concern?

A. Teaching prolific mothers about the disadvantage of rapid birth rate

B. Teaching all fertile citizens in the locality

C. Teaching all women to abstain from sexual tendencies

D. Teaching selected mothers and fathers so that they can control birth rate in their locality

_____37. Which one of the following is **not** a series environmental problem in most developing countries?

A. industrial pollution B. deforestation C. unemployment D. HIV/AIDS

_____38. Although it is very useful for construction and other purposes, people are not advised to grow eucalyptus tree.This is because...

A. eucalyptus is not indigenous to Ethiopian ecology.
B. the tree does not have anything to add to the soil
C. it s not indigenous plants
D. it was brought to the country without the approval of environmentalists

_____39. More than 30% of carbondioxide emission comes from industries in America. Yet America is not willing to sign for the international agreement for reducing emission of such poisonous gases. The is because ...

A. the agremment obliges America to close all its industries
B. of the impact it will place on American economy which is based on high level fuel consuming industries.

____40. Which population group has the largest proportion in developing countries?

A. 15-64 B. 5-35

C. 0-15 D. above 64

____41. Which one of the following frequently occurs in Ethiopia?

A. Earth quake B. Drought

C. Volcanic eruption D. storms

Questions 42-45 are based on the following table

Annual temperature (mm) and rainfall (degree Celsius) distribution for Algiers

month	J	F	M	A	M	J	J	A	S	O	N	D
Temp	10	11	13	15	18	22	24	25	23	19	15	12
RF. mm	116	76	57	65	36	14	2	4	27	86	93	117

___42. What is the annual range of temperature of the town in degree celsius ?

A. 15 B. 14 C. 12 D. 13

____43. Which month show the highest rainfall?

A. January and December B October and November

C. November and January D. February and April

____44. What is the average annual temperature of the area in degree celsius?

A. 18 B. 17 C. 20. D. 21

____45. Find the total amount of rainfall received in the area?

A. 600mm B. 800mm C. 591mm D. 691mm

____46. Which one of the folowin extrusive rock is used for road construction?

A. basalt B. gabbro C. obsidian D. pumic

____47. Which of the following is used for building lofty buildings?

A. sandstone B. pumice C. obsidian D. A & B

_____48. How does folding occur geographically in a given geographical environment?

A. When rock layers are pulled apart by earth movements.

B. When external force act on rock layers.

C. When rock layers are pushed from two directions.

D. When earthquake occurs ubruptly.

_____49. What is the advantage of ozone layer?

A. It traps oxygen B. It traps inert gases

C. it traps ultra violate ray D. It traps short wave rays

_____50. Which of the following areas is highly liable to drought ?

A. Afar region B. Part of Hararge

C. Jemjem Plateaus D. Ptarts of Arsi-Bale zone

_____51. Which of the following explains the difference between urban and rural areas?

A. Rural areas are less tradition bound B. Rural areas are more agricultural

C. Urban areas are more tradition bound D. The human settlement sites with less distinction

_____52. Which of the following do you agree regarding HIV/AIDS victims?

A. support them but with some reservation B. advise them to line on their own

C. support them with no reservation D. gossiping with others about their faith

_____53. What makes each environment different from the other?

A. The shape of the environment B. The internal composition of the environment

C. varied natural elements D. The type of rocks the environment is composed of.

_____54. Why do wild animals leave their areas and migrate to other lands?

A to change place to reduce boredom B. to get ride of human intervention

C. to visit their fellow animals D. to have peace and stability in other lands

_____55. Which of the following defines plantation agriculture?

A. at satisfying humans' food needs.

B. It is concerned with large scale production of grains.

C. It is an large scale agricultural activity concerned for the production of one two crops for sale

D. It is an large scale agricultural activity concerned for the production of one two crops oil crops.

_ 56. Which one of the following pair is used find the exact location of Ethiopia on the political map of Africa?

A. Prominent water bodies and landscapes. B. latitudes and longitudes

C. The north star and the equator D. The biggest and the smallest neighboring countries.

መመሪያ 2- በሰንጠረዥ 5 1 እና 2 ውስጥ የተጠየቁት ነጥቦች ስለአካባቢ ጉዳዮች ያለህን /ሽን/ አመለካከትና ተግባራዊ አስተዋጽኦ የሚገመግሙ ናቸው። የሚከተለውን የነጥብ አሰጣጥ ከተረዳህ /ሽ/ በኋላ በሳጥኑ ውስጥ የ '✓' ምልክት በማድረግ አሟላ /ይ/

4. በሰጠረዥ 1 ውስጥ በጠቀሱት ሐሳቦች በተመለከተው የግምገማ መግለጫ መሰረት ፍላጐትህን /ሽን/ ግለጽ

5. ጣም እስማማለሁ 3- ለመወሰን እቸገራለሁ 1 - በጣም እስማማለሁ
4- እስማማለሁ 2- አልስማማም

ተ.ቁ	*የአመለካከት ጠቃሚ ነጥቦች*	*5*	*4*	*3*	*2*	*1*
1	አካባቢን መንከባከብ ከግል ይጀምራል					
2	የአካባቢ እንክብካቤ፤ ትብብርና የጋራ ጥረትን የሚጠይቅ ነው					
3	በኢትዮጵያ ውስጥ ሲፈጠር ለቆየው ድርቅ ዋናው መንስኤ የአካባቢ አያያዝ ችግር ነው					
4	የተፈጥሮን ሀብት የምንከባከበው ለሚመጣው ትውልድም በማሰብ ነው					
5	የአካባቢ /ደህንነት/ ጥበቃ ለዘላቂ ልማት ወሳኝ ነው					
6	የአለም መሪቶት መጨመር በ1998 በድሬዳዋ ለተከሰተው ችግር አስተዋጽኦ ነበረው					
7	በጣና ሐይቅ ሙላት በባህርዳር ለሚከተለው ችግር የአካባቢ መራቆት አንዱ መንስኤው የአካባቢ መቀት ነው					
8	በኢትዮጵያ የገጠር አካባቢ መራቆት ከከተማው ይልቅ የበለጠ ሀገሪቱን ይጐዳል					
9	ደን ከመትከል ይልቅ የሚታረሰውን የመሬት መጠን መቀነስ በበለጠ አካባቢን ለመንከባከብ ያስችላል					
10	የአካባቢ ብክነትን ለመቀነስ የቴክኖሎጅ ውጤት ወደ ሃገር እንዳይገቡ ማገድ ጥሩ መፍትሔ ነው					
11	ቅርጽ መጠበቅ የሁለም ሰው ኃላፊነት ሲሆን ይህም አካባቢን መጠበቅ ነው					
12	በአለም ለሚታዩት አብዛኞቹ በሽታዎች መንስኤው የአካባቢ ጉስቁልና ነው					

5. በሰጠረዥ 1 ውስጥ ለተጠቀሱት ሐሳቦች በተመለከተው የግምገማ መግለጫ መሰረት የነበረህን /ሽን/ ተግባራዊ እንቅስቃሴ ግለጽ /ጭ/

5- ሁልጊዜ
4- አብዛኛውን ጊዜ
3- አልፎ አልፎ
2- እምብዛም
1- አላደርገውም

ተ.ቁ	*ተግባራዊ አስተዋጽኦን የሚያመለክቱ ጉዳዮች*	*5*	*4*	*3*	*2*	*1*
1	ስለአካባቢ ጉዳዮች ክፍል ውስጥ መጠየቅና መወያየት					
2	ሰዎች አካባቢያቸውን እንዲንከባከቡ ምክር መስጠት					
3	ሰዎች እርዳታ የሚፈልጉትን እንዲተባበሩ መምከር					
4	እንደዛፍ ተከላ ላሉ ጉዳዮች ላይ መሳተፍ					
5	እንደየአካባብ ጥበቃ ለዘላቂ ልማት ወሳኝ ነው					
6	ጐጅ ባህሎችን ለማስቆም ሰዎችን ማስተማር					
7	ጐልማሶችን መሰረተ ትምህርት በማስተማር					
8	ለHIV AIDS ተጠቂዎች ድጋፍ መስጠት					
9	ሰዎች እንዲተባበሩ ማድረግ					

Appendix D

Item Analysis on the criterion reference test

Method of Analysis

I have used Robert and David's way of analysis. Accordingly, i have considered 27% of the scores starting from the highest score and the same percentage from lowest. Although there could be different contextual factors that should be taken into account while analyzing items and deciding on the feasibility and usefulness of an achievement test, the following indices for level of difficulty, discrimination and reliability are usually taken as standards.

Index of difficulty

Difficulty index with >70% is very easy
30-70% is reasonably difficult
<30% is a difficult item

Index of discrimination

A discrimination with <0 is negative discrimination
0 has no discrimination power
0-0.19 poor discrimination power
0.20-29 marginal discrimination power
0.30-0.39 reasonably good discrimination
>0.40 a very good discrimination power

The table below shows the performance of each respondent against each item and the total score they got.

Level of difficulty

Based on the established standard given above, five of the items are evaluated to be difficult and eight items are easy the rest are reasonably difficult. This implies the need to make an improvement on those which difficult or easy.

Discrimination power

Sixteen of the items found to be very good in their power of discrimination with indices 0.42-71. Seven of the items are between o.28-0.39 indicating marginal discriminating power and another five items are with poor power both requiring improvement. There two items one with a negative and the other one with zero discrimination powers which implies the need either to change or profoundly amend the items.

Reliability

The reliability of the test is evaluated using Kuder-Rechrdsons method of estimation which is given by a formula

The table below shows the standard deviation, variance and mean of the scores obtained from the achievement test.

students	Score (x)	d (x-mean)	d
1	27	11	121
2	22	6	36
3	21	5	25
4	20	4	16
5	19	3	9
6	19	3	9
7	19	3	9
8	13	-3	9
9	13	-3	9
10	12	-4	16
11	12	-4	16
12	10	-6	36
13	9	-7	49
14	8	-8	64

Thus, by applying the K-R20 formula, we can find the index of reliability as follows;
Given K = 30 S = 30.28 S = 5.5 Mean = 16 pq = 6.6

For standard tests, the reliability coefficient is expected to fall between .85 and .95 to be acceptable. However, for tests designed to decide on a group of individuals just as the purpose of this achievement test, the coefficient is tolerable up to 0.65 Robert and David's (191) . Thus, this test could be taken as reliable as 0.80 value is even more than 0.65.