ADDIS ABABA UNIVERSITY
SCHOOL OF GRADGUATE STUDIES

UPPER PRIMARY SCIENCE CURRICULUM AND STUDENTS' ENVIRONMENTAL AWARENESS, ATTITUDES AND PRACTICES: THE CASE OF ALAMATA URBAN AND RURAL SCHOOLS

BY

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JUNE 2009

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A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Arts in Curriculum and Intruction.

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June 2009

Acknowledgment

First and for most, I am very much indebted to my advisor Ato Akalewleweld Esshete (Asst. professor) for his constructive criticisms insightful comments and unreluctant follow up untit the completion the study.

The heart felt thanks of mine is again extend to all upper primary school teachers and pupils of Alamata urban and rural weredas who participated and cooperated me in providing the data for the study. My special thanks also goes to Ato Muleta Getahun, Solomon Mekomen and Yirga Mola who helped me in coding and collecting data from the texts and evaluating the items developed from biology, physics and chemistry respectively.

My deepest thanks also goes to urban Alamata Wereda Administration Office, Tigray Education Bureau and Addis Ababa University school of graduate studies for sponsoring and funding me to attend this program. In addition to this I am also indebted to Ato Simon Hailu for his signing me guarantee to my sponsorship

I am also indebted to Ato Abrha Asfaw a staff of AAU for his expertise judgments & suggestions during tool development. I also indebted to my friends W/0 Alefu Abrha ,Ato Aweke Asmamaw and Ato Amsalu Molla who have helped me morally and materially for the successful completion of this study.

Finally, I have no words to express my gratitude to my beloved wife w/ro Afera Tesfay, for her strong moral and psychological support, shouldering all the burden and responsibilities in giving care for our children during my stay in the graduate school. I also indebted to my daughter Rozina Ali for her moral supports during the course of the study.

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CHAPTER FOUR

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Abbreviations and Acronyms

ANOVA:	Analysis of Variance
EE:	Environmental Education
EPA:	Environmental Protection agency
ETP:	Education and Training Policy
ICDR:	Institute of curriculum, development and research.
IEEP:	International Environmental Education Program
IUCN:	International Union for conservation of nature and natural resources
M.D:	Mean Difference
MoE:	Ministry of Education
S.D:	Standard difference
SE:	Standard error
SIDA:	Swedish International Development Authority
SS:	Sum of the squares
UNCED:	United Nations conference on Environment and Development.
UNEP:	United Nations Environmental Program
UNESCO:	United Nations Education, Science and Cultural Organization
UPS:	Urban Primary School
ICDR	Institute of Curriculum Development and Research
TREB	Tigray Regional Education Bureau

Abstract

The purpose of this study was to examine the extent of integration of EE in upper primary school natural science curriculum and to analyze the level of students' environmental awareness, attitude and behavioral actions. To achieve the purpose, the EE themes were examined in planned, practiced and learned curriculums by employing a descriptive case study research design. The data collecting instruments were: document analysis, observation checklists, interview guide questions, criteria referenced tests, environmental attitude & behavioral scales. For this study two schools in each of urban and rural weredas were selected randomly then equal number of students were selected in the sample schools. The total numbers of respondents were 240 grade eight students & 12 natural science teachers. The students were selected by stratified random sampling technique but teachers were taken by available sampling technique.. For data analysis both qualitative & quantitative methods were used and for statistical analysis both descriptive & inferential statistics were employed. The results of the study revealed that, though attempts were made to integrate EE in planned curriculum documents of the three natural sciences, the extent of integration of the three dimensions of EE (i.e. education about, in and for the environment) were not found proportional because the documents were found focusing on integration of cognitive component of EE than the psychomotor and affective components of EE. Particularly, the ultimate goal of EE that is education for the environment was found ignored in chemistry and physics documents and given very little room in biology documents. In addition to this school practices' for the integration of EE dimension were found worse than the responses found in the document , because teachers' awareness and competency to apply methods pertinent to EE teaching learning process were found to be low for that they had neither trained nor oriented how EE could be incorporated and taught in the classroom instructions. Moreover, school facilities and other educational activities were not supplementing the EE teaching learning processes. Students' were found having very low environmental awareness because their cumulative mean value was below 50 percent (47.47%). With regard to environmental awareness students had shown disparity in residence location, parent literacy level and school type but their variation by sex and age were insignificant. Generally, urban school &literate parent background students were found having relatively better environmental awareness than rural & illiterate parent background students In addition to this, without significant difference by location, sex, age and parent literacy level all students' environmental attitudes were found to be positive towards utilizing the environment, moderate toward appreciating the environment & negative towards protecting the environment. On the other hand, without significant difference all students' environmental behavioral actions (participations for solving environmental problems) were found to be poor and environmentally unfriendly practice. In addition to this EE knowledge of students was found to be a negative predictor for students' attitude towards utilizing the environment; a positive predictor for students' attitude towards protecting and appreciating the environment but it was not found as a significant predictor for students' environmental behavioral actions. The total contribution of the independent variables (informal sources of EE) to students' environmental knowledge, attitude and practices was found to be low. That is, the formal source of EE that were integrated in the curriculum documents and instructionalproceses were considered as major source of EE of students. From the above findings, the general conclusion drown was that integrated EE in documents, practices, and their learning outcomes were not found effective & in line with the national intentions of EE for primary schools .Finally, based on the findings and conclusions the recommendations given were: the need for local &regional level cooperation & concerted effort among curriculum developers, teachers, teacher training institutions, other environmentally active stakeholders such as health , agriculture etc so as to achieve their common goal EE; strengthening of teachers pre-service and in service programs of EE; and strengthening of informal sources EE such as media, club and family

CHAPTER ONE

1. Introduction

1.1 Background of the Study

Nowadays there is strong evidence that man's interactions with and actions for his environment are changing the environment of our planet earth. The age of man is very short as compared with the age of earth. However, in this short period of time men have had a major effect on the ecosystems upon which million other living things depend (Byrne, 1997). The ecosystem is the part of the earth in which life can exist. The life supporting systems of our environment such as soil, air, water, light and organisms are found in the ecosystem or biosphere of the planet earth. This system has its own stable balance that depends on the interrelationship and interdependence of the biotic and abiotic components the earth.

The biosphere (ecosystem) consists of three other spheres namely: atmosphere, hydrosphere and lithosphere. These spheres are interrelated and interconnected to each other and they are always in dynamic equilibrium of exchange of matter and energy. Though the ecosystem has way of maintaining the balance of the life supporting system, human's faulty approaches to development and actions for civilization and progresses have caused imbalancing of the natural ecosystem and poisoning the natural health of the life supporting systems of the environment (Bannet, 2003).

In this regard the interactions of components of the ecosystem can maintain or upset the dynamic balance of the ecosystem. Maintaining the dynamic equilibrium makes life and development sustainable but upsetting the balance endangered the survival of life in earth and declined the continuity of human's economical, social & technological development and progress. However, in current world as a result of human actions, what is actually happening is the upsetting of the balance of the ecosystem, that is, occurrence of environmental problems or hazards such as environmental degradation, pollution, climate changes, depletion of resources, depletion of ozone layer, biodiversity crisis etc (Bannet, 2003).

According to Bannet (2003), the stability or upset of the ecobalance depends on the interrelationship between biotic and abiotic components of nature as well as the relationship among the individuals of the biotic components. Especially human beings played greater role in disturbing the equilibrium of the ecosystem and shadowing the prospects of future life in earth. To satisfy their needs, human beings had been employed different economical, social, political and technological activities on the environment and exploited its resources without taking any responsible concern to the environment. As a result of the reckless exploitation of the natural environment by human beings our earth is facing the above mentioned environmental problems. Though there are naturally occurring problems such as volcanic eruption, flood, etc but most of the environmental problems are man induced problems (UESCO, 1991). Nevertheless, all problems associated with the environment have common denominator that is imbalance of the ecosystem.

Before 1970's developed countries had believed that their developments, civilizations and progresses in science and technology were independent of the environmental issues. However, as the effect of environmental problems had been growing faster and faster in number and intensity these countries were started to aware, to take concern at global level and then stared to incorporate EE in their education systems in general and school curriculum in particular (UNESCO, 1991; Otiende, 1997).

Particularly, after consecutive international conferences of the 1970's, in order to overcome the increasing global environmental problems, nations of the world agreed upon the importance of creation of environmentally literate citizen through incorporation of EE in formal and informal education (Otiende, 1997). Environmental education in both means were deliberately aimed at acquiring environmental knowledge, values, attitudes, and practical skills that help citizen to make informed decisions and motivate them to participate in a responsible and effective way in anticipating and solving environmental problems and in the management of the quality of their environment(UNESCO, 1991; Otiende, 1997).

Therefore, since 1970's the nations of the world have started considerations and integration of environmental issues in their education systems and development endeavors. To that end,

both developed and underdeveloped countries of the world tend to emphasize on the creation of environmentally literate society so as to sustain life in earth as well as to sustain their development too.

According to the above cited sources the basic and ultimate goal of EE is the development of attitude and values for the environment in addition to the necessary knowledge and skill. So a good environmentally literate citizen is the one that develop values, attitudes and committed actions which are reflections of the philosophy of EE. Thus, environmental literate citizen can best be created through quality of education given in educational institutions. From many others, one of the elements of quality of education is integration of EE in school curriculum planning, implementation and evaluation. In formal education the EE goals can be achieved through incorporation of environmental education themes in school curriculum & educational activities. Cognizant of this fact many countries have started incorporating components of EE since 1970s.

That is why; Ethiopia has tried to incorporate environmental education and sustainable development themes in her school curriculum. In Ethiopia EE was stared to be piloted 1985 in primary schools and teacher training institutions of north Ethiopia in collaboration of SIDA and MoE (Beletu & Yosef, 1990). After six year implementation of the pilot project at Wello & northern showa it was expanded to other regions of the nation. After six year implementation of the pilot project an evaluation research was made. As evaluative research of the pilot project revealed, there were encouraging results of students' achievement regarding applying theoretical knowledge to practical activities that were aimed to manage environmental problems (MoE, 1992; PII).

In spite of its encouraging achievements, the pilot project was purely conservation education project. Because the focuses of the project were on labor education for conservation works such as tree planting, terracing works, construction of check damps etc instead of focusing on integration of environmental issues in school curriculum and educational activities (MoE, 1992). However, in effect of the encouraging results of the project, the new national EE was planned.

In Ethiopia the need for integration of EE (environmental issues) in school curriculum and educational activities was reaffirmed after adopting the 1992 Earth Summit at Brazil (Damtew, 2007). Following the endorsement of the summit legal foundations by Constitution of Ethiopia (1995, Article 44: 1 & 2), formulation and incorporation of general and specific objectives in the policy document by ETP (TGE, 1994) and more specifically the formulation of EPA (1997) with the need to integrate EE in formal curriculum were some of the legal foundation and achievements so far done in Ethiopia. For instance according to the ETP (TGE, 1994:1) the main aim of education is *to* strengthen the individuals' problem solving capacity (ability) and culture. The ETP(1994) stated the aim of education as:

> *... education makes the learner all-round participant in the development process by acquiring knowledge, ability skill, attitude that helps him to improve, change as well as develop and conserve his environment for the purpose of all round development*(TGE, 1994:1*)*.

Taking similar initiation and concern for the environment EPA (1997) also urges the integration of EE in all sectors including education institutions. Regarding the integration of EE the EPA (1997) document states that, in Ethiopia teaching EE should be promoted by integrating it on the on going school curricula and not as a separate full-fledged subject.

In line with the above mentioned policy documents, MoE (1994) also developed a methodological guide line for Environmental education in Ethiopia. As the guide stated though there are two ways of offering EE Ethiopia follows the infusion method of integration EE in school curriculum & instructional processes. Infusion method is the integration of certain environmental issues with existing school subjects by adding a new focus on selection and integration of the EE objectives, contents, methods evaluation techniques without jeopardizing the integrity of the subjects themselves. Thus, the new focus calls for the deliberate selection and infusion of the above curricular elements based on the immediate reality of students' environment and its allied problems (UESCO, 1991; MoE, 1994).

The new focus has with the aim of addressing students' awareness and understanding of the environment, its issues and allied problems. Therefore, teaching EE is not only teaching of facts and concepts about the environment but also it includes developing appropriate life skill (mental, social and problem solving skills) in the environment and developing value,

attitude and concern for the environment(Palemr, 1998; MoE, 1994; UNESCO, 1991). That is to mean that the main goal EE is more than mastery of facts and concepts about the environment but it also includes developing skill and mainly creation of concern (positive attitude) and action for the environment.

1.2 Statement of the Problem

At present time in global, national and local context, there is no as such critical and burning issue that needs urgent solution than concern about environment. There has been a remarkable deterioration of the environment in our world in general and in our country in particular. In recent years the problem of society's interaction with nature has become increasingly acute and critical that needs immediate solution. The most suitable & probable way of getting solution to environmental problems is creating environmental literate citizen through the education system.

Especially, in a country like Ethiopia, where there are severe and visible environmental problems, creation of environmentally literate citizen must be an indispensable goal of the education system. The Ethiopian environment in general and its northern part in particular was not free from environmental problems. As Gedion (2003) argued that the environment in Ethiopia particularly the northern and eastern parts have been degraded to the extent that it is difficult to reverse. In related issues, Tewelde (1999) also argued that in Ethiopia the prevalent environmental problem was land degradation followed with urban waste disposal and pollution of water, soil and air. Tewelde also remarked that the major causes of environmental problems in Ethiopia were rapid population growth, unwise utilization and exploitation of natural resources. In connection with this Batkin and Kelly (1998) stated that low level of environmental literacy facilitates reckless exploitation of natural resources.

Thus, when the arguments of the above authors' brought to the situations of Ethiopian environmental crisis it could be justified that the crisis was not only due to the rapid population growth but also due to the effect of low level environmental literacy of citizens. For instance, Damtew(2007) in the country there is high level of deforestation for that the forest covered land has shrunk from 65% to 2.2%; 20,000-30,000 hectares of croplands in the

highland are being abandoned annually due to high soil erosion. When this present rate land degradation is projected it would destroy the farmland of 10 million high land farmers by the year 2010(Aklilu, 2001). This high level of land degradation was caused by the imbalance of the natural environment due to activities done to feed the ever increasing population of the nation. The activities were clearing of forest to get more arable land, for housing & energy consumption as well as land over grazing EPA (1997). All of these problems are results of low environmental literacy of the citizens.

That is, our environment has been abused severely with an increase number of environmentally illiterate people because the people's thinking have overlooked the short term benefit of the current human generation without considering the sustainability of all form of life in their environment. However, we humans can not exist in this world without other living and nonliving things. Therefore, to sustain our life in earth we have to change our value system, way of living and thinking about the environment. We human beings should not be selfish and abusers of the other non-human components of the environment. We have the responsibility to sustain life of this earth by applying the natural process of give and take. Generally our civilization, development and progress must be in harmony with natural environment. But in reality what is actually happening in our county in general and the northern high land part in particular is not in harmony with the natural environment.

Therefore, the intentions of integration of EE in our school curriculum, instruction and extracurricular activities were a call for personal and social actions in response to the abused environment. Thus, integration of EE in school curriculum documents and practices were supposed to promote students' environmental awareness and understanding about the environment and its problems and help students to develop positive environmental attitudes of concerns that make them willing and commit to participate in the protection and improvement of the environment. Moreover, it seeks to combine theoretical and practical knowledge to solve local specific problems by stressing on practical community oriented actions (MoE, 1994).

As mentioned above, in our school system in general and upper primary school in particular EE has been incorporated by infusion methods. An infusion method is the integration of EE themes in the existing school subject curriculums and practices with a new added focus (Added dimension of EE) in selection and integration of environmental issues and problems which are real and immediate to the learners' own environment.

The threefold dimension (EE themes) that should be integrated with a new added focus to existing school curricula were: education about, in and for the environment (Palmer, 1998). Education about the environment is cognitive component of EE which deals with environmental awareness and understanding. Education in or through the environment is the skill component of EE that deals with the combination of intellectual and practical skill to solve environmental problems. The third component of EE is education for the environment, that is, the affective domain of EE that deals with the development of concern and committed actions for solving environmental problems (Palmer, 1998; UNESCO, 1991; Otiende, 1997).

Environmental education can be incorporated almost in all school subjects. However, during integration there are problems in giving equal emphasis to the three dimensions of EE. In addition to this the teaching learning processes are also expected to respond to & integrate the local specific environmental issues at classroom level because there is no an all inclusive EE that can address all local specific problems. Thus, along with the curriculum documents the implementation processes at individual schools have their own key role in promoting students' environmental awareness, attitude and behavioral actions. So the extent of integration of EE theme in documents and how the integrated themes are implemented matters the extent of EE learning outcome of students.

The other point of initiation to study this topic was also including the following. As EE was relatively new concept in the Ethiopian school system, yet there were only few researches done specially in relation to students' environmental literacy level and extent of integration of EE themes in school curriculum documents and practices. For instance Aklilu (2001), Damtew (2007), and Asmare (2007) had studied secondary school students' environmental literacy in relation to school curriculum and school based educational activities. Similarly

Alabachew (2007) also had studied learners' and staffs' environmental literacy level at Adama University. Almost all of these researchers' results had showed that environmental literacy levels of their targets of study were low and integration of EE themes in their corresponding target curriculums and educational activities were poorly integrated.

As it was evident from the results of the above researches environmental literacy at higher levels was poorly achieved with regard to meeting the main goal of EE. However, primary level was believed to be the corner stone foundation for other higher educational stages. But its role was not found researched especially in relation to natural science curriculums documents and practices. Thus, the above mentioned facts inspired the researcher to study the already set topic. In addition to this the researcher also observed that environmental concerns and actions of students in the geographical area of the study were very low. Thus, from these rationales the researcher intended to question the planned, practiced and learned natural science's curriculums role of integration of EE and assess their effect in raising students' environmental awareness, attitudes and practical actions at Alamata urban and rural schools.

Thus, the intent of this study was examining the contribution of natural science curriculum and its instruction for raising the level of students' environmental awareness, attitude and behavioral practices at four selected upper primary schools in urban and rural weredas of Alamata.

1.3 Basic Questions of the study

To achieve this purpose, the following research questions were formulated:

1) To what extent did upper primary school natural sciences curriculum documents attempt to respond to integration of environmental education themes or dimensions?
2) How did upper primary school natural sciences curriculum implementation practices and educational activities at schools affect students' environmental awareness, attitudes and behavioral practices?

3) What are students' level of environmental awareness, attitude and behavioral practices? Is there disparity in students' level of environmental awareness, attitude and behavioral practices when they categorized by residence location, sex, school type, age and parent literacy level?

4) What are the relationships among students' environmental awareness, attitudes and behavioral practices? Are other factors than planned and practiced curriculums(informal sources of EE) such as sex ,age, location, parent literacy, media usage and club membership determinant for students' environmental awareness, attitude and behavioral practices?

1.4 Specific Objectives of the Study

In line with the above stated purpose the specific objectives of the study were:-

The specific objectives of this study were:

1. To examine the level of integration of environmental education dimension in objectives, contents, methods and evaluation techniques of the 2005/2006 revised curriculum documents of the target subjects.
2. To explore the curriculum implementation practices of the target subjects and educational activites that affect the students' environmental awareness, attitude behavioral practices in selected upper primary schools in urban and rural weredas Alamata.
3. To measure students' environmental awareness, attitudes and behavioral practices (actions) at selected schools in urban and rural weredas and study the influence residence, school type, sex, age, parent literacy, club membership on measured results of students.
4. To study the relationship among the students environmental knowledge, attitudes and behavioral practices and determine the contribution of informal source of EE to the students environmental knowledge, attitudes and behavioral practices.

1.5 Significance of the Study

The issue of integration EE in our school curriculum is relatively new educational innovation when it is compared with other educational practices. In addition to this, yet only few studies had been done about it. Therefore, the results of this study might contribute to fill the knowledge gap in the area. More specifically the results of this study would have the following significances:

1. Since the full intent of EE is not achieved in the school practices the study will help to fill some of the gaps in the practice.
2. The study will also help in the curriculum review of upper primary school in Tigray.
3. The study may enhance the understanding about level of integration of EE in natural science curriculum and practice and it will helps the region for identification of the problems and the measures to be taken regarding the problem.
4. It could also help to arouse awareness and motivation for further studies in the area of environmental education integration.

1.6 Delimitation of the Study

The scope of this study was limited to the content analysis of environmental issue in upper primary school natural science curriculum of Tigray region state and its implementation practices at four selected schools in Alamata urban and rural. The content analysis data were collected from only three natural science curriculum documents, namely biology, chemistry and physics student text books and teachers' guides. The classroom observation was done only in biology classroom and in only two schools namely, Alamata upper primary school from urban and Alembrhan primary school from rural. The interview data was again delimited only to natural science teachers. The tools developed were also delimited to the contents EE integrated in upper primary school natural science curriculum documents. The criteria referenced test items were delimited to measure EE awareness & understanding. On the other hand attitude scales were delimited in assessing students' environmental opinions, beliefs, feelings emotions and similarly environmental behavioral scale delimited in assessing students willing and motivated actions action for resolving environmental problems. Though the source of environmental awareness, attitudes and practices are many in number this study delimited in studying mainly the contribution or role natural science formal curriculums and studying the effects of few informal sources of EE such as location, sex, age, parent literacy, media usage habit and club membership. Finally this study's conclusions are delimited to Tigray regional state upper primary school natural science curriculums and to the implementation process at Alamata urban and rural upper primary schools. .

1.7 Limitation of the Study

It is known any social science research can hardly achieve its research objectives as completely as the physical sciences (Koul, 2006). This is due to the research design and efficiency of the research tools. In this research in order to minimize the limitation of the research methods (designs) the researcher tried to mix both qualitative and quantitative methods.

With regard to tools of the research though, all social since tools such as achievement test, attitudinal scale and behavioral scales have their own inherent limitation the research had to use standardized tools to measure students' environmental knowledge, attitude behavioral practices to minimize errors of the findings and conclusion. However, the researcher didn't get already standardized tools for the aforementioned purposes. Thus, to resolve problem the researcher had developed achievement tests, attitude and behavioral scales and had validated them by using expertise and teachers' views for content and item analysis for statistical validity. In addition to this reliability test was also checked to each of the tools (see appendix E).

1.8 Definition of Key terms

Environment: According oxford English dictionary. It refers to "all circumstances, things and events around people that influence their life.

Environmental knowledge: It is a dynamic formed through social interaction personal experience and observation. It is also context embedded which depends on specific time and space (Nonaka, Toucima and Kikonao, 2000) as cited by Atlabachew (2007).

Attitude: It is an "acquiring of social values, strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement" Aggarawal (2006: 380).

Behavioral Change:- is a participation of an individual or social group in a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems. (Aggarawal 2006). It is also a practical action that one takes on the

environment, that it refers to the actual decision making process (Pestling, 1997) in Atlabachew.

Integration: is the process of including environmental issues in objectives, contents, methods and evaluation techniques in to different subjects that are interrelated. When developing, revising curriculum guide, textbooks and teachers guides and /or in actual teaching learning process.

Environmental education: implies establishing ecological equilibrium which, implies proper use and conservation of resources and also control of environment pollution. It is a process of recognizing values and clarifying concepts related to environment and its problems.

Informal sources of environmental education: In this study the considered informal sources of EE were residence location, sex, age, parent literacy level, club membership and media usage habits

Problem solving skill: refers to the ability of students to identify environmental problem including their causes, consequences, solutions and practical participation in solving the problems.

Upper primary school: In Ethiopia education system upper primary school includes grades 5-8. However, since the three natural sciences (biology, chemistry & physics) are given in grades 7 &8 in this study upper primary school includes grades 7 & 8.

Teacher Variables: Fuller (1986) Classifies teacher variables in two teacher quality and teacher behavior in classroom. Teacher quality includes background in schooling, social, language proficiency and motivation of teachers. Teacher behaviors in classroom include teachers' performance in teaching & teachers ability to motivate students.

CHAPTER TWO

2 Review of Related Literature

2.1 The Concept of Environmental Education

The term "environment" means several things. It can be the home environment, the local environment, the man-made environment, the natural environment, the social environment and cultural environment. Therefore the term is all-inclusive which belongs to the total or universal environment. However, the survival of the universal environment rests on keeping and maintaining a balance with in the ecosystem. Only the maintenance of this kind of balance can guarantees the preservation of life in earth (Otiende, 1997: 14).

But, man's faulty approach to development and progress and his interferences with nature has now resulted in a number of environmental disasters. Some of these environmental crisis are desertification, drought, biodiversity crisis, pollution, soil erosion, global warming, depletion of ozone layer, depletion of resources, etc. (Fekade, 2005). These entire environmental crises are direct results of man's improper and unwise utilization of the environment so as to satisfy his needs through the development of science and technology. The development of science helps man to understand how works nature whereas the development of technology helps him to influence nature and able him to accomplish his current and future needs (Botkin et al, 1998). Until recently man was unaware about relationship between development of science and technology and environmental crisis therefore as a result of different human activities such as economic, social, political and technological intensions, there has been an increasing conflict between the natural environment and society. For surprise until recent time's human approach to development was considered as independent of the natural environment.

The first alarm about the pollution of the environment was raised by ecologists in the developed countries and it initiated the United Nations to have a new global concern for the environment (UNESCO, 1991). Based on the initiated and emerged new global concern, United Nations had had a concerted global call for Environmental education. To that end international conferences seminars and workshops had been organized on environment issues in general and environmental education in particular. There were serious of global conferences, workshops and seminars. In those conferences, workshops and seminars, the role

of environmental education as a solution for environment problems was under lined and believed to be the first choice. Developing awareness and understanding about how the environment is working is believed to raise a sense of responsibility for its protection and concern. It is also considered as effective vehicle to persuade human being to adopt rational attitude towards the natural environment and to avoid unwise exploitation and misuse of nature (UNESCO, 1991, Otiende, 1997). To this end, all nations are incorporating the theme of EE and sustainable development to their education system.

It is through education that environmental knowledge, skill and attitude of human beings can be changed and the concern and care for the environment is raised. To achieve these environmental educational intentions, different efforts have been made by the global community. One of the efforts is incorporating EE themes in school curriculum. However, the new concept of EE is a relatively new phenomenon in the global as well as education system. It has been introduced in school system as a new educational innovation that data back to the early 1970's. Globally since these periods of time international community and institutions have continued to raise the issues of environmental education and have tried to put profiles, aims, objectives, guide lines and approaches(UNESCO, 1991, Otiende, 1997, Palmer, 1998). However, after its incorporation in the education system EE had been defined in various ways by different educators. For instance according to the American state conference on education and environment held in 1971, it was defined as a teaching about value judgment and the ability to think clearly about a complex environment and its problems (Ja Cobson, 1985 in Abnet, 2005). On the other hand the eminent environmentalist Meadow's (1985:5) defined it as, "it is learning how to manage and involve the relationship between human society and the environment in an integrated and sustainable way".

Even though many attempts had been made to define the term environmental education the definition that was drawn up in 1970 by IUCN is well accepted and recommended for wide use in global scale (Otiende, 1997; Palmer, 1996; Devid, 2003). The organization gave the definition of EE on its working meeting on "Environmental education in the school curriculum" in Nevada, USA. The definition stated at the conference is stated as:-

> *Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biophysical surroundings. Environmental education entails practice in decision making and self-formulation on a code of behavior about issues concerning environmental quality (IUCN, 1970 in Palmer, 1996: 12).*

In a nutshell, EE is believed to provide learners the necessary knowledge for understanding the interrelationship of the complex phenomena that shape the environment and it also believed to provide a wide range of practical skills for devising and application of effective solutions to the environmental problems. Furthermore, based on the understanding and skills developed EE is believed to bring about changes in value attitude for the complex relationship between man's socio-economic development and the improvement and conservation of the environment.

2.2 Historical Development and Progress of Environmental Education

2.2.1 Global Development and Progress of EE

The global environmental concern has rapidly been growing over the past four decades as environmental threats and risks were increasing in number and in intensity. Specially, in 1970's after the first alarming and threatening environmental problem, pollution, had been raised by ecologist, many international concerns and efforts were increasingly emerged and grown to tackle the problem (UNESCO, 1997; Fekade, 2005). Thus, the 1970's were considered as the years of thinking and reflecting in concrete terms on environmental conservation and education (Otiende, 1997). Since these years a number of international conferences workshops – seminars about the EE have been done by the international organizations.

The first successful and concerted global concern about the environmental problems and the need for protective actions were raised in the Stockholm conference in 1972. It was organized by the United Nation. The main agendas of the Stockholm conference in the Human environment were focused on the danger signals emerged both in the biophysical and socio-cultural environments (UNESCO, 1991; Otiende, 1997; Palmer, 1996). The agendas were taken to include all threats of the environment such as population problems, depletion of natural resources and pollution of the environment. The delegates of the conference discussed

on raised issues and agreed up on the need for action based global understanding and cooperation for the environment.

Finally, the delegates of the conference set recommendations that were emphasizing on the need for environmental education programs at the international level (UNESCO, 1991; Otiend, 1997). Subsequently, the United Nations environmental program (UNEP) was established, which together with UNESCO founded the International Environmental Program (IEEP) in 1975; Palmer, 1996).

In effect, the IEEP was launched in 1975 at an International workshop on EE held in Belgrade, Yugoslavia. It was set up in response to the recommendation of 96 at Stockholm conference. The Belgrade conference was able to produce the first international statements on EE and come up with the framework for EE. If listed aims, objectives, key concepts and guiding principles of EE in its document which known as the "Belgrade charter" (UNESCO, 1991; Otiende, 1991; Palmer, 1996). The summarized objectives of EE stated in the Belgrade workshop were:-

1. To foster clear awareness and concern about economic, societal, political and ecological interdependence in urban and rural area.
2. To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skill needed to protect and improve the environment.
3. To create new patterns of behavior of individuals, groups and society as a whole towards the environment (UNESCO, 1991;; Palmer, 1996)

Moreover, the guiding principles stated in the Belgrade workshop were meant to be holistic in approach, that is, it was assumed to consider the total environment. And environmental education was considered as a process which is continuous and life long both in school and out of school and its approach was considered to be interdisciplinary.

The Belgrade workshop was followed by a series of regional meetings held in Africa, Asia, Arab states, America and Europe. The meetings were aimed in examining environmental problems peculiar to each of these regions and to recommend actions which would be suited to their respective environment based on the Belgrade charter as frame of reference

(UNESCO, 1991). Even though the progress and development of EE had been manifesting progresses but its nature, role, and scope lacked explicit clarification until the Tbisili Conference (UNESCO – UNEP, 1991 in Abenet, 2005).

Following the Belgrade workshop and series of subsequent regional meetings the first intergovernmental conference on environmental education was held in Tabisili, USSR, which was organized by UNESCO in conjunction with UNEP in 1977 (UNESCO, 1991; Otiende, 1997; Palmer,1996). This conference was attended by 66 member states and it was highly significant in the development of EE. It prepared recommendations for the wider application of EE in formal and non-formal education. In particular, it helps to specify the actual nature and characteristics as well as the strategies to be adopted at the national and international level based on the wishes of all member states. It stands, at present, as a final act and continues to provide the framework for the development of EE in schools and colleges in the world of to day (UNESCO, 1991; Palmer, 1996).

2.2.2 Environmental Education and Sustainable Development

After the Tbilisi conference, many schools both in developed and developing countries have been incorporating EE in their curricula. The member states responded positively by undertaking the development of EE (UNESCO, 1991; Bannett, 2003). The next progress in the development of EE was the world conservation strategy in 1980's. The world conservation strategy was launched by IUCN 1980. This document was concerning the conservation and environmental education. It stressed on the importance of resource conservation through Sustainable development, and underlined the idea of development and conservation is mutually interdependent (Palmer, 1996; Bannet, 2003).

Therefore, the world conservation strategy in its way of showing the relationship between environmental education and sustainable development it states the following message about EE.

> *Ultimately the behavior of entire societies towards the biosphere must be transformed if the achievement of conservation objectives is to be assured ...the long term of environmental education (is) to foster or reinforce attitudes and behaviors, compatible with a new ethics (IUCN, 1980, as cited by Palmer, 1996: 13).*

As a result of this since mid 1986's the work at the global level has been supplemented by world conservation strategy giving due regard to issues such as environmental education, ethics and culture (Palmer, 1996; Bannet, 2003). And following to this effort the tenth anniversary of the first Tbilisi conference that is "Tbilisi plus Ten" was held in Mosco, 1987. Through the cooperated effort of UNESCO and UNEP at this occasion, the vitality of EE was stressed. The opening "Tbisili plus Ten" anniversary addressed the following massage about EE:

> *In the long-run nothing significant will happen to reduce local and international threats to the environment unless wide spread public awareness is aroused concerning the essential links between environmental quality and the continued satisfaction of human needs. Human action depends up on motivation, which depends up on wide-spread understanding. This is why we feel it is so important that every one becomes environmentally conscious through proper environmental education (UNESCO, 1987 as cited by Palmer, 1996: 14).*

In line with this quoted idea, Bannett (2003) also remarked on the need of local specific and culturally oriented environmental education programs so as to bring the intended attitudinal changes for the environment. According him, the global programs did not work efficiently in the local context due to difference in value and cultural preference. The values given to problems and solutions of the environmental issues are not the some.

Therefore according to the above stated sources to achieve the global EE goals studying the local environmental problems, proposing culturally oriented solutions and incorporating them in the school curricula is essential.

A second major global conference of United Nations on EE was held two decades after Stockholm conference. The conference is known as the United Nations Conference on Environment and development (UNCED) "the earth summit", Brazil, 1992. The earth summit took place in Rio de Jareiro and several documents were signed at this summit. The agreements in this conference is known as Agenda 21 and a major action program setting out what nations should do to achieve sustainable development in the 21st century. The implications of this document to EE are children and youth in sustainable development (in Chapter 25) and promoting education, public awareness and trainings (in Chapter 36). One of the key outcomes of this conference for educators is the recommendations and proposals to

update and prepare strategies at integrating environment and development as cross-cutting issues in the education system at all levels(Palmer; 1996). In the continuum of focus on the environment and development, the role of education for sustainable development in 2000's in supposed to integrate EE together with quality of basic education (Aklilu, 2006).

2.2.3 Environmental Education in African Context

The term environment and environmental awareness is not new to most African societies. African societies had been awaring their young generations to their immediate surrounding using informal education. Before the new concept of EE incorporated in the modern school system, African society had been teaching environmental awareness through parents, elders etc. They used to teach youngsters how to hunt, plough, cultivate, adapt with environmental changes etc. (Otiende, 1997). However, this indigenous conception of environmental awareness has resulted short-sighted views about the environment. This old environmental awareness shaped human being to think as nature have unlimited resources. This in turn resulted, over utilizations, improper usage of the environment (Fekade, 2005). Therefore, the current African environmental problems such as deforestations, soil erosion, poverty, over population, etc are considered to be results of this African old conception of environmental awareness.

However, to day the old Africa conception of environmental awareness is being replaced by the new concept of environmental education. The history of new concept of EE in Africa is date back to the last two or three decades (Otiende, 1997). Even though African countries have started in incorporating the new concept of EE in their modern school system, yet they can't able to achieve full integration in their peoples thinking and every day activities. In line with this idea as the survey result of UNESCO-UNEP (2000) stated trends of EE integration in developing countries school curricula lacks relevance to the local environment. Similarly as Lindhe et al (1993) as cited in Aklilu (2006) stated a survey result in East Africa primary schools confirm similar result. Using the same vain, particularly regarding African education, Temechegn (2000) reviewed major African works on Science education and remarked that it lacks relevance to learners' life conditions.

Therefore the African education system in general and its environmental education in particular fail to respond and solve local specific problems. Particularly science education in Africa can't help learners in solving their every day life related problem (Temechegn, 2000). As Flint (1999) in Asmare (2007) states, an education system becomes more environmentally oriented only when it is adequately reflects and integrates environmental issues in local relevant context. On related issue Bannet (2003) also states that local specific environmental education programs would be more effective than holistic and globally designed programs. According to him, the need for locally oriented EE is due to the difference in value and culture about problems and solutions to them.

According to Orodho (1997) Environmental problems can be categorized into two categories. These are environmental problems arise from underdevelopment (Poverty) and environmental problems that arise out from the very process of development. According to him the nature and priority of environmental problems in developing countries are basically different from that of developed countries. The problem in the former case emanates from and results of under development. He added also that the solution for these problems is focusing on development goals because they can be solved though the developing processes. On the other hand Oredho (1997) stated the environmental problems of developed countries are mainly results of the development process. In other words environmental problems of developed countries emanated from high scientific and technological development. The need for fast development by using improper technologies and over utilization of the natural resources has brought different environmental hazards to the global environment. Thus, the solution for these problems might be also controlling the development process.

So, as developing and developed countries have different priority and focus regarding environmental problems their EE goals, contents and methods must be different (Otiend, 1997). There should be local specific EE programs so as to solve each categories of problem.

2.2.4 Environmental Problems

Based on their causes environmental problems can be categorized as naturally occurring and man-induced. Any way the common denominator of all environmental problems is imbalance the natural equilibrium of the ecosystem system (UNESCO, 1991). Though many of the

environmental problems are man-induced but some of them naturally occurring events that cause environmental problems are floods, volcanoes, earthquakes etc. On the other hand, the man-induced environmental problems are generally functions of population growth (Botkin, D, Keller. E. 1998). As the number of human element increases in this planet the environmental problem get worse and worse. Because human beings to satisfy their needs, they have just increased the use of science and technology to produce more by over using the environmental resources. To make things worse even they believed that as if natural resources were infinite and man could discover all of them and utilize using science and technology. Even according to some positivists thought and belief if the earth's resource were finished they would be able to use another planet's resource through development and application of science and technology (Miller, 1998). Therefore the main causes of environmental problems are human faulty thinking, beliefs, actions values, and moral ethics towards nature. Human beings to satisfy their needs they have employed different economical, social, political technological activities on the environment resources with out taking any concern to the environment.

For example to meet the need for food men were using hunting, agriculture, domesticating animals, cutting trees, over grazing, land, using fertilizers, pesticides etc. All these activities have their own adverse effect on the environment. In addition to that the current market oriented world has excessively using industries to produce much to the market and maximize profit. Though, a short term profit is gained a long lasting and severe environmental degradation are being facing.

Nevertheless the concern for the environment has been recognized as urgent and sensitive in the 1970's (Otiends, 1997, UNESCO, 1991). Since this time the global concern for the environment has been growing.

Even though there is a global consensus on the concern for environment, there is a difference in the nature and priorities of environmental problems among developed and developing countries (Ordeho, 1997). As mentioned earlier the environmental problems of the developed counties are results of the development process by over and unwise utilization of resources intensification of science and technology to make life easy where as the environmental

problems of the developing countries are emanated from undevelopment (Poverty). That is underutilization of science and technology (Ibid).

According Ordeho (1997) some of the environmental problems priority of developed nations are environmental pollution, resource depletion, wasteful usage of resources, accumulation of hazardous wastes etc. But according him the environmental problems of the developing countries are land degradation, deforestation soil erosion, over population, frequent drought etc. As the sources of environmental problems are different their solutions are also different. For example as Otiende (1997) states the environmental problems of developed countries can be solved by managing (controlling) the development process but the problem of developed countries can be solved by increasing development process by focusing on the developmental goals for development.

However, as Ordeho (1997) states through developed and developing nations have different priorities and focuses, both nations should focus on both problems regardless of their priorities because environmental problems have global nature.

2.2.5 Overview of Environmental Education Development in Ethiopia School Curriculum

The incorporation of EE in Ethiopian school curriculum was started as a pilot project in 1984 following to the drought of Wollo. The project was stayed for six years in pilot primary schools and teacher institutions which were financed by MoE and Swedish International development authority (SIDA) MoE (1992). The focus of the project was on integrating EE in the formal school system and activities were aimed at familiarizing teachers and educational staffs with vital concepts of EE education. Methodologically it was stressed mainly on active learning process that combined theoretical and practical knowledge relevant to the immediate environment. Furthermore it also stressed the practical community oriented activities which were aimed at the reduction of environmental problems (MoE, 1992: 1). As the same document revealed the project was implemented for six years at Wello and expanded to other regions (North Shewa, Harerge and Sidamo) which were predominantly affected by environmental problem. As the evaluative research on the implementation of the pilot project revealed that there were encouraging results in students' achievement with regard to applying

theoretical knowledge to practical activities that were aimed to manage the immediate problems. In effect of this encouraging result of the project the new national environmental education was planned and the research results were used for planning (MoE, 1992, PII).

On the top of this the ministry had developed a central team who were audited and recommended a framework for integration of EE themes in school curriculum. The team was also responsible to train teachers to be able to teach the integrated EE curriculum both in the pre-service and in-service models.

In Ethiopia the most recent progress of integration of EE in school curriculum is the on going practice of schools which is based on the new education and training policy of Ethiopia (ETP, 1994). The policy in one of its aims stressed that education ..."helps man to improve change as well as develop and conserve his environment for the purpose of an all-round development by diffusing science and technology in to the society" (ETP, 1994: 1). In addition to this one of the general objective of the policy stated that education is to be relevant to the environment and societal needs by cultivating the cognitive creative, productive and appreciative potential of citizens. Thus as a result of the policy direction EE has been integrated as interdisciplinary subject at lower primary school using the themes of natural science, social science, agriculture, home economics and hand craft (ICDR, 1995). In line with this the Environment protection of Ethiopia (EPA, 1997) formulate its policy goals, objectives and guiding principles so as to achieve sustainable development goals in alls sectors. Environmental education according to EPA (1997) is an environmental awareness program which addresses specific environmental problems of particular localities in the view of extreme variability of environmental conditions and problems in Ethiopia. Moreover this policy also states that the approach to EE to be on the multidisciplinary basis and to be integrated in to the on going curricula of schools and colleges. But it stated that it should be given as the separate subject in tertiary level (EPA, 1997). Therefore, in light of the policy directions the upper primary school curriculum documents are expected to integrate themes of EE in their contents, methods, evaluation strategies in documents and implementation practices.

2.3 Theoretical perspectives of environmental education and sustainable development

2.3.1 The concept of sustainable development and its dilemma

Despite its wide acceptance still now there is no universally agreed definition of sustainable development. Regardless of their varieties Borbier (1989) in Palmer (1998) categorized the concepts of sustainable development in to narrow economic concepts and in to broad that attempt to integrate economic social and ecological development. According to Pearce et al, (1989) in Palmer (1998) there are three themes that characterize the narrow concept of sustainable development which he called them green economy. The first is the need to value the environment properly (resources) using utilitarian justification which includes valuing the natural, man-made and cultural aspects of the environment and quality of life. The followers of this line of thought assess and value the degradation of resources. According to him the second theme is scale related with the need of planning in short term, medium-term and long term for implementing and realizing the desired economical change. The third theme of the green economy is equity which needs narrowing of the gap between poor and rich nations.

For the same issue according to Bannet (2003) explanation the green movement is termed as anthropocentric that demarcates human kind with other natural world, and sought nature as some thing essential but alien. According to him anthropocentric view of nature is rooted in the thinking of philosophers like Kant, Aquinous and Democrats who believed that non-human nature is subordinate to human beings. Though this kind of thinking had brought so many advances in science and technology but on the other hand it had so many side effects or hazards such as environmental degradation, pollution, over population etc (Bannet, 2003).

2.3.2 Modern environmentalism and sustainable development

According to Palmer (1998) the concept of modern of environmentalist in its definition and characteristics subsumed the dialectic concept of ecological and developmental sustainability. As Palmer remarked this concept was relevant for pursuing an understanding for the development of thinking and practice of EE. The modern environmentalist ideologies had been emanated from the increase in number and intensity of environmental problems and as a challenge to Ethnocentric ideology (Bannet, 2003).

On the other hand environmentalists themselves have different views on ecology and human nature. For instance Arne Naess (1973) in Palmer (1998) made two distinct categories of ecology. These are the "Deep" and the "Shallow" ecology. According him deep ecology rejects the dualistic nature of man and nature, and considers man as part of natural environment. On the other hand according him shallow ecology believed in separate nature of human beings and the rest nature but supports rational usage, manipulation and exploitation of nature by man.

As alternative to the "deep" and "Shalow" ecology O'Riorden (1988) in palmer (1998) also developed more tightly defined distinction of environmentalism. According to him the two distinctions are eco centrism and techno centrism. Ecocentrism sees human kind as part of a global ecosystem and subject to ecological laws. On the other hand technocentrism has greater faith in modern technology – believe in that environmental problems can be solved by current societies through careful economic activities and environmental management. Yet, an other complex classification is provided by Merchant (1992) as cited in Palmer (1998). She gave a three-fold classification of environmentalism as: the self-egocentric, society – homocentric and cosmos ecocentric. However the current world view of environmentalism according to Turner (1988) in Palmer (1998) expressed as:-

- Cornucopia technocentrism which believes on exploitation of nature by increased technological innovation and by infinite substitution of resources.
- Accommodating technocentrism support sustainable growth of economy by policy guided resource management .Its premises is that man can be a good manager of nature.
- Communialist ecocentrism:- emphasis on the need for prior macro environmental constraints on economic growth and favours a decentralized socio-economic system.
- The Deep ecology ecocentrism are extreme preservatives who oppose the instrumental value of nature and give rights for non-human part of nature. Therefore, human being gives place value for the environment protection from these perspectives.

In light with this (Botkin and Keller 1998:3) also categorized environmental protection justifications into four. These are:

- Utilitarian justification for protecting the environment is based on the economical value and use of the environment.
- An ecological justification for protecting the environment is not based on the direct benefit of human beings but based on the role of functions of resources in an ecosystem.
- Aesthetic justification for protecting the environment emphasizes that environmental resources give and preserve the beauty of nature.
- The moral justification for protecting the environment relies on the belief that resources should always present on earth no matter what economic value they have.

2.4 Curriculum and Environmental Education

2.4.1 Goals, Objectives and Principals of EE

As stated in the evolution of EE after various international initiatives there were general consensuses on the goal, objective and principles of Environmental education in school and colleges (UNESCO, 1991). These international broad consensuses have been emerged in the Tbilisi conference of 1977. The conference gave world wide definition of EE formulated overall goals guiding principles and advocated its definite inclusion in school curriculum using interdisciplinary approach (UNESCO, 1991; Otiende, 1997; Palmer, 1998). In addition to this the conference also generally accepted three core concepts or "threads of a theme" which are highly related to content of EE, learning experiences method of teaching and approach of incorporation of EE in curriculum (UNESCO, 1991; Palmer, 1998).

2.4.2 Goals of Environmental Education

In light of the Tbilisi conference the three general goals of environmental education are:-

i) To foster clear awareness of, and concern about, economic, social political and ecological interdependence in urban and rural areas.

ii) To provide every person with opportunities to acquire the knowledge, values attitudes and skills needed to protect and improve the environment.

iii) To create a new patterns of behaviors of individual, groups and society as whole towards the environment (UNESCO, 1977 cited in Palmer, 1998).

2.4.3 Objectives and guiding principles environmental education

As stated in UNESCO (1991: 12-13) the objectives and guiding principles formulated and agreed in the Tbilisi conference are given as:-

i) Objectives of Environmental education:-

Awareness: - To help individuals and social groups acquire awareness of and sensitively to the total environment and its allied problems.

Knowledge: - to help individuals and social groups gain a variety of experiences in, and acquire a basic understanding of, the environment and its associated problems.

Attitudes: - To help individuals and social groups acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.

Skil's: - To help individuals and social groups acquire the skills for identifying anticipating and solving environmental problems.

Participation: - To provide individuals and social groups with an opportunity to be actively involved at all levels in working towords resolution of environmental problems.

ii) Guiding principles of environmental education

Environmental education should:-

- Consider the environment in its totality – natural and built, technological and social (economic, political, technological, cultural – historical, moral and aesthetic);
- Continuous life long process, at all levels, through all formal and non-formal stages;
- Be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic balanced perspective;
- Examine major environmental issues from local, national, regional and international point of view so that students receive insights into environmental conditions in other geographical areas;
- Focus on current and potential environmental situations while taking into account the historical perspective;

- Promote the value and necessity of local, national, and international cooperation in the prevention and solution environmental problems;
- Explicitly consider environmental aspects in plans for the development and growth;
- Enable learners to have a role in planning their learning experience and provide an opportunity for making decisions and accepting their consequences.
- Relate environmental sensitivity, knowledge, problem-solving skills, value clarification, issue investigation and evaluation, to every age, but with special emphasis on environmental sensitivity to the learner's own community in early years;
- Help learners discover the symptoms and real causes of environmental problems;
- Emphasize the complexity of environmental problems and thus the need to develop analytical and synthetic intellectual skills;
- Utilize diverse learning environment and broad array of educational approaches to teaching and learning about, from and for the environment with the stress on practical activities and first-hand experience;
- To provide experiences in identification, evaluation, planning and implementation of environmental action. (UNESCO, 1991: 13-14).

2.4.4 Cores concepts of environmental education for structuring curriculum

Besides the clarification of goals, objectives and guide lines of EE, the Tbilisi conference, also identified three core concepts for successful structuring (organizing and integrating) of environmental education in school curriculum document and learning practices. These three fold structures (learning dimensions) of environmental education are characterized as education about, in/from and for the environment (Palmer and Neal, 1996; Palmer, 1998; ; Aggarawa,2007). According to the UK school's council's project environment (1974) as citied by Palmer (1998: 137) the three core concepts "threads of themes" are reflections of the cognitive, affective and psychomotor dimensions of objectives of education. The school's council (1974) stated the three told dimensions as:-

> *--- education about the environment seeks to discover the nature of the area under study often through investigatory and discovery approaches; the objective are chiefly cognitive ones in that the aim is to a mass information.*
>
> *--- in educating from the environment teacher must have sought to forward the general education of child by using the environment as a resource in two main*

ways; first as a medium for enquiry and discovery which may lead enhancement of the learning process, the most important aspect is learning how to learn; secondly as a source of material for realistic activities in language, mathematics, science and craft;

-- to be education for the environment --- is education which is environmental in style which emphasis on developing an informed concern for the environment. The objective go beyond the acquisition of skill and knowledge and require the development of involvement to the extent that values are formed which affect behavior ... thus the aim is to develop attitude and level of understanding which lead to a personal environmental ethics; that is, to educate pupils so that their actions and influences on collective action will be positively for the benefit of the earthy environment(Palmer, 1998: 137) .

In other words the most recent description of curriculum elements of EE is found to be four. These are the empirical synoptic, aesthetic and ethical elements (palmer, 1998). Nevertheless as Palmer's explanation of these four elements of environmental education curriculum are linked with the three fold dimension of learning. According to him when all of these elements (aspects) are fused together, they will form an approach to planning of teaching and learning tasks that reflects the eclectic nature of the three core concepts (threads of a theme) of EE. The cognitive component, education about the environment" is composed of the basic knowledge and understanding about the environment and human complex relationship with it. This reflects that it is synoptic element, which includes facts principles and theories of nature as well as human impact on it (Byrne, 1997). On the other hand, education in or from or through the environment is composed of empirical and aesthetic elements together that enable pupils to engage in first hand experiences by using the environment as a resource for inquiry and investigation. It is related to the development of problem solving skills of the student by increasing scientific mental process skills (head-on and hand- on) and social skills towards the development of personal ethics for the environment.

Finally according to Palmer (1998) education for the environment is concerned with values, attitudes and positive actions that reflects ethical element. This is to mean that acquisition of environmental knowledge is more than facts to be mastered or learned. Learning and reflecting on behalf of the environment is likely to be as it is an issue-based, action-oriented and problem solving in nature (MoE). In this case it links the development of attitude and

values based on the acquired knowledge and understanding about the environment for the development of sustainable living patterns and caring use of the planet and its resources.

2.4.5 Relationship between four pillars of learning and three fold dimensions of EE.

On the other hand when one analyses the three dimensional learning of EE one can relate them with the UNESCO (1996) four pillars of learning. The three dimensional learning of EE seem to state the same content of information regardless of their difference in words. The UNESCO (1999) four pillars of learning are learning to know, learning to do, learning to live together and learning to be (Prakash, 2007). The first Pillar "learning to know", basically, is to learn the art of learning. It helps the learner to develop the skill of self learning in a life long process because knowledge is dynamic and can't be store for ever at once. It is less a matter of mastering of itemized codified information than of mastering the instruments of knowledge themselves as both a means and an end in life. As a means it enables the learner to understand at a very least enough about their environment to be able to live indignity to develop work and communication skill. As an end its basis is the pressure of understanding knowing and discovering (Parakash, 2007) of education "learning to do" basically, implies mastering the art of applying knowledge for human welfare. It belongs to the development of practical skills and problem solving skills. The nature of work or every day life is increasing becoming more and more knowledge driven and skills for work and every day life are changing fast. Therefore learning to do must change accordingly in order to make learners better competent. The third pillar of education is "learning to socialize learners for global membership. It belongs to the value of co-operation, harmony and dignity. It needs learning to remove walks between one person and another person. The last and the fourth pillar of education is "learning to be" refers to the development of human personality that enables each individual to develop independent critical thinking and for his own judgment (Prakash, 2007). Thus, the issues in four pillars of educations are also the issues in three fold dimensional learning of environmental education.

2.4.6 Contents of Environmental Education

The general directions concerning the contents of EE were set in the Tbilisi conference of Environmental education along with the goals, objectives and guide lines. According to the

conference the content of EE should embrace natural basis of the human environment (which constitutes the biological and physical features together with its ethical social, cultural and economic dimensions that determines the line of approach and instruments people apply to understand and make better use of the natural resources in satisfying their needs. Furthermore special attention should be paid to understanding the complex relations between socio-economic development and the improvement of the environment (UNESCO, 1991).

Therefore EE should provide "the necessary knowledge for interpretation of the complex phenomena that shape the environment ... and it should also provide a range of practical skills for devising and application of effective solutions for environmental problems (Ibid).

So the ultimate goal of EE is creating "environmentally literate" person who has acquired a life style which is environmentally appropriate. This means that his life style allows the environment to function as life support system in the full ecosystem therefore the goal and objectives in the curriculum and the teaching-learning should be concerned mainly with change in attitude through awareness appreciation and action (UNESCO, 1991).

In line with this Palmer (1998) states that in recent years alongside with sustainable development and education for sustainability there has been on increasing emphasis an the "education for the environment" that is the affective domain of environmental education. But achieving this goal is not an easy task. It needs appropriate planning, developing and implementing and evaluating the curriculum. On the top of this, since life styles are different in different culture and situations, the content of EE should be relevant for specific context of the learner and should range from local, national and global scope (O' Donoghue & Naught in Aklilu 2006). Using the same vein, Bannett (2003) also states that local specific EE programs are more effective than globally designed programs because concern for environment and the solution for environmental problems are dependent on specific culture.

Therefore, during curriculum development and implementation practitioners should form their EE curriculum on the bases of the three threads of themes of environmental education about, for and in the environment (Palmer, 1998). And besides to this the contents of EE should be built in and reflect cultural and social values of the learners' community. To do so planning

process should include formulation of local specific objectives and deciding what specific knowledge (Facts, concepts), what problem solving skill and attitude to be incorporated in the curriculum (UNESCO, 1991).

1. Objectives of EE for primary school curriculum

According to methodological guide for EE Ethiopia (MoE, 1994:21-22) and Glasgow (1981) in UNESCO (1991) the objectives of EE for primary school curriculum are:-

i) To have pupils achieve a simple factual awareness of the environment in general terms and their place in it.
ii) To arouse in pupils an understanding of and interest and healthy curiosity in their environment, and to utilize this understanding towards satisfying their natural curiosity in part;
iii) To lay the foundation for the development of positive attitudes in pupils to wards their environment;
iv) To develop in pupils a willingness to work together to worked individually and in groups in cooperation with others to effect the maintenance and prevention of the environment;
v) To develop skills for learning their learning (skills of observation, collection and classification).

Of these goals the first and the second belongs to the cognitive domain of EE in which the first is at the level of facts and concepts where as is at slightly higher level of comprehension. Furthermore the second objective includes the motivational element. The third objective states the attitudinal domain where as the fourth and the fifth objectives state for social growth by attaining metal process skills (UNESCO, 1991). Thus based on the objectives the contents of EE should be selected, organized, developed and implemented.

2. Knowledge and Understanding of Environmental Education

The knowledge and understanding of EE addresses the cognitive domain of the objective. The theme for it is education about the environment which enables the learner to make informed judgment. To achieve this objective curriculum content of EE will be facts and concepts both in natural and social environment. Particularly it should focus on the relationship between components of the environment the biophysical and socio cultural environment (Palmer, 1998).

3. Skills of Environmental Education

As stated in the EE objectives above, skill component of EE focuses on both mental and social skill. The mental skills (process skills) are essential for building environmental awareness of environmental problems, causes, effects and solutions whereas social skill for working in group for environmental actions. Thus, the skill part of EE addresses the theme education in or from the environment by using the environment as teaching aid and by making contents of EE relevant to local, national and global contexts of environmental issues (MoE, 1994; UNESCO, 1991).

4. Environmental Attitude

Environmental attitude is basically the development of concern to the environment based on the acquired knowledge and skill. It addresses the theme "education for the environment" that is the affective domain. It includes informed decision making and care for both natural and social environment by the development of good attitudes and personal qualities (MOE, 1994). It includes:-

- Appreciation of care and concern for the environment and for the other living things developing positive attitude and concern for the environment in general
- Independence of thought on environmental issues such as conservation and management of resources, waste management protecting pollution, etc. It focuses on responsibility of ones actions.
- Respect for the beliefs and opinion of others.
- Respect for the evidence and rational argument.
- Tolerance and open mindedness
- Develop value for the environmental (UNESCO, 1991; Palmer, 1998).

Generally the curriculum elements (themes) of EE – Education about, in or from, and for the environment are interrelated components that enable pupils to acquire all round development in experience, concern and action.

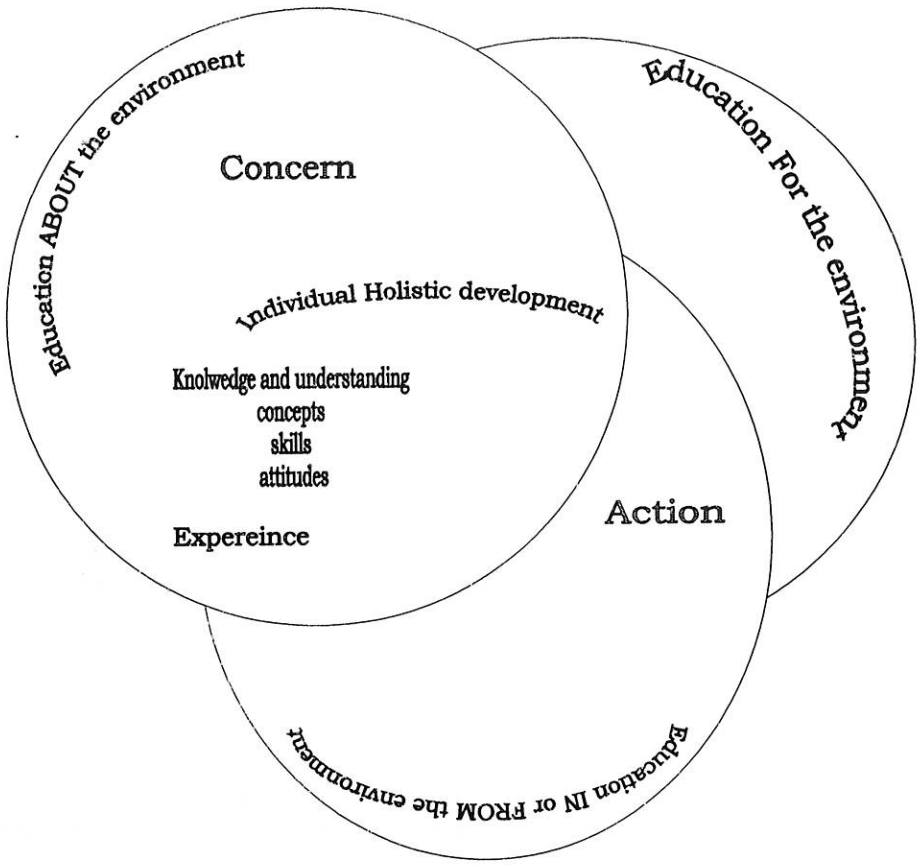

Fig. 1: Model of teaching and learning in environmental education: component of the planning task. (Palmer, 1998: 145)

2.4.7 Approaches or models of incorporating environmental in curriculum

2.4.7.1 Images of EE in curriculum ideologies

In curriculum theory and practice there are different views of purposes and content of EE. This is to mean that the there is no balanced eclectic view for themes of environmental education. For example the behavioral positivist, (utilitarian) curriculum emphasizes on knowledge about the environment. Its main purpose of EE is for vocational and environmental knowledge is assumed to be imposed externally by experts. Similarly teachers are authority in knowledge and students are passive recipients of knowledge (Palmer students are passive recipients of knowledge (Palmer, 1998). According to this line of though, knowledge is treated as commodity and the main organizing principles are disciplines. On the other hand the interpreticist progressivist (constructivist) emphasizes on activities in the environment – that is hand on learning or learning by doing. The purpose of education in this case is more of liberal and the main organizers of the curriculum documents and practices are

experiences in the environment – in local, national and global context. Teachers are considered as organizer, facilitator but students are active learners through environmental experiences. In this case, Knowledge is treated as personal experiences of students developed by intuition and reflection. Thus, these elements are main organizing principles. Finally the third and socially critical or reconstructivist line of though emphasis on actions for environment. Teachers in this case are considered as collaborative, participant, inquirer and students are active generators of knowledge. Knowledge is considered as generative or emergent and the main organizing principles of the curriculum and practice are environmental issues (Palmer, 1998).

Through these different curriculum ideologies have different area of emphasis the three fold dimensional nature of EE needs an eclectic approach (Palmer, 1998). In line with Schwab's (1970) in Pesner, (1995) rejects a curriculum model based on a single theory and he advocates for the need of eclectic approach for curriculum theories and practices. According to Schwabs's there are four common places which can be used as an element for curriculum organization. These are the subject matter knowledge (Facts, concepts), the learner, the teacher and the milieu. According to him, four of these common places of curriculum organization should get balanced level emphasis during curriculum development and practice. Therefore, for Schwabs's a curriculum developer and a teacher should look the four elements eclectically – the cognitive theory of child development, a critical theory of teacher empowerment, a philosophical theory of how scientific knowledge evolves and a progressive theory of the schools role in community development (Schewbs (1970) in Pesner ,1995). The idea of Schewb's is also supported by post Habermacian thinking of the EE curriculum and practices (Andre, 2004).

2.4.7.2 Approaches to teaching environmental education

In line with above discussed curriculum ideology there are four types of approaches for teaching EE in school curriculum. There for teaching EE in school curriculum are the interdisciplinary; multidisciplinary, problems solving and community – based a broaches. Among these the first two are disciplinary based where as the 3rd and 4th are learner and community based respectively (Otiende, 1991; UNESCO, 1991).

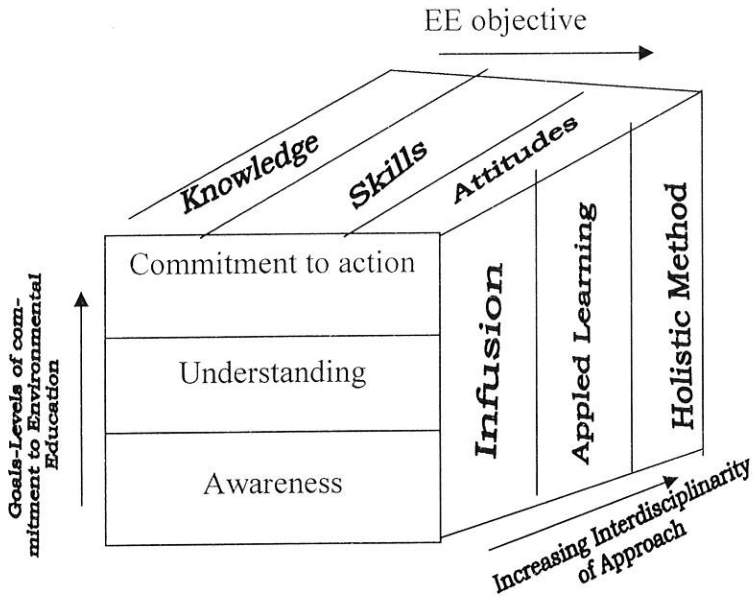

Fig. 2: Diagram to illustrate how objectives teaching approaches and goals of environmental education constitute a whole. (UNESCO, 1991: 162)

2.5 Factors that affect environmental education implementation process

According to Lockheed and Vespoor (1991) there are four essential influencing factors for students learning at schools. These are the curriculum document, the instruction process, the school environment and learner's teach-ability. In line with this (Palmer, 1998; Scott and Gough 2004) underlined that the EE rhetoric-reality gap emanates from conception and view of policy makers curriculum experts and teachers about curriculum. As cited sources elaborate different ideologies for curriculum have different purposes of focus, organizational principle, and methodology and evaluation systems.

For example if curriculum developers and implementers view of curriculum is conceived as fact their emphasis will be on the mastery of fragmented facts about the environment for disciplinary similarly of their view of curriculum their primary focus on the participatory action based on persons experience of learner on the other hand of their view of curriculum is in line with critical perspectives their focus will be on the environmental issues.

Therefore the curriculum developers' view and knowledge about curriculum organization content selection, formation of objectives and frameworks for integration of EE affects the

curriculum document as well as the teaching learning process and the kind of learning outcome of students (Palmer, 1998).

In addition to their view of curriculum teachers' competence to select and organize the local specific environmental problems in the teaching learning process also affects the students learning, outcomes (UNESCO, 1991). Therefore, teachers training background, pedagogical skills, usage of the resources, attitude and concern for the environment affect the teaching learning process and learning outcomes of EE (Otiende, 1997). In line with this schools' whole activities in management, extracurricular activities, planning and implementation of environmental related issues also affect the learning outcome of students. On the top of this the evaluation system of school also affects the learning outcome (Palmer, 1998). Finally the teachability of the learner that is his own home back ground, individual differences, (sex, residence, religion family back ground etc.) also affect the environmental knowledge, skill and attitude (Butter and Flinn (1978) in Atlabachew (2007).

Therefore, as mentioned by the above authors, the EE learning outcomes such as students' environmental awareness, attitudes and behavioral practices could be influenced by the formal education given in the school system. That is the curriculum planning, the curriculum implementation processes and school based educational activities could largely affect the students learning's. In addition to this informally students' difference in sex, age background experience, and home environment could influence their environmental awareness, attitudes and behavioral practices.

2.6 Nature of EE in natural sciences

Before presenting, and analyzing data of the content analysis results taking some insights about the relationship between EE and natural sciences has a paramount importance to understand the operational definitions and unit of analysis used in this content analysis. Natural sciences are closely related to EE, not only to the physical and biological environment but also to economic and social environment through technology (UNESCO, 1991). To this end, EE, in natural science is about considering science in large societal, cultural, economical and political context to promote informed decision making and action (Alosp & Hicks, 2003)

Therefore, a units or sub-units of the natural sciences were considered and identified as environmental styled units or sub-units if they were found integrating facts and concepts about environmental issues and problems especially in relation to learners' real and immediate environment with the intention of enabling them to apply scientific principles to analyze & explain events related with environmental issues as well as solve environmental problems. Thus, EE in science give insight to learners' about the causes, impacts and possible solutions to environmental problems. This, enable them to analyze and justify behind conflicting interests between exploitation and protection of the environment.

Ultimately, EE in sciences enables students' understand their responsibility for their environment and willingly to participate in actions for protecting and improving the environment (Palmer, 1998; MoE, 1994). Therefore, based on the above definition of EE in natural sciences, the content analysis was made on objectives, contents, methods and evaluation strategies in order to determine the level of integration EE in each subjects' curriculum materials

CHAPTER THREE

3. Research Design and Methodology

3.1 Design of the Study

The major purpose of this research was to examine students' environmental awareness, attitude and behavioral practices in relation to the contribution of upper primary natural science curriculum documents and practices in selected schools of Alamata Urban Rural weredas. To achieve the purpose a descriptive case study research design was employed. A rationale behind the design was threefold. Firstly, even though EE can be integrated in all subjects, the study focused on describing the level of integration of EE themes only in three natural science curriculums documents. Secondly, the study focused on exploring few case of Alamata urban and rural schools' curriculum implementation process to explore and investigate school based factors that might influence students' EE learning outcomes. Thirdly, it focused on describing what learning outcomes of integrated EE curriculums were by measuring grade eight students' environmental knowledge, attitudes and behavioral practices (actions for environment). Thus, all the above rationale lead the researcher to select the design.

In this regard Kumar (1999) stated that a design of a study is nothing but a strategy or plan of investigation to obtain answer to research questions or problems. From the view point of objectives research types can be descriptive, exploratory, explanatory and correlational. On the other hand, the author also stated that, although theoretically research studies can be classified in to the above stated designs but practically a combination of the categories can be used. Thus, the researcher preferred to combine the exploratory and descriptive types in order to formulate the major design, that is, descriptive case study.

On other hand, from the view point of the types of information sought for the research the employed methodology was mixed, for that, it used both qualitative and quantitative data to answer the basic research questions raised in the process of the study According to Creswell (2003) each of the paradigms, which is qualitative and quantitative methodology, have their own limitations. However, according to him, one can benefited much from by mixing them.

Hence the researcher preferred to mix the two methods in order to cross- validate the findings obtained by each of the methods.

3.2 Data Sources

For the purpose of this study, relevant and useful data sources were upper primary schools natural science curriculum documents (grade 7&8 textbook, and teachers guide),which were revised and published by of Tigray Regional State Education Bureau in 1999 E.C.(TRSEB199,a,b,c) school physical environments, natural science teachers and grade eight students.

3.3 Sample size and sampling procedure

In order to select appropriate samples of participants for the study, the frame of sampling or population of all data sources should be defined (Koul, 2006). Therefore, in this study the target populations were: grade seven and eight natural science curriculum documents; 14 upper primary schools in which six were in urban and eight were in rural Alamata weredas; all natural science teachers and all grade eight students in the study area.

The choice of sampling method depends up on any considerations unique to each individual research project Koul (2006). Therefore, with regard to sample size of schools, students and teachers, the study decided to take equal (symmetrical) size of samples for each of them. Therefore, equal number of schools, students, teachers and class rooms were selected in both urban and rural weredas. In related issue Yalew (2006) stated that the researcher can determine sample size from the study population based on the purpose, the research design, research questions, objective of analysis etc. The reason behind such decision made was that the numbers of schools as well as students in urban rural weredas were found to be almost equal. When a sampling technique, that is, probability proportion to size (PPS) was applied to both school and student samples size were found to be equal. For instance to select four schools the researcher tried to calculate PPS to urban & rural schools. The result showed that the value for urban to be 1.5 schools & for rural 2 schools. Since there was no a half school the study decided to take equal number of schools from each cases.

Similar procedure was also done for sampling of students because the total numbers of students were almost equal, that were, 1398(49.93percent) and 1411(50.27percent) of students from urban and rural respectively. On top of this, since the purpose of the study was merely to assess the extent of attainment of integrated EE goals selecting equal number of participants believed to prevent mean variation caused by inequality of the samples (Koul, 2003).

Therefore, a total of four schools (two urban and two rural) schools were included in the study. However, sample schools in each of the category were selected randomly. Similarly, a total of 240 students that was 8.5 percent the total population, were selected by stratified random sampling techniques. To get the total sample size (240 students) students were stratified by residence location, school and sex then after equal numbers of students were selected randomly from each stratum. With regard to selection of participant teachers, the available sampling technique was used where as for observation purpose biology classrooms were selected purposively.

Table 1 Distribution of sample respondents by wereda & school

No	Area of study	No Schools	Sample schools														
	Urban Alamata	6	Alamata UPS						Kokebtsibah UPS						Total sample size		
			Population			sample			Population			sample					
			M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
			192	211	403	30	30	60	117	135	252	30	30	60	60	60	120
	Rural Alamata	8	Alembrhan UPS						Waja UPS						Total sample size		
			population			sample			population			sample					
			M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
			154	136	290	30	30	60	129	128	257	30	30	60	60	60	120

Sampling of the Document Analysis

In relation to the sample of a document analysis Cartwright (1970) in Koul(2006) stated that, based on the purpose of the study the sample of a document analysis can be representatively selected items(words, sentences, units etc) of small size or it can be the whole document. With regard to sampling of curriculum documents of the three natural sciences, all chapters in the target documents were taken for assessment of integration EE themes in their objectives,

contents, methods& evaluation techniques. Thus, for the assessment of integrated EE objectives, contents and evaluation techniques, the whole grade seven and eight students' text books were sampled where as for assessment of EE methods the respective teachers' guides were counted

3.4 Data Gathering tools (Instruments)

For the purpose of the study both primary and secondary data were collected from the sources. Besides to this, both qualitative and quantitative data were employed to achieve the research purpose and answer basic research questions. Thus in order to collect appropriate evidences or information about each research question the study used different data gathering instruments. The data gathering instruments which were employed in this study include: document (content) analysis, criteria referred achievement test, attitude and behavioral scales, observation checklists and open-ended interview questions.

3.4.1 Content analysis

According to Berlson(1952) in Koul(2006) content analysis is a research technique for the objective, systemic and quantitative description of symbolic behavior or manifest of contents of communication or document. It is concerned with classification, evaluation and comparison of contents in documents or communication. Therefore, content (document) analysis was done in order to determine the level of integration of EE themes in target subjects' curriculum documents revised in 1999 E.C. EE themes were assessed in objectives, contents, methods and evaluation techniques developed in the documents. To achieve the purpose units of analysis, categories and variables were specified by using operational definition to each of the above mentioned targets of count. However, to prevent redundancy and make readability of the report preferred to put them in the analysis part. Thus, based on the developed unit of analysis categories and variables of the study coding sheet was prepared to each target of count (see appendix B). Then a training manual with examples was produced so as to train coder.

3.4.2 Observation checklist

Observation checklists were used in order to describe whether or not planned integrated EE properly implemented or not in the actual classroom instructional processes and to explore

school based factors which might influence students environmental knowledge, attitude and practices. Therefore, in this study two types of checklist were employed. These were classroom observation checklist and the whole school compound observation checklist (see appendix C). The former was used to explore the teaching learning process in biology class rooms of two selected schools. Where as the later was employed to all sample schools in order to check school physical environments, facilities ,waste disposal , vegetation, sanitation and students actual participation and action for the environment.

3.4.3 Interview questions

Interview is a process of collecting needed data from participants of a research through oral and face –to- face situation. It is superior to other data collection tools because people are usually willing to talk than to write (Best & Khan, 2003). As the classroom observation periods were too short to conclude about the whole year's teaching learning processes in the target subjects, the researcher interviewed all of the target teachers(12)were interviewed(see appendix C for interview schedule)in addition to the observed class. That is, by scrutinizing the two data the researcher believed to draw conclusion about the effect the instructional processes on the achievement of students' environmental awareness, attitude and practices.

3.4.4 Criteria referenced Achievement test

The researcher faced a problem of getting standardized tests to measure students' environmental knowledge and skills. However he decided to prepare criteria referenced test items & standardized its minimum mastery level achievement by judgments of teachers during the pilot test of the instruments. This type of Criteria referenced test standardization was advised by Shycoft(1979) and Wiersma &Jurs(1985). On the other hand, according to Kuol, (2006) and Best & Khan (2003) Criteria referenced achievement tests can be prepared in order to measure present performance of students in relation to knowledge or skill which has been acquired as a result of learning at the end of instruction or training. Thus, the main purpose of Criteria referenced test is to assess whether students possessed a required knowledge & skill with reference to a minimum designated mastery level of the criteria or not because students' learning pace is not the same

Therefore, the purpose of this study's achievement test was to distinguish students, who have mastered and who have not mastered the minimum essentials of EE knowledge and skill after instructional processes of natural science subjects. The test items were prepared in line with steps for constructing criteria referenced tests. First the researcher prepared test objective based the EE objectives set for primary school curriculum & instruction in the environmental methodological guide of Ethiopia (MoE, 1994).Then, the Table of specification was prepared to develop the 60 test items from EE contents developed in the three in upper primary school natural science curriculum documents of the study area. The test items were developed in a way to include contents from environmental facts & concepts that cover both natural and social environments as well as mental skill components of EE such as analyzing, anticipating, synthesizing & evaluating skills about environmental issues, events and problems in all local, national and global scales.

Finally the developed items were given to biology, chemistry & physics subject teachers who had long experiences of teaching in the target grade levels schools at the study area. Apart from this, the items were evaluated by MA holders in curriculum & instruction and measurement & evaluation. During this time some of difficult items & irrelevant questions for the grade level (10 items) were discarded and other 12 items were changed before the developed items were administered to the pre –tested students. Then 50 of the developed items were translated to Tigrigna version and were given to 26 grade eight students (to 13 boys & 13girls) who were sampled randomly in Rarhe primary school which was found in rural Alamata. Based on the pilot result, item analysis for each question was done based on the achievement results of the pre-tested students then level of difficulty & discriminating power of the items were calculated by using Garrett(1981) method of analysis by calculating the discrimination power and validity index (see appendix C &section 3.5 of reliability & validity).

3.4.5 Likert-type Scale Questioners

In order to rate and describe the students' environmental attitudes and behavioral practices (actions) a likert type scale was used. The likert-type scales which were used to identify the students' environmental attitudes were statements that belonged to the opinions, belief or feelings about environmental issues especially with regard to utilizing, protecting and

appreciating the environment. Then along with each statement a five interval scales ranging from strongly agree to strongly disagree was used. Similar to attitude scale another likert-type scale was used to rate and describe students' environmental behavioral action especially with the intention of solving environmental problems. These scales, like the formerly mentioned scale, use statements that indicate the intentional actions for environmental problems and a five interval scale which ranges from always to not at all (see appendix C)

To develop the above mentioned scales the researcher collected statements which were supposed to represent participants' opinions, beliefs, feelings and practical actions about environmental issues in the study area. Then after, he developed items to both scales and present them to teachers & experts for suggestion & evaluation before they were administered to piloted students. Totally 27 attitude and 9 behavioral action items were developed and administered to piloted students in line with achievement tests.

3.5 Pilot testing of Instruments

To check the quality of the instruments developed the researcher had to carry out a pilot test in the non-sample school of the study area. As mentioned above a total of 26 grades eight students were selected for pilot test. These students were chosen from Rarhe primary school in rural Alamata. Then the Tigrigna translated version of the tools, that is, 50 criteria referenced test items, 27 attitude and 9 behavioral scale items were administered to the piloted students Therefore, as the quality of good research tool depends on the degree of validity and reliability, then validity and reliability of the tools were checked during the pre- test.

3.5.1 Validity of the instruments

Validity is the utility of the tool that is the measure of the usefulness of the tool to achieve its purpose. The tool is valid if it measures what it claims to measure. Research instruments can be validated using experts judgments and /or statistical procedures (Best and Khan, 2003; Koul, 2006). Therefore, in addition to experts' evaluations and suggestions for content validity, statistical procedures were applied to calculate the validity of the instruments. Especially during pilot test statistical validity was calculated for criteria referenced tests.

3.5.1.1 Item analysis for each of criteria referenced tests items

After the criteria referenced test was given to 26 randomly selected grade eight students, the researcher did item analysis for each question using Garrett (1981) method of item analysis by calculating the discrimination power and validity index. Accordingly, the scores of pilot sample students were arranged from the highest to the lowest. Then from arranged scores the top 27percent and the bottom 27percent were separately taken to calculate the difficulty index and discriminating power or validity index of an item. To evaluate the worth fullness of each questions both difficulty level and discriminating power was calculated and both were used simultaneously to evaluate each question utility for research purpose (Koul, 2006).Then the quality of each question item was evaluated based on the Table found NOE (1994:124) document. Supporting the principles in the Table Garrett (1981) in Koul (2006) also stated that both the level of difficulty and discriminative values are to be used to value the quality of the item. Therefore item with validity index of 25percent and more and difficulty index of 0.40 to 0.60 are regarded satisfactory. But items having zero or negative validity are useless and must be discarded. Based on the item analysis results of the pilot test 47 questions were found to be valid for the study because of the items fall in the ranges of medium, very good &good, the Table(2) found from NOE(1994:124) however, 3 questions were found to be bad questions and were discarded. (see appendix C).

Table 2: Item analysis Table for criteria referenced test items which contain item difficulty level

Item difficulty level (1)	Item discriminative power (index)			
	<0	0-0.3	0.3 – 0.4	0.5-1.0
> 75percent	Bad item	Easy item	Easy item	Easy item
Between 40percent - 75percent	Bad item	Medium (marginal)	Very good item	good item
Between 26percent - 39percent	Bad item	Difficult question	Difficult question	Difficult question

In addition to the endeavor done to valid the items by suggestions & evaluation of teachers and experts' especially the criteria-referenced test items achievement level was standardized by teachers of the piloted school. According to the evaluative judgment of teachers the mastery level achievement of the criteria referenced test items was standardized to be 75 percent and above.

3.5.2 Reliability the Instruments

The reliability of the research instruments is the extent of measuring consistency. Reliable research tools are stable measures and yield comparable scores with minimum errors (Best & Khan, 2003) Thus reliability of the items had to be checked before they were administered to targets of the study.

Reliability of the criteria referenced test items were analyzed by split-half method. The items were split in to odd and even items then the correlation of the two half were computed by calculating Pearson's "r" for ungrouped data. Then for more internal consistency, the correlation coefficient which was found by Pearson's formula was modified by using the Spearman-Brown formula and the result was found to be 0.97.Thus, the test was found to be reliable to achieve the intended objective of the research under consideration. Similar to criteria referenced tests, for reliability of attitude and behavioral scale items, the Cronbach alpha test was employed (Best and Kahn, 2003). Then the computed result for attitude scale items was found to be 0.85 and for behavioral scale items it was found to be0.87. So all of the pilot test results for the validity and reliability of the instruments were found to be relevant to measure the claim they were supposed to measure, that is, students' environmental awareness, attitude and behaviors practices (actions). Therefore, the instruments were used for actual data collection.

3.6 Methods of Data Analysis

3.6.1 Content Analysis Procedure

Categories, Variables and unit of analysis

. The document analysis was done by using the four categories of analysis. The main categories used were for assessment of EE themes were objectives, contents, methods and evaluation techniques. In addition to these main categories additional sub categories The analysis of each category in the target curriculum document was done by applying procedures of content analysis as suggested by Koul (2006).

According to the procedure of content analysis, after definition of the categories and sub categories the units of analysis and variables were specified for each category .The variables

which were used in all the categories were themes EE such as EE knowledge, attitude, and skill .These theme represented the three core concepts of EE, that is,. Education about environment, education in/from environment and education for the environment respectively (Palmer, 1997) However, different units of analysis were employed to count themes under each of the categories. The units of analysis for objectives were percentage of EE developed in the curriculum documents. Similarly, for EE contents the unit of analysis was the number (percentage) of chapters that eclectically integrate EE themes. The same procedures were also applied for EE methods and EE evaluation strategies. In addition to this during the plot test of the instruments coding sheets were developed, for each subject's two coders were trained and eventually inter-coder agreements for each subject were calculated (see appendix B).

Operational Definition for sub categories of EE objectives

EE knowledge objective and Model examples

Environmental objectives that categorized under knowledge were those which intended to raise students' awareness and understanding about the environment its allied problems and students' own role in it. EE objectives that focused on mastery of facts, concepts, theories, issues and problems about the environment were identified as EE knowledge type objectives. The action verbs that were used to identify EE knowledge objectives were recall, repeat, explain, list, give example, etc. For instance some of the models used to signify the EE knowledge type objectives were those stated like: -

Students will able to:-*State causes of pollution; List effect of fertilizers; Explain solutions for erosion, deforestation, waste disposal etc. (UNESCO, 1991).*

Operational Definition of EE skill objective and Model examples

Similarly for the identification sub-categories of skill type EE objectives higher level environmental education objectives that were supposed to raise students' thinking skills (critical thinking, decision making skill) and problem solving Skill were used. For counting skill type EE objectives Bloom's higher level educational objectives that were supposed to be at the level of application, analysis synthesis and evaluation were used. This is to mean that EE objectives which were supposed to help learners in decision making, anticipating, and

analyzing, predicting and evaluating issues related with the environment were considered as EE skill.

The action verbs which were used for identifying skill type EE objectives were: apply, organize, predict, use, demonstrate, measure, collect, compare, make identify draw conclusion etc. According to the above definition the model skill type EE objectives which were used for counting and recording purpose were those which stated like model examples given below.

At the end of this lesson students should demonstrate ability to:-*To use library resources; Interview experts to obtain information; Collect necessary specimen; Make choice between alternative; Predict consequences or solutions for environmental problems for environmental problems; Identify patterns or signs of environmental problems etc. (UNESCO, 1991).*

Operational Definition of EE Attitude objective and Model examples

The third categories of EE objectives that addressed the third dimension of EE and belonged to the affective domain of EE were those which were targeted for the development of concern (values, positive attitudes and actions) for the environment. Thus, such types of EE objective were categorized under environmental attitude. Attitude was considered to be the main component of EE and must be learned/or changed in addition to intellectual and motor skills (MoE, 19940). This component emphasized on development of value clarifications, motivation and commitment in learners' belief, opinions and emotions. Similar to the former cases, some of the model examples used for categorizing EE objectives in to attitude type category were objectives stated like the following.

At the ends of the topic (lesson) students show: *willingness to find things for themselves; Appreciation for their environment; care their environment; Concern for living and non-living thing (UNESCO, 1991).*

Operational Definition of EE Participation objective and Model examples

The last and fourth category of EE objective was belonged to environmental actions and participation. The objectives under this category were those which were belonged to practical actions. These participations and actions objectives motivate learners to solve environmental

problems, and acting or behaving on behalf the environment in their own pattern of life. It includes doing something with environmentally friendly choices or decisions made and repeating the choice or decision in some pattern of life. It also includes willingness and motivation to participate voluntarily and cooperatively in alleviation of environmental problems. Some of the models examples which were used for categorizing environmental participation objectives were those stated like:

At the end of this topic (lesson) students should:- *To do action based on the decision made; Assist others in group work; Act willingly in school clubs which are established to alleviate environmental problems ;Freely express their feeling ;Express concern over the distraction of habitat etc. (UNESCO, 1991).*

Therefore according to the above mentioned operational definition and unit of analysis for EE objectives developed in target documents were counted and results were organized as in the Table (3) that follows

The dependent variable student's environmental knowledge was measured by achievement test. Another dependent variable environmental attitude towards environmental issues (both physical and social environment) was measured by Likert type scale. The third dependent variable behavioral practice was measure by Likert type scale. The independent variables that refer to factor that affect the achievement of students learning of environmental education in this study includes school environment (condition), teachers' classroom teaching, school environment and student personal background data such as urban and rural living environment and gender, age parent literacy & club membership were considered as independent variables in this study. These independent variables were collected from students during data collection in order to see their statistical significance as students' environmental knowledge, attitude and practice predictors.

In addition to this for content analysis integrated EE themes in objectives, contents methods and evaluation strategies were counted and computed in percentage to the compare each subject's degree of integration of EE in their documents. Here the documents were independent variables and the EE themes (education about in & for) were dependent variable.

In the data analysis both descriptive and inferential statistics were used as a method of analysis .The main descriptive statistical methods employed were: percentages, frequency count, mean scores value and standard deviation. Similarly some of the inferential statistics were t-tests, one way analysis of variance, multiple correlation and regressions analysis were used.

CHAPTER FOUR

4. Presentation and Analysis of Data

In this chapter the collected data were presented and analyzed in the way to achieve the research objectives through answering of the basic research questions. As mentioned in methodology part the purpose of this study was to examine the extent of integration of EE in upper primary school natural sciences curriculum documents and educational activities; and then to assess & describe the level of students' environmental awareness, attitude and behavioral practices. Therefore, data were collected from the curriculum documents, instructional processes, school environments, teachers and students. The data from each source were organized, presented and analyzed sequentially in a way to answer each research question of the study.

Therefore, the sequence of presentation and analysis of the data were in the sequence of the research questions. Firstly, the data collected from the curriculum documents were presented and analyzed using percentage. Then, the qualitative data collected in the curriculum implementation processes of the case schools were analyzed qualitatively. Finally, the data collected from students were also analyzed separately. However, the final session the implications of the results of document analysis and being practiced curriculum implementation processes to measured values of environmental awareness, attitudes and practices were included in the analysis. In addition to this, the effects of the other factors or informal sources of EE such as residence location, sex, age, and parent background and club participation on students' measured values of environmental awareness, attitudes and practices were analyzed in this section. That is, for convenience research question number three and four were analyzed in combination.

4.1 Responsiveness of the Curriculum Documents for integration of EE Themes'

4.1.1 Assessment of EE themes in Students' Text Books

As mentioned above in order to examine the responsiveness of the documents for their integration of the three themes EE (education about, in/from and for the environment) the

total objectives, contents, teaching methods and evaluation techniques developed in the documents were examined. The target documents were grade seven and eight biology, chemistry and physics students' texts books of (TRSEB, in1999 EC.; 1999 EC.; 1999. EC).

4.1.1.1 Integration EE Themes in educational objectives of Biology, Chemistry & Physics Text books

It worth noting that educational objectives are simply frameworks from which curricular or instructional sequences can be developed MoE (1994). That is, educational objectives are intended learning outcomes that are supposed to be seen in or up on students behavioral patterns as a result of their learning. On the other hand as indicated in literature EE objectives in natural sciences need an added focus of deliberation in selection and infusion of environmental facts, concepts, issues and threats relevant to learners' immediate and real environment with an intention of promoting environmental knowledge, attitude and behavioral practices of students. Then according to the operational definitions to each the sub-categories EE objectives were counted and categorized in to the four categories: environmental knowledge, attitude, skill and participation.

Table 3: EE objectives Developed in Biology, Chemistry and Physics text books

Categories of objectives	Biology				chemistry				physics				Total	
	Grade 7		Grade 8		Grade 7		Grade 8		Grade 7		Grade 8			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Total no. of objectives	160	100	160	100	107	100	87	100	108	100	127	100	749	100
No. of EE objectives	76	47.5	84	51.3	27	24.3	19	21.8	22	20.4	33	25.9	261	34.8
EE knowledge	41	53.4	56	66.7	22	81.1	16	86.5	18	81.0	30	90.9	183	70.1
EE skill	19	25.0	20	23.8	5	18.5	3	13.5	4	19.0	3	9.1	54	20.9
EE attitude	9	11.8	4	5.6	0	0	0	0	0	0	0	0	13	5.0
EE participation	4	5.2	4	4.4	0	0	0	0	0	0	0	0	8	1.06

Integration of EE Objectives in Biology Text Books

As depicted in Table 3 both grade seven and eight biology text books gave relatively added focus of attention for integration of EE objectives. For instance, from the total number of objectives developed in biology texts books almost 50 percent of the objectives were found to be environmental education objectives. Even though half of the biology objectives were found to be EE oriented, almost 60 percent of them were found to be pertinent to environmental knowledge. That is, their ultimate target was found to be achieving the cognitive domain of Environmental education which was mastery of facts, concepts and theories about the environment and its allied problems.

Next to cognitive domain, EE skill components (thinking skill, social skill and problems solving skill) were given the second place of focus, because 24.4 percent of the EE objectives were found to be pertinent to EE skill development. However from those EE skill objectives mental skills were highly emphasized while social and problem solving skills were given little room. Relatively speaking, biology text books were found giving lower focus of attention to the EE attitude and participation kinds of EE objectives. Because, from total EE objectives developed in biology text books only 8.1 percent of the objectives were found to be environmental attitude and only 5 percent of them were EE participation objectives. On the other hand as one compared biology text books of the two grade levels, relatively greater proportion of EE attitude objectives were found integrated in grade seven than grade eight biology text books.

Integration of EE Objectives in Chemistry and Physics Text Books

Unlike biology, both chemistry & physics text books were found giving little added focus of attention to integration of EE objectives. As it is evident from Table3 from total objectives developed in chemistry text books, only 24.3 percent of grade seven, 21.8 percent of grade eight and 23.7 percent of the sum of the two grade levels were found integrating EE objectives. However, from EE objectives found in chemistry text books 82.6percent of them were found to be environmental knowledge type objectives and 13.5 percent the objectives were EE skill type but EE attitude and participation objectives were totally ignored in both grade seven and eight chemistry text books.

Similarly, 20.4 percent of grade seven, 25.9 percent of grade eight and 23.4 percent of both grades' physics texts books were found integrating EE objectives. But like chemistry EE objectives, 87.3 percent of physics EE objectives were categorized under EE knowledge and 12.7 percent were EE skill objectives.

Therefore, with regard to integration of EE skill objectives, both chemistry & physics text books were found giving very low level focus of attention when compared with biology texts. Moreover, in contrast to biology, both chemistry &physics texts were found ignoring both environmental attitude and participation dimensions of EE objectives. Thus, as can be inferred from the results discussed above both chemistry and physics educational objectives were not sufficiently and proportionally incorporated EE themes. Because the developed objectives were found over emphasizing to EE knowledge and totally ignored the main goal of EE that is EE attitude. Relatively speaking, biology text book were found addressing the three theme of EE better than chemistry and physics curriculum

Generally as can be seen from the grand sum from the total objectives developed in the three subjects, only 34.8 percent were EE objectives. But from these EE objectives 70.1 percent were environmental knowledge, 20.9 percent were environmental skill, 5.0 percent were environmental attitude and 3.0 percent were environmental participation. Thus, EE objectives in the three natural science text books were not only inadequately integrated in educational objectives but they were not also proportionately distributed or responded to environmental knowledge, skill, attitude and participation categories of the objectives. Especially the main dimension of EE, that is "education for the environment" was given very little room in biology texts, but was totally ignored in both chemistry and physics text books. This was contrary to the ultimate main goal of EE as stated in the policy documents and EE literatures. According to MoE (1994) and Palmer (1998) the main intention of EE should not be confined to providing learners with knowledge and skill but it should be also to develop positive environmental attitude and values that reflected awareness of the surrounding environment and acceptance of the responsibility for action to solve environmental problems. In this regard, though there were encouraging trials in biology documents, generally speaking the three natural sciences were not responsive to ultimate goal of EE.

4.1.1.2 Integration of EE Themes in Contents and Methods Developed in Biology, Chemistry and physics text books

As has been discussed above, despite their difference in focus and degree of integration, the three subjects' text books had attempted to integrate EE objectives. But educational objectives are merely intended outcomes that are expected to appear in behavioral terms in/upon learners (Palmer, 1998; Pensner, 1997). However, it is known that realizations of educational objectives are highly depending on the means by which they are intended to be achieved. The two important means by which objectives could be achieved were contents and teaching-learning strategies or methods. Learning experiences and contents are prerequisite factors for effective achievement of intended EE objectives and goals. That is, selection, organization and sequencing of environmentally appropriate contents and methods determine the effectiveness of the teaching learning process. .

4.1.1.3 Integration of EE Contents in Units of Biology, Chemistry and Physics Text Books

Environmental education contents are facts, principles, ideas and concepts about the environment and human complex relationship to it (palmer, 19998). The EE contents are environmental issues integrated in the existing subjects with added focus of deliberation so that learners' acquire them and achieve the intended learning outcomes of EE such as environmental knowledge skill and attitude MoE(1994). In order to assess the three themes of EE in contents of the target subjects all units (chapters) were explored. A unit in the text book was considered as environmental in style if it were found incorporating the three dimension of EE eclectically. That is, education about, in and for the environment. In addition to that a unit was considered to be environmental in style if it were found incorporating environmental facts, concepts, issues and problems with the intention of promoting environmental awareness, appreciation and action (MoE, 1991). In particular, as Palmer (1998) and MoE (1994) stated, the EE attitudinal domain which was the main goal of EE and it could be achieved through integration of contents and experiences that were related to environmental issues, problems, values and actions that were immediate and real to learners' own environment(palmer, 1998; MoE, 1994). Thus, using the above operational definition all developed chapters or units were assessed to determine whether they eclectically incorporate education about, in or for the environment. Then the results of the assessment were organized as follow in Table 4.

Table 4: Extent of integration EE themes in Biology, Chemistry and Physics Units' Content

Subject	Grade level	Total number of Units developed in the text	Number of units That integrate EE themes	
			In Number	Proportion In percent
Biology	Seven	7	5	71.4
	Eight	6	4	66.7
	Total	13	9	69.2
Chemistry	Seven	5	1	20
	Eight	5	1	20
	Total	10	2	20
Physics	Seven	8	1	12.5
	Eight	7	1	14.5
	Total	15	2	13.5
Total	Seven	20	7	35.0
	Eight	18	6	33.3
	Total	38	13	34.2

Environmental contents in biology text books

As it can be seen from Table 4 biology text books in both grade levels had integrated EE better than the other two subjects. For instance, 71 percent of grade seven and 66.7 percent of grade eight biology units(chapters) were found integrating EE content.

Environmental contents in Chemistry text books

In contrast to biology, in grade seven chemistry only one unit (20percent), in grade eight only one unit (20percent) and in both grade levels a total of two units (20percent) were found integrating EE themes. On the other hand, in grade seven chemistry EE contents were organized in a separate unit while in grade eight chemistry they were found integrated and organized at a sub-topic level in the units. The contents were incorporated in grade seven chemistry were issues about air and air pollution, about water and water pollution, about soil and plant nutrients and about fossil fuels and energy sources. Likewise grade eight chemistry contents were facts about carbon cycle, nitrogen cycle, fertilizers, mineral resources, etc. which were integrated at a subtopic level. So when compared with biology text books both grade levels chemistry text were found giving little added focus attention to integration of EE themes.

Environmental contents in Physics text books

Similar to chemistry, both grade seven and eight physics text books were not found giving adequate room for incorporation of EE themes in their contents as compared with biology text books. For instance only 12.5 percent of grade seven, 14.3 percent of grade eight and 13.3 percent of both grades' physics chapters were found integrating EE themes. In summary 34.4percent of units in the target text books were found incorporating EE theme.

4.1.1.4 Integrated EE Methods in Units of Biology, Chemistry and Physics Teachers' Guides

Next to contents, the second means of achieving the intended goal or objectives of EE are learning experiences (Pesnor, 2003). According to this author, learning experiences are teaching-learning strategies (methods) that help learners' interact with their environment in effort to acquire the desired contents of EE, that is, facts, concepts, issues& problems about the environment. For similar issue MoE (1994) also stated that learning experiences (strategies of teaching and learning) are means for achieving environmental skill in which their primary emphasis are achieving both mental and social environmental objectives for the development of appropriate environmental problem solving skills and actions. Therefore learning experiences belonged to the domain education in or through the environment. Still according to Palmer (1998) education in the environment or EE skills can be developed by using the environment as educational resource in two ways; first as medium of enquiry and discovery (learning how to learn) and secondly as source of realistic materials and activities.

Operational definition of EE methods

In this study EE teaching-learning strategies were given operational definition according to the above literature. The methods suggested in the teachers guide were considered to be pertinent to EE if they were found appropriate for active learning, participatory learning or teaching as well as if they were issue based and action oriented in style. Corresponding to this for the attainment of the three themes of EE the suggested teaching learning strategies (methods) were mainly experiment, field trip, field work, group discussion, role play, debate and case study MoE (1994). The teaching methods that increase student passivity, non participatory in style and teacher centered were categorized as inappropriate to EE.

Therefore, the document analysis for EE methods was done according to the definition given above and the results were organized as depicted in Table 5

Table 5: Appropriateness of suggested teaching learning Methods in teachers' guides for EE instruction

Categories of suggested teaching – learning methods	Biology				chemistry				physics				Total	
	Grade 7		Grade 8		Grade 7		Grade 8		Grade 7		Grade 8			
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Total no. of methods developed in the guide	86	100	101	100	103	100	94	100	82	100	82	100	548	100
No. of methods appropriate to EE teaching – learning process	28	32	40	39.6	32	31.1	43	45.7	40	48.9	32	39.0	215	39.2
Experiment sub category	5	17.8	7	17.5	16	50.0	8	18.6	11	27.0	15	46.9	62	28.8
Field trip/work sub	6	24.4	5	12.5	0	0	0	0	0	0	1	3.1	14	6.5
Project work sub category	4	14.3	5	12.5	1	3.1	4	9.3	2	5.0	1	3.1	17	27.4
Debating sub category	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Group discussion sub category	4	14.3	11	27.0	15	46.9	31	72.1	25	62.5	15	46.9	80	37.2
Problem solving sub category	6	24.4	10	23.0	0	0	0	0	2	5.0	0	0	20	9.3
Role play sub category	1	3.6	0	0	0	0	0	0	0	0	0	0	1	0.004
Case study sub category	2	7.1	2	5.0	0	0	0	0	0	0	0	0	4	1.9

Suggested Teaching-Learning Strategies in Biology Teacher's Guides

In biology teachers' guides except debating method almost all other methods were addressed regardless of their unfair proportion. As can be seen from Table 5 from the total suggested teaching methods of biology, 32.6 percent of grade seven, 39.6 percent of grade eight and 36.4 percent of both grade levels were found to be appropriate for EE teaching-learning strategies. The distributions of the methods to each of the sub-categories were in the following proportions: 17.6 percent experiment, 19.1 percent field trip (field work), 13.2 percent project

work, 22.1 percent group discussion, and 23.3 percent were problem solving, and 1.5 percent role play and 5.9 percent case study.

Suggested Teaching-Learning Strategies in Biology Teacher's Guides

In chemistry teachers guides from the total suggested methods 38 percent of them were found appropriate for EE teaching learning process. However, these methods were not in the reasonable proportions because the suggested methods were: 32 percent experiments 6.6 percent project work and, 61.3 percent group discussion. That is, methods such as debating, role play, case study, field trip (work) and problem solving, which were very important for achieving main goal of EE (change in attitudes and value system) were totally ignored. So, suggested methods in chemistry teachers guides were not found to suggest all teaching – learning strategies pertinent for EE knowledge, skill and attitude development.

Suggested Teaching-Learning Strategies in Biology Teacher's Guides

With regard to methods of EE in physics teachers' guides from the total developed methods 43.9 percent were found appropriate to EE teaching and learning strategy. However, the distributions of the methods into the given categories were not fairly distributed. For instance the suggested methods were 36.1 percent experiment; 1.4 percent field work, 4.2 percent project work, 55.6 percent group work and 2.8 percent problem solving but debate, role play and case studies were totally ignored.

In sum with regard to methods developed in the three subjects' teachers' guides 39.2 percent of the suggested methods were found to be appropriate for EE teaching learning processes. However, from the suggested methods in the documents, more emphasis was given to group discussion and experiment methods than the other environmentally appropriate methods. Particularly, debating, role play and case study which were important methods for development of environmental value clarification (important for acquiring, value system about the environment) was totally ignored by almost all of target documents. Therefore, what can one infer from this content analysis is that the two important means of achieving the EE objectives, that is, contents and methods were not found sufficiently and proportionally planned and so the documents were not responsive enough to the eclectic integration of the three EE themes.

4.1.2 Environmental education evaluation strategies developed in Student text Books

Like any other educational evaluation, the evaluation of EE learning outcomes are processes of determining the extent of realization of EE objectives in/upon the learners' behavior patterns or personality traits. For the assessment and evaluation EE learning outcomes a combination of two or more methods (techniques) could be applied. For instance knowledge and understanding about the environment and its problems could be evaluated by using paper and pencil tests such as multiple choice, completion, matching and true or false type items (MoE, 1994). Therefore, low level cognitive EE objectives which were at the level of awareness and comprehension could be measured using these types of items.

However the same document, that is, MoE (1994) also suggested that, certain higher intellectual skills (higher level cognitive EE objective) and communication skill could be assessed by the use of essay type question and simulated situations such as role play. Furthermore EE affective domains (attitudinal change towards the environment) could be assessed using checklist of behaviors, rating scales and ranking scales (MoE 1998). In addition to the above mentioned measuring tools performance tests could also be applied to assess acquired environmental skills such as manipulative skills, operating skill etc. Thus, the performance test can be used for assessing environmental skills. Therefore, based on the above stated definitions of sub categories of EE measurement and evaluation strategies the items developed in students' text books of the target subjects were assessed and the results of the document analysis was organized as it is seen in Table 6 that follows.

Tabie 6: EE evaluation strategies developed in the Biology, Chemistry and Physics Text Books

Categories & sub-categories of items developed in the text	Biology				chemistry				physics				Total	
	Grade 7		Grade 8		Grade 7		Grade 8		Grade 7		Grade 8			
	N	%	N	%	N	52	N	%	N	%	N	%	N	%
Total no. of items developed	362	100	205	100	259	100	303	100	217	100	175	100	1521	100
No. of items that measure EE objectives	160	44.2	89	43.4	69	23.4	52	17.2	41	18.9	45	25.7	456	30
Items that measure EE knowledge	120	75	44	49.4	60	86.9	52	100	35	85.4	38	84.6	349	76.5
Items that measure EE skill	32	20	35	39.3	9	13.04	-	0	6	14.6	7	13.4	89	19.5
Items that measure EE attitude	8	5	10	11.2	-	0	-	0	0	0	0	0	18	4

Evaluation strategies developed in Biology text Books

As it is evident in Table 6 from the total items developed in biology texts, 44.2 percent of grade seven and 43.4 percent of grade eight were found pertinent to evaluate EE learning outcomes. However, from these items 75 percent of grade seven and 49.4 percent of grade eight were aimed to evaluate EE knowledge; and 20 percent of grade seven and 39.3 percent of grade eight were aimed to evaluate EE skill. Among the three subjects biology in both grade levels had tried to measure environmental attitude using rating scale. But the number of items that were developed to measure students' environmental attitude were proportionally low (5percent) compared to the skill and knowledge components.

Evaluation strategies developed in Chemistry and Physics text Books

As can be seen in Table 6 as compared with biology texts, both chemistry and physics text books in both grade levels incorporated relatively lower proportion EE measuring items. For instance from the total items developed in chemistry texts, only 23.4 percent of grade seven and 17.2 percent of grade eight were found appropriate to evaluate EE learning outcomes.

Similarly in physics text books 18.9 percent of grade seven and 25.7 percent of grade eight were found appropriate to evaluate EE learning outcomes. However, from these items developed in text books of the two subjects' the larger proportions (above 85 percent) of the items were found to evaluate EE knowledge. With regard EE skill evaluation only 13.04 %of grade seven chemistry items, 14.6% grade seven physics & 13.4 grade eight physics items were found appropriate to evaluate EE skill objectives. Nevertheless, almost all the items were merely measuring simple intellectual (mental) skills but social skills and problem solving skills were totally ignored. In contrast to biology, both chemistry and physics text books totally ignored evaluation of environmental attitude objectives.

Generally, as can be seen from Table 6 from the total items developed in the three subjects' text books only 30 percent of them were found to evaluate EE objectives. On the top of this, from the environmentally oriented developed items generally 76.5 percent of them were found to evaluate environmental knowledge and understanding objectives. In addition to that, from these items, only 19.5 percent of them were found to evaluate EE skills; however, social skills & problem solving skills were under emphasized than the mental skills. But in contrast to main goal of EE (MoE, 1994) from the total items developed in the texts, only 4.0 percent of them were found to evaluate EE attitude objectives. Thus, the main goal EE that is education for the environment was not sufficiently focused in the assessment & evaluation strategies during item selection and integration for curriculum revision.

Generally what was inferred from document analysis results was that EE integration in the documents was in different degree of added focus. So the integration lacks horizontal organization among the three sciences. Moreover the vertical organization of each subject's EE was poor. Besides to this, in all the documents the three core concepts of EE were not treated sufficiently and proportionally in the developed objectives, contents, methods evaluation techniques. Even if natural sciences are very close to EE and can incorporate EE themes in each topic or sub-topic, the new added focus given it was not as such responsive as expected from its related nature. Because only cognitive component was treated well in the documents while psychomotor and affective domains were given very little room. Especially if the attitudinal component was ignored or under emphasized in all the curriculum elements

such as objectives, contents, methods and evaluation strategies then it is hardly possible to say that the curriculum documents were responsive enough to the intentions of EE as stated in the policy documents such as ETP (1994) and EPA (1997). Though, there was a relatively good trial of incorporation of EE themes in biology curriculum documents when we totally looking the three subjects it is possible to say that the natural science curriculum documents are not adequately responded to EE as equal as the severity of the environmental problems. Thus, unless teachers fill the gap during curriculum implementation in schools what is planned in curriculum documents would not enable learners acquire the desired environmental awareness, attitudes and committed actions.

4.2 School practices & Implementation of Integrated EE

4.2.1 Teachers' Role during classroom instruction

According to MoE (1994) teachers can modify the existing units, topics and sub-topics in their lesson and unit plans. The modification may be three kinds: addition of environmental learning's about a given topic, EE attitude objectives or changing of the learning activities to student center and action oriented methods. That is, the intended EE outcomes can not be achieved without teacher's awareness and competency of integrating EE themes in their classroom instruction.

To this end, in addition to the document analysis, the researcher planned to undertake classroom observation for biology curriculum implementation process in two sample schools. From the urban rural categories one school was selected from each for classroom observation of biology instructional processes for consecutive 12 sessions in each school. For classroom instructional observation Alamata primary school from urban and Alembrhan primary school from rural were purposively selected and observed. Thus, the classroom instructional bb observation results were organized as depicted in Table 7 and 8.

Table: 7 Extents of appropriate environmental teaching strategies by teachers in urban and rural schools

Teaching learning strategies (methods) applied by teachers' instructional process for acquiring EE objectives.		Sample Schools				Total observation sessions
		Alamata		Alembrhan		
		no. of periods	percent	no. of periods	Percent	
1	Effective use and implementation of EE contents (facts, issues and problems) for cognitive development of students using teacher center methods.	10	84.2	11	91.4	12
2	Infusion of local specific environmental issues appropriate to immediate reality of learner environment.	0	-	0	0	0
3	Proper usage of available school resource pertinent for teaching EE learns (laboratory pedagogical center, science kit etc.	1	8.4	0	0	1
4	Use of local community issues ecology and human resource for teaching and learning purpose	0	0	1	8.4	1
5	Use and effective implementation of teaching strategies appropriate for EE as suggested in curriculum documents:- a) Outdoor methods (field trip, field work, etc.	0	0	0	0	0
	b) Affective educational methods (value-clarification methods) such as role play, debate, games group discussion.	1	8.4	0	0	1
	c) Problem solving, project work, case study	0	0	0	0	0
6	Evaluation of intended EE objectives in light of cognitive affective domains.	0	0	0	0	0

Teaching learning strategies applied by teachers

As the observation results revealed 91.6 percent of rural and 84percent of urban observed classes were found applying teacher centered methods. Only two session at urban and one session at rural were found applying methods appropriate for EE. For instance at urban Alamata the two environmentally appropriate methods applied were group discussion and field work. The group discussion was observed at grade eight biology sessions. The topic of group discussion was 'causes **of environmental pollution'**. The second EE appropriate method seen in urban school was the field work method. It was about **"estimation of**

population of living things" in grade seven biology. In this session, students were found working in group at the field around their school by using a quadrant sampling technique of estimating the population of living thing. Moreover, students were seen working in group.

However, in the rest of the observed sessions both in urban and rural schools the methods used were found to be teacher centered in their approach. In other words students were found passive receivers of information or idea given by their teachers in confined classrooms. Moreover, teachers were not seen applying teaching learning methods appropriate for EE as prescribed in the documents. Especially the value clarification methods, out door methods and even in door methods that were appropriate for EE teaching-learning processes were not adequately planned, used and practiced.

Even though the objectives of EE need eclectic integration of all the three domains observation results revealed that emphasis of the pedagogical approaches applied by teachers were pertinent only for achievement of cognitive domain. That is. Teachers were not seen integrating local specific environmental issues or problems to develop students positive attitude for the environment and/or they were not seen using the environment as medium of enquiry and discovery or source of real teaching aid Palmer (1998).

Therefore, EE skill and EE attitude components were totally ignored more badly in the classrooms instructional practices than in curriculum documents. Let alone teachers add EE objectives, contents & methods for modify the existing units, topics and sub topics in the curriculum documents they were even unable to apply what was already prescribed by the curriculum documents. Particularly value-clarification methods, out door methods and problem solving method were not seen applied by observed teachers. So, from this one can infer that EE objectives were not effectively achieved in the actual curriculum implementation processes in sample schools.

Teachers' awareness and competency for applying EE methods

In addition to the classroom observation interview responses of teachers revealed that not only the observed teacher but also all case teachers were not integrating EE themes in their

instruction process. Because they did not take any training how EE is integrated to classroom instruction and they also confessed that they lack awareness and competency. For instance all respondent teachers both in urban and rural schools responded that they did not know how EE was given to grades seven and eight students. In their responses they also added that they did not take training or orientation how the integrated EE in the newly revised curriculum was taught. The more surprising response that indicates their low level awareness of teachers was stated below. When the researcher asked one of the respondents to reply how environmental education was given in grades seven and eight he responded that:

EE is not given in grade seven and eight but it is given only at lower primary school (Haftanu , march 26/2009)l.

Therefore, from this response one can infer that let alone they apply more environmentally appropriate methods for realization EE objective even they did not know whether EE was integrated in their subjects or not . Moreover, all of them responded that they did not take any training and orientation about how EE could be integrated in their instructional planning & processes. For surprise even they didn't know which methods are appropriate for EE teaching learning process.

Reasons given for not applying the suggested methods

With regard to their usage of curriculum materials all of the interviewed teachers responded that they were strictly following students' text books and teachers' guides for their daily & unit lesson preparation. But, even though they responded that they were strictly following the texts and guides for their planning, on the other hand, they also admitted that they did not applying all the suggested methods in the curriculum documents. Therefore, their responses for similar issues were contradictory. But when they were asked to give rationale for the observed contradiction they gave many categories of reasons. Some of the reasons include that:

The developed methods were too many to implement at regular classes with the existing classroom settings; the periods allotted for the subjects were not adequate to apply all prescribed methods; Students had negative attitude to group discussion and group work methods; Schools had no appropriate internal facility to apply methods such as experimentation; high teaching period load of teacher and lack of awareness and training (kahsay, Gebreyesus; Belay; Eyasu March 26/2009).

In addition to this some of the respondents argued that if they were trying to apply all the methods developed in the documents they fear they would face lack of time for lecturing and giving notes for students &they justified that it would make them unable to cover the given contents. Therefore, as can be inferred from their responses their traditional view of teaching stressed and directed them to apply teacher center methods than the more environmentally oriented student centered methods. They consider that using more student centered methods is like killing (wasting) teaching time. Thus, their view of students' learning had influenced their practices.

However, the school facilities, high teaching load and lack of training were factors that also influence their practices. On the other hand as respondent teachers revealed the most frequently used evaluation technique was found to be paper and pencil test to measure EE knowledge outcomes but rating scale and practical skill or performance tests were not totally practiced.

Therefore, both from the responses of the interview and classroom observation results and discussions one can infer that the three themes of EE (cognitive, psychomotor and affective domains) were not sufficiently and proportionally implemented in classroom instructions and whole school practices. The teachers' primary focus, both in their lesson plan and instruction processes, was confined to teaching for mastery of facts and concepts about the environment and its allied problems. But educations in/from environment(EE skill) and for the environment(EE attitude) were not found incorporated neither in the actual teaching learning processes nor in their lesson planning of the observed teachers in case schools.

4.2.2 Appropriateness of School Physical Environment and Facilities For EE teaching learning Process

4.2.2.1 Appropriateness of School Facilities for Implementation of Integrated EE

Generally, as it was evident from the interview responses and from researcher's subjective observations the school environments and facilities were hardly appropriate for effective implementation of natural science curriculum in general and integrated EE in particular. For instance even if the curriculum documents prescribed, the laboratory activities, however, the

school facilities were not appropriate for implementation of prescribed laboratory works. The subjective whole school environment observation done by the researcher also helped him to verify that the schools lack appropriate laboratory equipments, chemicals, laboratory rooms, pedagogical rooms. Even, adequate classrooms teaching learning were not found sufficient and to the standard because the student class ratio for observed schools was on average above 1:65.

Though there were science kits in all schools the interview responses and observation results revealed that equipments and chemicals in the kit were not to the standard, adequate, appropriate and relevant for EE teaching learning process of the upper primary sciences in general and EE in particular. According to responses of interviewed teachers, in a year only very few science laboratory were usually demonstrated by teachers by using the science kits and /or by borrowing equipments and chemicals from nearby high schools. As per teachers' responses and the researchers' inference through his observation the schools were not found to fulfill the facilities that the curriculum documents required or prescribed.

For instance for the question whether he applies all suggested methods in the curriculum documents or not one of the respondent replied:

In grade eight physics the documents prescribed electricity and electronics equipments, simple machine and generators to be demonstrated in laboratory or in local area resource but in the rural area these kinds of materials are hardly available. So, the revised version of grade eight physics is not appropriate to rural school environment (Assefa kalayu, March 26/2009).

Thus, from the above response the prescribed materials and equipments were not available neither in the schools nor the local environmental teaching learning resources. These materials were prescribed simply to make the curriculum contents to the standard without critically looking the real and immediate environment of learners. As a result of these inadequate school facilities some teachers were responded that they were forced to apply more traditional teaching methods than activity oriented teaching methods. In addition to this, rural teachers were also unable to use community resources methods such as field trip for teaching learning

process because the real environment didn't have the required teaching resources. These kind of problems were also seen in both chemistry and biology curriculum implementation processes. Therefore, in addition to the low awareness and competency level of teacher the schools' internal facilities were found to be among the major contributors of the implementation of natural science curriculums in general and integrated EE in particular.

4.2.2.2 Students' participation and responsibility for caring and protecting the school environment

Students' environmental behavioral practices for school waste management

As it was explained in the methodology part the research the whole school environment was observed to make subjective evaluation about students' environmental behavioral practical changes as a result of their science learning outcomes. Hence, the targets of observation were waste management, availability of garbage and usage; cleanness of the school compound, classrooms and latrines; and availability of school plants and students participation in caring them. As this subjective observation verifies school compounds, latrines and classrooms were not as such clean and neat. With regard to availability and usage of garbage area school wastes, except Alamata primary school (in urban) the rest schools hadn't any garbage area. School dirty materials such as torn papers and other dirty substances were seen thrown here and there in the schools' compound. Thus, from this observation results one can infer that students were not found acquired the desired behavioral patterns of changes in light of environmental awareness more especially with regard to waste management and disposal. Moreover, the students didn't seem understand their role and responsibility for school waste management. Above all, they didn't seem aware that cleaning their school environment was their responsibility, because they were simply seen acting as if they were waiting for some one to come and clean their school environment. Thus, their learning science did not change their environmental behavioral practices nor make them understand their roles and responsibilities for their negative or positive actions in the environment.

Students' participation in caring and protecting the schools' natural environment

With regard to caring & protecting the natural environment especially in relation with caring of school plants except one school in urban the rest schools hadn't vegetation area cared by willingful actions of students. However, in urban schools Alamata primary school students were seen planting and caring trees in their school compound through the club called nature club. Club member students were given one tree to each so as to care and manage it responsibly. In contrast to the above mentioned students activities, in other observed schools similar activities were not seen by students. Even, seedlings which were planted for the millennium were not observed grown because they were not cared by students. On the other hand school garden was not used for teaching and learning purposes in all of the observed schools. In simple terms students were not taught problem solving capacity for their life. Therefore the teaching learning processes in classrooms were not found related with students' life conditions and with solving environmental problems. Instead the instructional processes were found stressing on mastery of facts and concepts about the environment and allied problems.

In summary, from the above discussion of the qualitative data it is possible to infer that the EE is not integrated well in the actual classroom instructions. The EE objectives, units and methods in the curriculum documents are merely guide line to all schools. Teachers had responsibility to modify each topics objective or content method to local specific environment and allied problems (MoE, 1995). But in reality let alone teachers modify the already developed objectives, methods, contents evaluation strategies they even unable to properly implement what was planned by the documents. Thus teachers' role during curriculum implementation couldn't fill the gap created in the curriculum documents analysis. Because, teachers were not able to incorporate EE themes effectively as intended for that they lack awareness and competency about how EE is incorporated and taught. On the top this school facilities were not to the standard to implement EE. Finally students were not found changed behaviorally especially with regard to development of skill in the environment and concern for the environment

4.3 Students' Environmental Learning Outcomes in Relation to knowledge, Attitude and Behavioral Practices

In this section, the data collected by criteria referenced test, attitude scale and behavioral practice scale were presented and analyzed sequentially. In this case the dependent variables students' environmental learning outcomes such as environmental knowledge, attitudes, and behavioral practices were measured by the above mentioned research tools.

Therefore, the criteria referenced test, attitude scale and behavioral action (scale) were supposed to measure environmental knowledge (awareness) attitude and behavioral actions respectively. In addition to this factors that influence students' environmental learning outcomes such as students' personal characteristics such as sex, &age; and other variables such as parent literacy level, school locations and club membership were also considered as independent variables (informal sources of EE that might influence the measured results). Hence their effect on students measured environmental knowledge, attitudes and behavioral practices were analyzed along with students' achievement levels. Therefore, the data collected on both the dependent and independent variables were analyzed and interpreted using both descriptive and inferential statistics simultaneously. The data were Computed by the help SPSS version 15.0:

4.3.1 Students' Environmental Knowledge

Environmental knowledge and understanding refers to education about the environment which belongs to the acquiring and understanding of, facts, concepts, issues and problems environmental. It is one of the three themes (dimensions) of EE. Environmental knowledge is considered to be prerequisite factor for environmental skill and attitude changes (Palmer, 1998);MoE(1994). Thus, Environmental knowledge and understanding enables students to make informed decisions and judgments in issues, problems and actions related to the environment and its allied problems.

Therefore, as mentioned in the methodology part, a criteria referenced test was used as a data collecting tool for measuring students environmental knowledge and understanding. The items of the test were validated by experts and teachers of upper primary schools. Moreover the mastery level of the test was standardized (judged) to be 75percent by teachers consulted

during the pilot test study. Therefore according to standardize this mastery level (75percent) together with MoE satisfactory level passing grade for achievement test results(50 percent) achievement tests results of students were computed in score intervals by converting each students score into hundred as depicted in the Table 9 that follows:

Table 9: EE Achievement test score intervals at 75 percent mastery level set by teachers and 50 percent satisfactory level set by ETP (1994).

Score interval in percent	In location						In Sex					
	Urban		Rural		Total		Male		Female		Total	
	Freq.	%	Freq.	%	Freq	%	Freq	%	Freq	%	Freq	%
<50	58	48.3	75	62.5	133	55.42	67	55.8	66	55.07	133	55.4
50	2	1.7	7	5.8	9	3.8	5	4.2	4	3.3	9	3.8
51-64	40	33.3	32	26.7	72	30.0	33	27.5	39	32.5	72	30.0
65-74	14	11.7	5	4.2	19	7.9	11	9.2	8	6.7	19	7.9
>75	6	5	1	0.3	7	2.9	4	3.3	3	2.5	7	2.9
Total students	120	100	120	100	240	100	120	100	120		240	100

Overall students' achievement levels on EE criteria referenced test by achievement levels in intervals

As Table 9 depicts from total students who took the test half (55.4percent) scored below satisfactory passing grade set by ETP (1994), that is, 50 percent. This implies that let alone students mastered environmental knowledge developed in the curriculum documents, the majority of them were not able to achieve the passing satisfactory level achievement average mark set by the Ethiopian Education and Training policy . In other words, from total students who took the test only 44.6percent were achieved above satisfactory level (50percent). Regarding the students who achieved the mastery level set by their teachers were only 2.9percent of the total students. As Table 10 shows a total of 240 students took the test and their total mean score was 47.48 with a standard deviation of 14.04. In this, case the overall performance of students did not meet the national minimum passing grade (50percent) of the achievement test stated by ETP (1994) policy document.

Though, much emphasis was given to EE knowledge component both in the curriculum documents and implementation process the measured students' knowledge was found to be in

the reverse direction of the actual detected fact. Since students did not get basic understanding of environmental issue with their context in their classroom teaching learning process, their result appears to be low. Let alone students develop appropriate EE skill and attitudes they were unable to master the already emphasized EE knowledge. As students were active participant in the teaching learning process and discovers of the EE knowledge much of the information send to them was not retained. Thus, for students' lower level achievement among others the formal education (curriculum& instruction) would be responsible.

Disparity of students Environmental Awareness level in Urban –Rural categories

When the students' achievements intervals were seen in residence location of students, 48.3 percent urban and 62.7percent of rural school students' achievement were below satisfactory level set by MoE (50percent). With regard to mastery level set by teachers only 5percent of urban and 0.3 percent of rural students were found achieving that level. In summary, despite the fact that the scores were low in both cases, generally urban school students achieved better than rural counterparts (see table10).

Table 10: Mean, Standard Deviation, and t-value of Students achievement Test Score by Location of Residence

Variable	Students residential location	N	Mean	Std. Deviation	Independent t-test for equality of mean				M.D
					Std. error mean	T	Df	Sig	
Achievement test score	Urban	120	51.23	14.13	1.29	4.29	238	.000	7.517
	Rural	120	43.72	12.95	1.18				
	Total	240	47.47	14.04					

**** Significant at 0.05 level (P < 0.05)**

As it is evident from Table 10 achievements mean score of urban school students were higher compared to mean achievement score of rural school students. That is the mean achievement score of urban school students was 51.23 with a standard deviation of 14.13 while the corresponding figures for rural school students were 43.72 with SD of 12.95 (see Table10). In order to compare the significance of the mean achievement difference between independents

samples of urban and rural student's t-test was computed. As the analysis in Table 10 shows the mean difference between urban and rural students achievement score was statistically significant, t (238) = 4.29, P < 0.05. Thus, it is evident that urban school students perform better than rural students by a mean difference of 7.52.

Disparity of students' Environmental Awareness by sex categories

Similarly to urban rural categories, when students' achievement scores were seen by categories of sex 55.8 percent of boys and 55 percent of girls achieved below 50 percent. With regard to achievement of the mastery level set by teachers' only scores of 3.3 percent of boys and 2.5 percent of girls were above 75 percent. When mean score achievement value of the two sex categories compared, though the mean difference was not statistically significant, scores of girls were slightly greater than their male counter parts.

Table 11: Mean, SD, and t-value of Students' achievement Test Score by Sex.

Variable	Sex	N	Mean	Std. deviation	Std. error of mean	Independent t- test for equality of the means			
						t-value	Df	Sig.	M.D
Achievement test score	boys	120	47.41	14.89	1.36	-0.082	238	0.93	-0.150
	girls	120	47.56	13.23	1.21				

****Not significant at 0.05 (*P > 0.05)**

As it can be seen from Table 11 the mean achievement score of girls were 47.56 with a standard deviation of 13.23, while their counter parts (boys) mean achievement score was 47.41 with standard deviation of 14.89. As the same Table (11) depicts the mean difference between boys and girls were not statistically significant because t (238) = -0.082 p > 0.05.

Disparity of students' Environmental Awareness by school type categories

Since the formal curriculum implementation processes & the other informal EE activities such as activities in club are supposed to vary and tend to influence environmental knowledge differently the students achievement levels were analyzed by school type.

Table 12 Mean, Standard Deviation of Students' achievement Test Score by Schools.

School	Location	N	Mean	S.D	Std. error mean
Alamata primary school	U	60	51.57	13.92	1.79
Kokeb Tsibah Primary School	U	60	50.90	14.46	1.87
Alembrhan Primary School	R	60	42.80	11.62	1.50
Waja Primary School	R	60	44.63	14.20	1.83
Total	U + R	240	47.48	14.04	0.906

As it is evident in Table (12) two of urban schools have a mean score above 50 percent in which Alamata primary school (51.57) performed better than Kokob Tshibah's mean performance (50.90). Contrary to urban schools, both of the rural school students mean scores were below 50 percent. When the two rural schools compared regardless of their low mean scores Waja primary school students performed better than Alembrhan's.

Table 13: One Way Analysis of Variance (ANOVA) on students' achievement Test Scores by Schools.

Source of variation	Sum of squared	Degradation freedom	Mean square	F ratio	Sig.
Between groups	3504.183	3	1168.061	6.321	.000
With in the group	43607.667	236	184.776		
Total	47111.850	239			

*** Significant at 0.05 (P < 0.05)**

The one way ANOVA result Table (13)showed that there was a statistically significant mean difference among students of the four schools achievement test scores of EE for that($F = 6.321$, $p < 0.05$). Therefore, there is a significant mean difference among the four schools. Therefore, although urban students mean score performance didn't reach the mastery level and it was at marginal satisfactory level, and it was generally better than their rural counter parts. This finding is the reverse of the findings of Aklilu (2001) and Damtew (2007) at secondary school students achievement level because according their finding urban students were lower achievers that their rural counterparts.

Disparity of students' Environmental Awareness by parent literacy level categories

Since the students' environments awareness level can also be affected by the home backgrounds then their parent literacy level was taken as a variable to see its effect on their environmental awareness level as one of the informal EE knowledge sources.

Table 14: Descriptive Statistics of Students Test Score by Parent Literacy Level

Parent literacy level	N	Mean	SD	SE
Illiterate	105	45.59	14.611	1.426
Literate up to primary school	90	46.99	12.925	2.076
Literate up to secondary school and above	150	52.84	13.925	0.906
Total	240	47.48	14.040	0.894

Table 15: One way Analysis of Variance (ANOVA) of Students Achievement Score by Parent Literacy Level

Source of Variation	Sum of the Squares	Degree of Freedom	Mean Square	F ration	Sig.
Between groups	1691.560	2	845.780	4.413*	0.013
With in the group	45420.290	237	191.647		
Total	47111.850	239			

*** Significant at 0.05 (P < 0.05)**

As Table 15 shows, students achievement test mean score values were different as one looks their achievement level on EE criteria referenced test by parent literacy level of the students. Moreover, the mean differences of the scores were found increasing as their parent literacy level was increasing. To determine the significance of the difference of the students score by their parent literacy level, one way analysis of variance (ANOVA) was computed to check the statistically significance difference in the mean score for achievement test.

Thus as Table 15 shows, students mean score achievement of the test by parents' literacy level was found statistically significant ($F = 4.413$, $P < 0.05$). Thus students from illiterate parent background thus achieved least as compared with those students from literate background. In particular, students whose parent literacy background were secondary school or above were relatively scored the highest mean value (52.84), where as students with primary literate parent's background were in between the two extremes. Thus, this implies

that home environment, especially parents (father & mother) literacy level, has much to do with students' environmental awareness and understanding.

Disparity of students' Environmental Awareness by age categories

On the other hand, since any form knowledge can be influenced by age level variation of students achievement level on the EE criteria reference test was analyzed separately for three age groups of students. The exact age level for grade eight students is 14 the ages below and above this age were categorized and analyzed separately to see the influence on students' environmental awareness level.

Table 16: Descriptive Statistics of Students Achievement Test Score by Age

Categories of students by age	N	Mean	S.D	SE
Below 14 years	52	47.38	15.291	2.120
Age of 14 years	87	49.22	12.349	1.324
Above 14 years	101	46.02	14.695	1.426
Total	240	47.48	14.040	0.906

Table 17 One way: ANOVA of Students Achievement Test Score by Age

Source of variation	Sum of squares	Degree of freedom	Mean square	F-ratio	Sig.
Between groups	478.731	2	239.366	1.217*	0.298
With in groups	46633.119	237	196.764		
Total	47111.850	239			

* **Not significant at 0.05 (P > 0.05)**

As the descriptive statistics in Table (17) shows there was a very slight mean score difference among the three age groups of students. Following to the observed mean score difference of students' achievement by age group one way analysis of variance (ANOVA) was computed to test the statistical significance of the difference of mean scores. Thus, as it is evident in Table (17) the mean score difference of students achievement test was not statistically significant, for that ($F = 1.217$, $P > 0.05$). Therefore, the difference in mean score achievement of students might be accounted for the sampling error.

4.3.2 Students' Attitudes Towards the Environment

Environmental attitude is one of the three themes (dimensions) of EE that belongs to the affective domain of EE objectives. According to MoE (1994) & UNESCO (1991) this dimension of EE is considered to be the major and ultimate goal of EE curriculum and instruction. That is, attitude governs behavior and actions towards environmental issues and problems. Environmental attitude belongs to the third theme of EE that is education for the environment. It mainly focuses on value formation for the environment. With regard to environmental values, different individuals and groups have different justifications for their value system. For instance, some value their environment as a source of goods and services still others value it economically, aesthetically, ecologically and morally (Botkin et al, 1998). Thus, the value people place to their environment determine their attitudes and change in value and belief system is the ultimate goal of EE. Therefore, to test students' attitude towards their environment, three different attitude scales were developed namely attitude towards utilizing, protecting and appreciating the environment.

4.3.2.1 Students' Attitude Towards Utilizing the Environment

Utilitarian justification for protecting the environment was usually made based on the economical value and use of the environment resources (Botkin & Keller, 1998). That is the value of forest is simply to the value of wood, timber, paper, production. According to this view the environment was supposed to serve only human. In this line of thought human needs and interests are prior to the other abiotic and biotic components of the environment (Ibid). Therefore, according to followers this thought human beings have the right to abuse nature in order to satisfy their needs and interests. On the top this, they did not believe that man has a responsibility to live in harmony with nature, that is, with a rule of nature that is give and take (Bannett, 2004). According these authors higher tendency to utilize environment without taking adequate concern about the nonhuman elements of the environment (other living things &none living things) is the main cause of environmental crisis.

Table 18: Urban and Rural Students attitudes towards utilizing the environment

Item	Urban (n = 120)						Rural Student (n = 120)					
	Frequency						Frequency					
	5	4	3	2	1	Mean	5	4	3	2	1	Mean
U1	57	27	13	11	11	3.9	73	33	6	5	3	4.43
U2	40	39	11	16	14	3.96	69	33	5	9	4	4.30
U3	62	42	4	4	8	4.73	64	43	5	4	1	4.30
U4	86	19	3	5	7	4.73	74	23	11	4	8	4.26
U5	57	30	3	19	11	3.9	54	18	17	14	17	3.65
U6	29	34	10	18	29	3.13	62	37	9	8	10	4.25
U7	35	11	10	19	15	3.52	50	36	20	5	9	3.91
U8	40	33	8	11	28	3.38	49	27	16	10	18	3.66
U9	40	27	17	15	21	3.42	59	34	10	6	11	4.03
UT						30.09						32.32
	Average mean					3.73	Average mean					3.92
	S.D					4.64	S.D					4.29
t-value – 3.86 df = 238 mean difference = -2.23												

See appendix(C&D) for items U1 –U9

N.B. The mean scores average mean scores computed from the data analysis were interpreted as: - > 3.5 = favorable attitude of utilizing the environment, 2.5 – 3.5 = moderate favorable attitude of utilizing the environment and < 2.5 = unfavorable attitude of utilizing the environment

Overall attitude of students towards utilizing the environment

As depicted in Table (18) most of the students were found having high attitude towards utilizing their environment. From a total of students who took this attitude test almost all of them showed favorable attitude towards utilizing their environment, because the total means attitude value of the students was found to be 3.73 with standard deviation of 4.64 for urban and 3.92 with standard deviation of 4.29 for rural. Thus, from this result one can infer that students in the sample schools had a tendency of utilizing their environment. Thus, students' high utilitarian view value can be accounted for their low level awareness and comprehension environmental issues.

Disparity of students' attitude towards utilizing the environment by Urban –Rural categories

As can be seen from Table (18) both urban and rural students were found having favorable attitude towards utilizing the environment. To compare the difference in students' view of utilizing the environment between urban and rural categories a t-test was computed. Thus, as

can be seen from Table 18 the difference in mean score was not statistically significant, for that, t (238) = -3.86, p > 0.05.

Disparity of students' attitude towards utilizing the environment by sex categories

Like knowledge, attitude could also be affected by gender influences. Because due our socio-cultural influences male and female have no the same experiences with regard to the environment. For change in attitude experience plays role Pakarash(2007). Thus, their difference in attitude was analyzed accordingly.

Table 19: Attitude Differences of students toward utilizing the environment by sex.

Sex	N	Mean	S.D	t	M.D
Boy	120	31.0	4.52	-0.688	-0.468
Girls	120	31.41	4.65		

* Not significant at o.o5 * P> 0.05

As Table 19 shows, the obtained result confirms that boys and girls were not significantly differing among themselves with regard to their utilitarian views of the environment. Though the obtained mean score of girls tend to be higher than boys it is not significant to say that girls had more utilization view than boys. The difference observed between them might be accounted for sampling error.

Disparity of students' attitude towards utilizing the environment by school type categories

With regard to the utilitarian view of the environment, one way ANOVA was employed to see the significant difference of mean score attitude of utilizing the environment among students the four sample schools.

Table 20: One way analysis of variance of students' attitude towards utilizing of the environment by school

Source of difference	df	S.S	MSS	F
Between the group	3	244.88	81.63	3.89
With in the group	236	4950.97	20.98	
Total	239	5195.85		

Significant * P< 0.05

Table 21: Mean value of students attitude towards utilizing the Environment by School

Name of the school	Location	N	Mean	Average mean value	S.D.
Alamata complete primary school	U	60	32.62	3.62	4.78
KokobTsibah complete primary school	U	60	32.97	3.64	4.37
Alembrhan complete primary school	R	60	35.02	3.84	3.70
Waja complete primary school	R	60	32.62	3.66	4.50
Total		240	33.00	3.83	4.59

NB. The average mean value scores computed from the data analysis were interpreted as: .3.5 favorable attitudes; 2.5-3.5= moderately favorable attitudes and < 2.5= unfavorable attitudes.

As Table 21 shows one way ANOVA result indicates that there was a significant difference mean value of students' attitudes towards utilizing their environment by school. As Table 21 shows generally two of rural schools were found having greater mean value than the urban schools. The rural school students Alembrhan primary school with average mean value of 3.89 and standard deviation 3.7 was found the highest in its utilitarian view towards the environment and KokebTsibah from urban was found least. Whereas students in the rest of the schools were found having almost similar utilitarian mean values. In general students in all schools were found having similar and positive utilitarian view of the environment. The implication of this result might be interpreted as that the poverty level and the need of economical growth might have pushed them to have that kind of attitude.

4.3.2.2 Students' Attitude Towards Protecting and Preserving the Environment

According to Botkin and Keller (1998) the justifications for protecting and preserving the environment also include ecological and moral views in addition to the utilitarian and aesthetic views. According to these authors ecological justifications for protecting the environment is not based on the direct economical benefit of human but based on the role and functions of the environmental resources in the ecosystem. For example plants should be protected & conserved because they take carbon dioxide from animals and give oxygen to them in turn. On the other hand, moral justification for protecting the environment relies on the belief that resources should always conserved in regardless of their economic value to

human beings. That is human beings have no moral right to modify & change natural environment for the sake of satisfying his unlimited needs and they need to live in harmony with nature. According to Palmer (1998) this kind of view is the result of deep understanding of the environment, developing of positive attitude and creation of concern for the environment.

Table 22: Urban and Rural Students' Attitudes towards Protecting and preserving the environment

Urban (n = 120)							Rural Students (n = 120)					
Item	Frequency						Frequency					
	5	4	3	2	1	Mean	5	4	3	2	1	Mean
P1	15	15	14	43	33	2.47	13	8	12	28	59	2.00
P2	14	22	11	31	42	2.46	14	12	8	35	51	2.07
P3	6	10	8	56	41	2.03	8	3	21	53	35	2.19
P4	6	3	8	48	50	2.93	5	21	24	35	35	2.13
P5	24	17	14	40	25	2.79	16	20	14	44	26	2.38
P6	12	20	6	38	44	2.32	24	22	14	44	26	2.63
P7	17	7	25	36	35	2.46	19	18	13	44	27	2.38
P8	32	12	3	27	46	2.64	16	20	14	44	26	2.38
P9	14	15	7	28	55	2.20	19	17	18	35	31	2.38
PT	Sum of the mean					25.75	Sum of the mean					26.40
	Average mean					2.36	Average mean					2.35
	S.D					4.64	S.D					4.29
	t = -0.83			mean difference -0.65					df=238			

1 P > 0.05

See appendix (C&D) for items P1 –P9

NB. The average mean value scores computed from the data analysis were interpreted as: .3.5 favorable attitudes of protecting the environment; 2.5-3.5= moderately favorable attitudes of protecting the environment and < 2.5= unfavorable attitudes of protecting the environment.

Disparity of students' attitude towards protecting and preserving the environment by Urban –Rural categories

As can be seen from Table 22 unlike the former utilitarian view, students both in urban and rural schools were found having unfavorable attitude towards protecting and preserving their environment. The average mean value of urban students was 2.36 while their counter part rural students were 2.35. Nevertheless, the average mean attitude values of protecting the environment in both urban and rural students were found lower than 2.5. Therefore, unlike

their attitude towards utilizing their environment their attitude to protect the environment found to be negative. This is not surprising because negative out look for the environment is expected from a person who have low level of awareness of his/her environment and highest utilitarian view of his/her environment.

With regard to significance of the difference between total mean of students' attitude towards protecting and conserving their environment, t-test by school location was computed. However, since t (238) = -0.83, p > 0.05 the mean attitude of students was not statistically significant, thus, the difference between students might be accounted for sampling error.

Disparity of students' attitude towards protecting and preserving the environment by sex categories

Table 23: Attitude Difference of Students towards Protecting and preserving their environment by sex

Sex	N	Mean	S.D	t	M.D	df
Boys	120	25.93	5.46	-0.407	-0.300	238
Girls	120	26.23	5.96			

Not significant at o.o5 * P > 0.05

As can be seen from Table 22 the mean difference of boys and girls was not statically significant for t (238) = -0.407, P > 0.05.

Disparity of students' attitude towards protecting and preserving the environment by School type categories

In order to see the attitude difference of students towards protecting their environment in terms of schools one way ANOVA was used. As it is evident in the Table (23) that follows the difference was not statistically significant because F (239) = 0.49, p > 0.05.

Table 24: One way ANOVA of Students Attitude towards Protecting & Preserving their Environment

Source of difference	df	SS	MSS	F
Between groups	3	47.78	15.93	0.49
with in the group	236	7722.87	32.72	
Total	239	7770.65		

Not significant * P > 0.05

Table 25: Attitude of Students towards Protecting and Preserving the Environment by School

Name of the school	Location	N	Mean	S.D	Average mean value
Alamata complete primary school	U	60	23.53	5.78	2.60
KokobTsibah complete primary school	U	60	22.77	6.14	2.53
Alembrhan complete primary school	R	60	20.20	5.19	2.24
Waja complete primary school	R	60	20.60	5.72	2.28
Total			26.08	5.70	2.55

As it is evident in Table 25 the average mean attitude difference in students was not statically significant. Thus, the observed difference might be accounted for sampling error. Nevertheless, the two urban schools' students were found having a marginal moderate favorable attitude towards protecting and conserving the environment while the two rural school students were having unfavorable attitude for the same issue.

4.3.2.3 Students' Attitude Towards Appreciating the Environment

Aesthetic justification for protecting the environment relies on keeping the natural environment in order to give and preserve the beauty of nature. It also includes keeping the historical and cultural heritages Botkin and Keller (1998).

Table 26: Urban and Rural Students Attitudes towards Aesthetic and View to the environment (appreciation of the environment)

Urban (n = 120)							Rural Student (n = 120)					
Item	Frequency						Frequency					
	5	4	3	2	1	Mean	5	4	3	2	1	Mean
AE1	72	20	76	6	15	4.07	49	16	16	17	22	3.44
AE2	29	18	18	25	30	2.93	25	15	17	25	38	2.70
AE3	17	12	10	24	57	2.20	27	16	16	22	39	2.75
AE4	32	23	13	25	27	3.07	32	19	21	31	17	3.15
AE5	14	10	10	33	53	2.16	26	17	12	26	39	2.71
AE6	16	14	6	22	62	2.17	16	17	22	28	37	2.56
AE7	38	19	8	29	26	3.12	30	18	15	22	37	2.88
AE8	69	19	6	12	14	3.98	30	17	14	33	26	2.93
AE9	40	27	17	15	21	2.10	39	34	30	6	11	1.94
AET	Sum of the means 27.13					3.01	26.83					2.98
	Urban students average mean					3.01	Rural students average mean					2.98
	Urban students S.D					4.75	Rural students S.D					4.58
t = value (0.498 * mean difference = 0.30												

Not significant * P > 0.05

See appendix(C&D) for items AE1 –AE9

NB. The average mean value scores computed from the data analysis were interpreted as: .3.5 favorable attitudes of Appreciating the environment; 2.5-3.5= moderately favorable attitudes of the environ Appreciating ment and < 2.5= unfavorable attitudes of Appreciating the environment.

Disparity of students' attitude towards appreciating the environment by urban rural categories

As Table 26 shows the attitude of students towards Aesthetic view of the environment was found to be at the moderate level. That is, urban students average mean value was 3.01 with standard deviation of 4.75 while their counter parts rural students was with average mean value of 2.98 and with a standard deviation of 4.58. Similar to former cases, t – test was computed to see the statistical significance of the difference of aesthetic view of students by school location. As it is evident in Table 26, the mean attitude difference was not significant because $t(238) = 0.49$, $p > 0.05$.

Disparity of students' attitude towards appreciating the environment by sex categories

Table 27: Boys and Girls Attitude towards their Appreciating Environment.

Sex	N	Mean	S.D	t	M.D	df
Boys	120	26.78	4.61	-0.664	-0.336	238
Girls	120	27.18	4.72			

*** P > 0.05**

As Table 27 depicts, the difference in attitudes between boys and girls was not statistically significant because t (238) = -0.66, P > 0.05. In order to see the aesthetic mean attitude value difference of students by schools, one way ANOVA was computed. As it is evident in the Table (25) that follows the difference was found statistically significant.

Disparity of students' attitude towards appreciating the environment by school type categories

Table 28: Students Attitude towards Aesthetic of the Environment by School

Name of school	Location	N	Mean	S.D	Average mean value
Alamata complete primary school	U	60	28.4	4.76	3.2
KokobTsibah complete primary school	U	60	25.85	4.42	2.87
Alembrehan complete primary school	R	60	27.43	4.68	3.05
Waja complete primary school	R	60	26.22	4.45	2.91
			26.98	4.66	2.99

As Table 28 shows the mean difference in attitude of students towards aesthetic view of the environment among the four schools was found statistically significant. In spite of their difference in mean attitude value by school yet the students' average mean attitude of students towards aesthetic view was found moderate according to this research's data interpretation procedure.

Table 29: Students attitude difference towards the Aesthetic view of the environment by school

Source of difference	df	SS	MSS	F
Between the group	3	244.88	81.63	3.89
With in the group	236	4950.97	20.98	
Total	239	5195.85		

* P < 0.05

As it can be seen from Table 29 the attitude difference of students regarding aesthetic view of the environment was statistically significant. That is F (239) = 3.89, P < 0.05.

4.3.3 Students Environmental Behavioral Practices and Actions to solve environmental problems

Table 30: Urban and Rural Students Environmental Behavioral Practices and Actions to solve environmental problems

Urban students (n – 120)							Rural students (n – 120)					
Item	Frequency						Frequency					
	5	4	3	2	1	Mean	5	4	3	2	1	Mean
BP1	0	1	38	41	40	2.00	0	2	34	36	48	1.92
BP2	0	2	20	49	49	1.79	0	0	25	40	55	1.75
BP3	0	0	35	58	27	2.07	0	1	52	38	29	2.22
BP4	0	1	27	56	36	1.94	0	0	28	58	34	1.95
BP5	0	0	37	48	335	2.02	1	3	44	41	31	2.18
BP6	0	2	19	57	42	1.84	0	0	22	45	53	1.74
BP7	0	0	41	60	49	2.18	0	0	52	35	35	2.14
BP8	0	0	32	65	22	2.09	1	1	22	68	28	1.99
BP9	0	1	50	50	19	2.28	0	1	42	51	25	2.17
BPT	Sum of the means					18.13	Sum of the means					18.03
	Urban students Average mean					2.01	Rural students Average mean					2.00
	Urban students S.D					2.67	Rural students S.D					3.00
t – value 0.514 mean difference = 0.2												

Not significant P >O.O5

N.B: The mean scores computed from the data analysis were interpreted as: > 3.5 highly practiced environmental friendly behaviors (action); 2.5 – 3.5 moderately practiced environmental tiredly behaviors (actions) and < 2.5 poorly practiced environment friendly behaviors (Actions).

Disparity of students' behavioral practices by urban rural categories

As Table (30), shows the average mean value of environmental friendly behavior (actions) both in urban and rural schools students were found in the range poorly practiced. Because as can be seen from the same Table (30) the average mean value of urban students was 2.01 with standard deviation 2.67while their counter part rural students' average mean value was 2.o with standard deviation 3.30.

Disparity of students' behavioral practices by sex categories

In addition to this, the average mean difference of urban and rural students was found and it was statistically insignificant because the t (238), p> 0.05. Similar to the residence of students' average mean difference in sex was also tested. Once again the average mean difference between boys and girls was found significant because as Table (30) shows t (238) = -0.87, P > 0.05.

Table 31 : t- test for Mean Differences of Environmental friendly Behavioral Practices by Sex.

	N	Mean	S.D	t -0.866	Mean difference
Boys	120	17.96	3.02		0.06
Girls	120	18.29	2.96		

* P > 0.05

Disparity of students' behavioral practices by school type categories

As can be seen from the Table that follows Table (31) there are differences observed in average mean value of behavioral practices of students by school. Even though low average students in all the schools had a low average mean value that was computed as poorly practiced environmental friendly behavior (action), a mean difference was seen among the schools. In order to determine the statistical difference of mean behavioral scores one by school way analysis of variance was employed.

Table: 32Average Mean values of Environmental Behavioral Practices by School

Name of school	Location	N	Mean	S.D
Alamata complete primary school	U	60	2.11	2.98
KokobTsibah complete primary school	U	60	1.62	2.08
Alembrehan complete primary school	R	60	1.95	3.58
Waja complete primary school	R	60	2.06	2.94
Total	U + R	240	2.01	2.89

Table 33: ANOVA test for difference of students mean value of behavioral practices by school.

Source of difference	df	SS	MSS	F
Between groups	-3	97.88	32.62	3.77
With in groups	236	2024.34	8.6	
Total	239	2122.22		

As can be seen from Table (33) the results of one way analysis of variance confirmed that the mean behavioral score among the schools was significant. Because $F(239) = 3.89$, $P < 0.05$.

4.4 Relationship between variables of the study

4.4.1 Correlation, of Environmental Knowledge, Attitudes and Behavioral Practices.

In order to determine the magnitude and direction of correlation of the three measured values Pearson – product – moment correlation was computed. Therefore the magnitude and direction of the relationship between the three domains were found as depicted in the Table (34) that follows.

Table 34: Pearson's correction Coefficient for Students' Environmental Knowledge Attitudes and Behavioral Practices.

	Environmental knowledge Vs Environmental attitudes			Environmental knowledge Vs Environmental practices and actions
	Utilizing E	Protecting E	Appreciating E	
Environmental knowledge and understanding	r = 0.192 sig=0.01	r = 0 .64 sig=0.01	-0.154 sig=0.05	0.042 Not significant

As Table (34) depicts environmental knowledge and understanding had a negative correlation of 0.192 with students' attitudes of utilizing the environment. On the other hand, as knowledge increases by one unit the tendency of students to utilize their environment

decrease by 0.192 units. This means an increase in environmental knowledge and understanding results in a decrease the utilitarian view of the students. In contrast to utilitarian view of the environment, environmental knowledge and understanding had a positive correlation with students' attitudes of protecting and preserving their environment. As can be seen from Table as in environmental knowledge increases in one unit, their attitude of protecting and preserving the environmental also increases by 0.64 units. With regard to the relationship of environmental knowledge and students' attitude towards appreciating their environment was found related negatively. Finally as depicted in Table 34 in spite of its negligible magnitude environmental knowledge had positive correlation with environmental friendly practices and action. However since the magnitude of r= 0.042, which is below 0.19 then the magnitude of the correlation was found insignificant (Best, and Kahn, 2003; Yalew, 2006).

4.4.2 Prediction Power of students' Environmental Knowledge for Environmental Attitude and Practice

Table 35: Environmental Knowledge as a predictor of Environmental Attitude and Practice

	Students' attitudes towards						Environmental Practices(actions)	
	Utilizing the environment		Protecting the environment		Appreciating the environment			
	ß	R2	ß	R2	ß	R2	ß	R2
Environmental knowledge	-0.193	0.037	0.635	0.407	0.153	0.024	0.042	0.002
Attitude to Utilize the environment	--	--	0.135	0.014	0.214	0.046	-0.20	0.000
Attitude to Protecting the environment	--	--	--	--	0.033	0.001	0..044	0.002
Attitude to Appreciating the environment	--	--	--	--	--	--	0.088	0.009
Environmental Practices(actions)	0.042	0.002	0.004	,000	0.002	0.002	--	--

To determine the predictive power of environmental knowledge to environmental attitude and environmental practices linear regression was done. Then as the Table 35 showed students' environmental knowledge was to be a significant positive predictor for students' attitude of protecting and appreciating the environment. In contrast to the above mentioned attitudes, environmental knowledge was found as a significant negative predictor of students' attitude towards utilizing the environment. However, students' environmental knowledge was not found as a significant predictor for environmental practices.

4.4.3 Determination effects the informal sources of EE to students' environmental Knowledge, Attitude, Behavioral practices.

To determine the effect of the independent variables (other than school factors)or the expected informal sources of EE such as location, school, sex, age, parent literacy, media usage and club participation, on the students' environmental knowledge, attitude and behavioral practice, multiple regression analysis was employed. The result of multiple regression model summaries for each case was presented as depicted in the Table (36).

Table 36: Multiple Regressions Model Summaries and the Predictors Effect of the Independent Variables to the Dependent variables

Mode	Dependent	R	R^2	Adjusted R^2	SE	$R^{2X\,100}$ (percent)
M1	Environmental knowledge (test scores)	0.269	0.02	0.048	13.67	2.0percent
M2	Attitude to words utilizing the environment	0.213	0.045	0.020	4.55	4.5percent
M3	Attitude to words protecting and preserving the environment	0.156	0.02	-0.05	5.69	2.0percent
M4	Attitude to words appreciating the environment	0.383	0.147	0.127	1.47	14.7percent
M5	To environmental friendly behavioral practices and actions	0.194	0.038	0.08		3.8percent

Contribution of informal EE source to students' environmental knowledge, attitudes, behavioral practices

Therefore, as can be seen from the model summaries of the multiple regression results in Table (35) all of the aforementioned independent variables (other than school factors) were found having very low contribution for environmental knowledge attitude and skill. As can be seen from the above Table (35) R^2 x 100 value shows that the coefficient of determination of effects of all independent variable used in this research to the dependent variable were found very low. Therefore, the independent variables which were used as predictor for the dependent variable for the dependent variable such as location, schools sex, age, parent literacy, media usage habit, and participation in club were found having very low effect. For instance all the aforementioned variables had a contribution of 2.0 percent for environmental knowledge, and for attitude to protect the environment. Where as all these predictors were found having 4.5percent, 4.7 percent and 3.8percent contribution to utilitarian attitude, aesthetic attitudes and environmental friendly behavioral practices respectively.

In a net shall, these independent variables roles to change in EE cognitive, affective and psychomotor domains were found to be insignificant. From this one may conclude that environmental education knowledge, attitude and skill should be depending on other factors that are not included in the statistic. Source of environmental knowledge, attitude and skill are many, school curriculum documents and teaching learning process might be considered as primary source if the above independent variable effect were found to be have insignificant contribution. Since the effect of independent variables on the dependent variables such as environmental knowledge, attitude and skill was very low, the researcher tends to justify that the major sources of EE dimensions were the school curriculum documents and practices. So, if this was the case, the results of the students need to be related with school documents and practice. That is if school practices were good, students result would be good if they were bad it would be again bad.

CHAPTER FIVE

Summary, Conclusions and Recommendations

5.1 Summary

The purpose of this study was examining the contribution of natural science curriculum and its instruction for changes of students' environmental awareness, attitude and behavioral practices at four selected upper primary schools in urban and rural weredas of Alamata.

So, in attempt to meet the above stated purpose of the study four basic research questions were raised as frame of reference. The essence of the basic questions includes:-

1) To what extent did upper primary school natural sciences curriculum documents attempt to respond to integration of environmental education themes or dimensions?
2) How did upper primary school natural sciences curriculum implementation practices and educational activities at schools affect students' environmental awareness, attitudes and behavioral practices?
3) What are students' level of environmental awareness, attitude and behavioral practices? Is there disparity in students' level of environmental awareness, attitude and behavioral practices when they categorized by residence location, sex, school type, age and parent literacy level?
4) What are the relationships among students' environmental awareness, attitudes and behavioral practices? Are other factors than planned and practiced curriculums (informal sources of EE) such as sex, age, location, parent literacy, media usage and club membership determinant factors for students' environmental awareness, attitude and behavioral practices?

In line with the above stated purpose and raised questions the specific objectives of the study were:-

1) To examine the level of integration of environmental education dimension in objectives, contents, methods and evaluation techniques of the 2005/2006 revised curriculum documents of the target subjects.
2)To explore the curriculum implementation practices of the target subjects and educational activities that affect the students' environmental awareness, attitude behavioral practices in selected upper primary schools in urban and rural weredas Alamata.

3)To measure students' environmental awareness, attitudes and behavioral practices (actions) at selected schools in urban and rural weredas and study the influence residence, school type, sex, age, parent literacy, club membership on measured results of students.

4.) To study the relationship among the students environmental knowledge, attitudes and behavioral practices and determine the contribution of informal source of EE to the students environmental knowledge, attitudes and behavioral practices.

In order to achieve the stated purpose and objectives of the study and to find answers for basic research questions raised both qualitative and quantitative data were gathered. For collecting relevant data the sources used were curriculum documents, teachers, students and total physical and natural environment of the schools.

The numbers of schools involved in the study were four in which two of them were selected in urban and the other two in rural Alamata woredas. In both urban and rural woredas schools were selected randomly after the available schools in each case were listed by name. Teachers for interview were selected by available sampling where as for classroom observation only biology teachers were selected purposively. Besides to this target students were selected using stratified random sampling techniques. The total students participated in the study were 240 grade eight students from them 120 were from urban school and the other 120 were from rural schools and 120 were boys and an other 120 were girls. Similar to urban-rural and sex category, equal numbers of students were taken from each school type. Thus, in each school 30 boys and 30 girls were selected by random sampling.

The data collecting instruments employed in the study were: - document analysis, observation checklists, interview guide questions, criteria-referenced EE achievement tests, EE attitude and behavioral scales.

The data obtained the above sources were analyzed by using both qualitative and quantitative methods of analysis. The major statistical tools used for analysis were percentage, mean, t-test, one way ANOVA, Pearson correlation and multiple regression.

Major Findings of the Study

1) Extent of Integration of EE in Planned Curriculum Documents.

Extent of Integration of EE in Developed Objectives

Among the three subjects biology curriculum text books relatively incorporated greater proportion of EE objective then chemistry and physics curriculum text books That is , biology curriculum text books incorporated EE objectives in 50% of the developed objectives while chemistry and physics incorporated in only 23% the developed objectives. From the total objectives developed in the text books of the three subjects generally, 34.8% of them were found to be pertinent environmental education objectives.

1.1) Categories of developed EE objectives (coverage)

As has been discussed in the document analysis part of this report the already identified EE objectives were categorized in to four categories to see their extent of coverage for the three themes that is EE knowledge, attitude skill. Hence, the results found revealed that:

- EE knowledge objectives were found integrated in 60% of biology, 82% of chemistry and 87.3% of physics developed objectives
- EE skill objectives were found integrated in 24.4% of biology, 13.7 %of chemistry and 12.7% of physics developed objectives.
- EE attitude and participation objectives were found integrated in only 8.1 and 5.0% developed objectives in biology text books but these categories of EE objectives were totally ignored in chemistry and physics text books. .
- Generally from the total developed EE objective in the three text books greater coverage was given to EE knowledge than EE attitude and skill because 70.1% of the Objectives were EE knowledge while only 20.9%, 5.0 % and 3.%of them were EE skill, attitude and EE participation objectives respectively. Thus, the ultimate goal EE, that is, education for the environment was not given adequate room (coverage) during development of objectives for curriculum planning of natural sciences.

1.2) Extent of Integration of EE contents in developed units of text books

- Once again, biology curriculum documents were found integrating relatively greater proportion of contents and methods in their units.

- That is, 71% of grade seven and 66.7% of grade eight units were found integrating EE contents. .

- But, in contrast to biology, chemistry curriculum documents integrated in only 20% of the units of both grade levels. Similar to chemistry, physics curriculum documents integrated only in 12.7% grade seven and 14.3 % of grade eight.

1.3) Extent of Integration of Methods pertinent to EE teaching learning processes

With regards to integration of methods pertinent to EE teaching learning processes once again biology documents tried to cover almost all methods pertinent to EE. The detailed results were:

- Regardless of their proportional distribution the suggested methods in biology teachers' guides tried to incorporate all EE pertinent methods except debating method.

- In biology from total suggested methods 39.65% of grade seven, 36.44 % of grade eight were found pertinent to EE teaching learning strategies. The proportion of these suggested methods were 23.3% problems solving, 22.1% group discussion, 19.1% field trip or work, 17.6 % experiment 13.2 % project work 5.9 % case study and 1.5 % role play.

- In chemistry teachers' guides, though 38% of suggested methods were found pertinent to EE teaching learning strategies but their distribution to the subcategories was not found covering all the EE pertinent methods. The suggested methods were limited to only three methods. Because from these methods 61.3% were group discussion 32% were experiments and 6.6% were project work. Thus, the other methods which were pertinent to EE value formation were totally ignored.

- In physics teachers' guides, similar to chemistry 43.5% of the suggested methods were found pertinent to EE teaching learning strategies . But from these methods 56.6% of them were group work, 36.1 % were experiment, 4.2% were project work, 2.8% were problems solving and 1.4% were filed work.

1.4) Extent of Integration of EE themes in Evaluation Strategies Develop in the documents

- From items developed in biology text books 44.2% of grade seven and 43.2% grade eight were found pertinent to evaluation of EE learning outcomes . However, greater proportions of the items were found to evaluate the cognitive EE outcomes than the psychomotor and affective domains. But from the three subjects only biology documents had tired to develop items that evaluate EE attitude using rating scales.

- Unlikely biology, items developed in both chemistry and physics text books fail to evaluate EE attitude. Furthermore, in chemistry and physics text books the proportions of the items that evaluate EE learning outcomes were relatively lower than biology.

- Generally the evaluation techniques developed in the three text books like objectives, contents, and methods they gave greater emphasis to evaluation of cognitive components of EE but they gave little room to evaluation of EE skill and underemphasized attitudes components.

2) Implications of curriculum Implementation for students' environmental awareness, attitudes and behavioral practices.

As has been noted in data analysis of this report the curriculum implementation process in schools was not encouraging for the achievement of EE goals. Because:-

- Teachers were not seen applying method pertinent EE learning teaching processes. They were not either seen incorporating local specific environmental issues to make students sensitive to them and to develop positive attitude to the environment.
- Teachers were not found aware that they were teaching EE themes in their subjects
- Teachers were not trained how EE was integrated in their instructional planning and practices.
- As observation results revealed teachers were not able to properly implement all methods and evaluation strategies prescribed by curriculum documents. Teachers were seen applying predominantly the teacher centered lecture methods than the student center methods pertinent for self acquiring of environmental knowledge, skills and attitudes.

- School facilities were not appropriate for the implementation of prescribed science experiments.

3) Students' level of Environmental Awareness, Attitudes and Behavioral practices

3.1) Students' level of Environmental Awareness,

- Generally, students' environmental awareness level was found to be low. Because the total mean achievement value of the criteria referenced test was found to be 47.47 with a standard deviation of 14.04. This means achievement value of the tests was found to be lower than the passing grade for achievement tests (50%) set by (ETP, 1994). Moreover 55.4% of the total students' scores were below 50% and only 2.9% of the total students achieved the mastery level set by teachers (> 75%)

3.1.1) Disparities in Students' level of Environmental Awareness

- Generally, urban students were found more environmental aware than their rural center parts because the computed t- test was statistically significant for that $t(238)= 4.29$, $p < 0.05$.

- Students environmental awareness was significantly vary among the four schools because the computed one way ANOVA test was statistically significant for that $F (239) = 6.32$, $p<0.05$.

- Students environmental awareness level was significantly vary among the three categories of parent literacy level because the computed one way ANOVA test was statistically significant for that $F (239) =4.413$, $P<0.05$. In addition to this, environmental awareness was found having an increase trends as parent literacy level increase. That is, students from illiterate parents scored least where as those students from secondary schools and above literate parents scored the highest in the achievement test.

- Students' environmental awareness was not found significantly verity with sex and age of students.

3.2) **Students' level of Environmental Attitudes**

Generally, students environmental attitudes were found to be:-

- Positive (favorable) towards utilizing the environment because the total means average attitude value of students was 3.98 with S.D 4.47.
- Negative(unfavorable) towards protecting and preserving the environment because the mean average attitude value of students was 2.36 with S.D 5 .69
- Moderate towards appreciating the environmental because the mean average attitude value of students was 3.04 with S.D 4.75.

3.2.1) Disparity of Students' level of Environmental Attitudes

- Urban and rural students were not varying in their attitude towards utilizing, protecting and appreciating the environmental because the values found by t-test computations were not statistically significant.
- Similarly to urban-rural categories the students' environmental attitudes towards utilizing, protecting and appreciating the environment were not significantly varied by sex categories of students.

Thus, all students regardless of their difference in sex and resident location were having positive attitudes towards utilizing environmental, negative towards protecting the environment and moderate attitudes towards appreciating the environment

- On the other hand ,students attitudes towards utilizing , protecting and appreciating the environment were found varying with variation of students by school type.
- When students were categorized by the school type, generally students in the rural schools were found having slightly, greater positive attitudes towards utilizing the environment than the students in urban schools.

3.3) Students Environmental Actions (Behavioral Practices)

Generally, as it has been discussed in qualitative and quantitative analysis Students Environmental Actions (Behavioral Practices) were found environmental unfriendly practices. Because the computed mean values of students' behavioral action towards solving environmental problems were found to be low and it fall under poorly practiced environmental friendly behavioral practices.

3.3.1) Disparity of Students' level of Environmental Actions (Behavioral Practices)

- Generally students both in urban and rural schools were found practicing environmental unfriendly practices.
- No significant difference was found in relation to behavioral practices taken to solve environmental problems between students of urban and rural categories as well as the male and female categories. Because an independent computed values were not statistically significant.
- However, a significance difference among the four schools was observed for that $F(239) = 3.77$, $P < 0.05$. This might be accounted for the school factors for environmental education activities. For instance Alamata upper primary school which scored the highest mean value was observed as better than others in club activities, vegetation, facilities and teacher roles during observation.

4) Relationship of students' environmental knowledge, attitude and behavioral practices

- Environmental knowledge of students was found related negatively with students' attitude of utilizing their environment the magnitude of 0.192. That is as environmental knowledge increase by one students utilitarian view decrease 0.192.

- Environmental knowledge of students was found positively related with students' attitude of protecting their environment. That is, as environmental knowledge increase by one unit, attitude of students to protect their environment increase by 0.64 units. Moreover as result of regression value revealed environmental knowledge was found as a good predictor of students' attitude towards protecting the environment and contributes 40.7percent at standard error of 4.4.

- Environmental knowledge of students was found positively correlated with students' attitude of appreciating their environment. That is, as environmental knowledge increase by own students attitude to appreciate the environment was found increasing by 0.154. The contribution of environmental knowledge for aesthetic view of students was found to be 2.4 percent.

- Environmental knowledge of students' correlation with environmental practices positively but the correlation was not significant. Moreover, environmental knowledge of students was not found as a good predictor of environmental practices.

- As analysis of multiple regressions revealed that the effects independent variables (informal EE sources) were found to be very low. That is, the predicative power of each variable (R) and the percent of contribution (R^2 x 100) of the variables were very low.

5.2) Conclusion

Based on the summary of major finding the following conclusions have been drawn:-

As can be seen in the major findings of this study among the three natural sciences there were variations with regards to responding to integration the added dimensions of EE. Regardless of their unfair proportion biology curriculum documents had tired to integrate the three dimension of EE in their objectives, contents methods & evaluation strategies than chemistry and physics curriculum documents. In addition to this, chemistry and physics documents had not only given little room(coverage) for integration of the three themes EE but, they were also found ignoring (failed to the respond) to the ultimate goal of EE, that is , EE attitude in their objectives, contents , methods and evaluation strategies. Hence, from the above results generally, one can conclude that the three natural sciences' curriculum documents had not responded sufficiently and proportionally to EE themes (dimensions) in their objectives, contents, methods and evaluation strategies. More specifically the ultimate goal of EE, that is, education for the environment was negligibly considered in biology but ignored in chemistry and physics curriculum documents.

When we come to the implementation process, the gaps that had been found in documents were not seen filled by roles of teachers at classroom level. Because teachers were not found incorporating local specific environmental issues (issue oriented learning's) in given topics; either adding EE attitude objectives or changing the learning activities to students –centre or activity oriented by using the local environmental teaching resource. Instead of that they were observed using predominantly teachers- centre teaching methods teaching for masterly of contents found in the documents. Moreover, let alone teachers add new local specific environmental issues they did not able to properly implement what were planned in the documents.

On the top of that, teachers were neither trained nor oriented how EE themes could be integrated in their subjects and taught for the achievement the three dimensions of EE. Thus, teachers lack awareness and proper competency to plan, use and apply EE teaching learning strategies. In addition to this school facilities were not appropriate and other school activities were not supplementary to EE teaching learning process in particular science curriculum in

general. So, with regard of integration of environmental education themes the curriculum implementation processes at schools were found worse than the problems found in curriculum documents.

Finally, as has been discussed in the summary the measured learning outcomes of students revealed that students had low level of environmental awareness, unfavorable attitudes to protect and conserve the environment favorable attitudes to utilize the environment moderate attitudes to appreciate the environment and environmental unfriendly behavioral practices. According to this result, let alone the intended environmental attitudes and behavioral practices that were neglected in planned and practiced curriculums the already emphasized cognitive component if EE was not found attained as it was intended in the policy documents. Thus, generally the EE attempts made to integrate EE in the three subjects planned, practiced and learned curriculums were not effectives in achieving the three dimensions of EE.

The most probable reasons for its poor outcomes might be the problems found in planned curriculum and in implemented curriculum. Because the other informal sources were having determinant effect on students' environmental awareness, attitudes and behavioral practices for that regression results revealed that the effect of informal source of EE found to be low. That's, the documents were not planned by giving added focus of attention to EE themes equally neither implementation process treated the EE theme as intended to fill the gaps.

5.3 Recommendations

Based on the findings of the study and the conclusions drawn, the following recommendations were forwarded to improve integration of EE in planned, practiced and learned curriculums of the three natural sciences in Alamata urban and rural primary schools in particular and Tgray Regional curriculum in general.

1. This study results showed that the way the curriculum documents developed particularly students texts and teachers guides, appeared to contribute non negligible share for the failure of EE learning outcomes. So, during curriculum development and /or revision, EE objectives, contents, methods and evaluation strategies need to be incorporated adequately and eclectically so as to achieve the three EE domains proportionally, namely, education about, in and for the environment. This can be easily done by coordination and cooperation among the curriculum developers, teachers colleges, teachers and other environmentally active stakeholders such health sector agriculture sector etc. as For instance, if the experience in biology curriculum developers were shared to chemistry and physics, the result would be better than the observed. So, collaboration among experts of different subjects needs to be emphasized.
2. During curriculum development or revision teachers of different woredas need to participate in the process of selection of EE objectives, contents, methods and evaluation strategies. Above all teachers need to be trained or oriented how the new integrated EE in the subjects are taught using different teaching learning strategies.
3. As the finding of this research revealed, since the focus of the documents and practices of EE in science curriculum were on low level learning objectives intended changes of environmental attitude and practice were not attained. So, documents as well as practices of EE need to focus on high level of learning objectives.
4. To achieve high level learning objectives methods that are relevant to EE need to be emphasized. Such methods are value clarification methods, activity-based, methods community resource methods and indoor and out door methods should be emphasized during teacher training programs both in the pre service and in service programs.
5. Since the source of EE is not only the formal education the other informal sources such as media, parents, clubs, etc. need to be strengthened.

6. With regard to school facilities, stakeholders such as local government, community and school community need to solve them.
7. Since the major problems recognized in this study are not left only to curriculum developers and teachers, other concerned bodies, teacher education colleges should be involved in the process of solving EE problems.
8. The curriculum documents need not be rigid and prescribed in approach, they ought to be flexible and give chances to both learners and teachers to enquire ,investigate and solve problems by incorporating local specific environmental issues and problems during curriculum implementation process (instructional processes).
9. The curriculum documents as well as teaching processes need to incorporate and apply methods with high degree of students' independent learning in or through their environment.

Finally the researcher suggested files for further study in primary school EE. Some of these were:-

- Status of teacher pre-service training in view of integration of EE themes:- the case of Tigray teacher training centers.
- The focus of EE in teacher in service training and school based CPD programs.
- The focus of E issues in programs of mass media as informal sources of students environmental awareness, attitude and actions.
- Practices and problems of environmental oriented clubs in primarily schools.

Role of home environment for students' environmental awareness, attitude and actions.

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Appendix- E

2. Reliability and Validity the tools

Pilot test results of students
O= odd item score
E = even item score
H= high achievers
L= lower achievers
T = total score

Student No	Total score T	Even items score E	Odd items Score O	E^2	O^2	E*O	27% Of high achievers	27% of low achievers
1	45	21	24	441	576	504	H1	
2	43	20	23	400	529	460	H2	
3	41	19	22	361	484	418	H3	
4	38	17	19	289	361	323	H4	
5	36	17	19	289	361	323	H5	
6	36	16	20	256	400	320	H6	
7	36	19	17	361	289	323	H7	
8	29	15	14	225	196	210		
9	28	16	14	256	196	224		
10	27	14	13	196	169	182		
11	27	15	12	225	144	182		
12	26	13	13	169	169	169		
13	25	12	13	144	169	156		
14	25	13	12	169	144	156		
15	24	12	12	144	144	144		
16	24	13	11	169	121	143		
17	23	12	11	144	121	132		
18	23	11	12	121	144	132		
19	22	11	11	121	121	121		
20	21	9	12	81	144	108		L1
21	19	7	12	49	144	63		L2
22	18	11	7	121	49	77		L3
23	17	8	9	64	81	72		L4
24	16	6	10	36	100	60		L5
25	14	8	6	64	36	48		L6
26	13	5	8	25	64	40		L7
		∑340	∑356	∑4920	∑5456	∑5090		

Reliability
To estimate the reliability of the criteria reference test items were analyzed by split-half method. The items were slited in add item and even item then the correlation of the two half were computed by calculating persons "r" for ungrouped data then for more internal consistency the correlation coefficient found by person's formula is modified by using

the spear mans-Brown formula (Best and Kahn, 2003: 218). Person product moment correlation formula

Reliability of criteria Referenced test items

$$r_{oE} = \frac{N\sum oE - \sum 0.\sum E}{[N\sum 0^2 - (\sum 0^2)\,[N\sum E^2 - (\sum E^2)}$$

$$\text{RoE} = \frac{26x\ 5090\text{-}356x340}{\sqrt{((26x4920)\text{-}115600)}\ \sqrt{(\ 26(5456)\text{-}(126736)}}$$

$$\frac{132340\text{-}\ 121040}{(\sqrt{(127920\text{-}11560000)}\ (\sqrt{(141856\text{-}126736))}}$$

$$\frac{11300}{\sqrt{(12320)}\sqrt{15120}}$$

$$\frac{11300}{(110.9)(122.9)}$$

$$\frac{11300}{13636.6}$$

0.83

Spearman Brown formula:

$$1 - \frac{6\sum r^2}{N(N^2-1)}$$

$$1 - \frac{6(.83)^2}{26(26^2-1)}$$

$$1 - \frac{6(0.69)}{17550}$$

0.97

Reliability of attitude and behavioral scales

Similarly for attitude scale and behavioral scales the crombach alpha test was done. Then the result of attitude scale was found to be 0.83 and that of behavioral scale was 0.87. So all of the tests done for the validity and reliability for the instruments are relevant to measure and estimate piloted subjects (students) environmental awareness attitude and behaviors (actions).

Item analysis on items of criteria referenced tests

After the criteria referenced test is given to 26 randomly selected grade eight students. The researcher did item analysis of each question using Robert and David's method of analysis. Accordingly, the score of pilot sample students were arranged from the highest to the lowest. Then from arranged scores from top 27% and the bottom 27% were separately taken to calculate the difficulty index and discriminating power or validity index of an item. To evaluate the wrathfulness of each question both difficulty level and discriminating power were calculated and both are used simultaneously to evaluate each question item.

Item	High Achievers							X	Low achievers							X
	H_1	H_2	H_3	H_4	H_5	H_6	H_7	7	L_1	L_2	L_3	L_4	L_5	L_6	L_7	7
1	+	-	+	+	+	+	+	6	+	-	-	+	-	-	+	3
2	+	+	+	+	+	+	+	7	-	+	+	-	+	-	-	3
3	+	+	+	+	+	+	+	7	+	+	-	-	-	+	-	3
4	+	+	+	+	-	-	+	5	+	+	-	-	-	-	-	2
5	+	+	+	-	+	+	-	5	-	-	-	-	-	+	+	2
6	+	+	-	+	+	-	-	4	-	-	+	+	-	-	-	2
7	+	+	+	+	+	+	-	6	+	+	+	+	+	-	-	4
8	+	+	+	-	+	+	+	6	+	-	-	-	-	+	-	2
9	+	+	+	+	-	-	+	5	-	-	-	-	+	-	+	2
10	+	+	+	+	+	-	-	5	-	+	+	+	-	-	-	3
11	-	+	+	+	-	+	+		+	+	-	-	-	-	-	2
12	+	+	+	-	+	-	-	4	+	-	-	-	-	+	-	2
13	+	+	+	+	-	+	-	5	-	-	+	+	+	-	-	3
14	+	+	+	+	+	+	+	6	+	-	+	+	-	-	-	3
15	+	+	+	+	-	+	+	6	-	+	-	-	+	+	-	3
16	+	+	-	-	+	+	+	5	+	-	-	-	-	-	-	1
17	+	+	+	+	+	+	-	6	+	+	+	-	-	-	+	4
18	+	+	+	+	+	+	+	7	-	-	-	-	+	+	+	3
19	+	-	+	-	+	+	+	5	-	-	-	-	-	-	+	1
20	+	+	+	-	+	+	+	6	+	+	-	-	-	-	-	2
21	+	+	+	+	+	+	+	7	-	-	+	+	-	-	-	2
22	-	+	+	+	+	-	-	5	-	-	-	-	+	-	-	1
23	+	+	+	+	-	-	-	4	+	+	-	-	-	5	-	2
24	+	+	+	+	+	+	+	7		-	+	+	+	-	-	3
25	+	+	+	+	+	+	-	6	-	+	+	+	-	+	-	4
26	-	-	+	+	+	+	+	5	-	-	-	-	+	-	+	2
27	+	+	+	+	+	+	-	6	+	+	+	+	-	-	-	4
28	+	-	-	+	+	-	+	4	-	-	-	+	-	+	-	2
29	+	+	+	+	+	+	+	7	+	+	-	-	-		+	3
30	+	+	+	+	-	+	+	6	-	+	+	-	+	+	+	5
31	+	+	+	-	+	+	-	5	+	-	-	+	+	+		4
32	-	+	+	+	+	+	+	6	-	-	-	+	-	+	-	2
33	+	+	+	+	+	-	-	5	-	+	+	-	+	-	-	3
34	+	+	+	-	-	+	+	4	-	-	-	-	-	-	+	1
35	-	-	-	+	+	+	+	5	-	-	+	-	-	+	-	2
36	+	+	+	+	-	-	-	4	+	+	-	-	-	-	-	2
37	+	-	-	-	+	+	+	4	-	-	-	+	+	-	-	1
38	+	+	+	+	-	-	-	4	+	-	-	-	-	-	+	2

39	+	+	+	-	+	+	+	5	-	-	-	-	+	-	-	1
40	+	+	+	+	+	+	+	7	+	-	+	-	-	-	-	2
41	+	+	-	+	+	-	-	4	-	+	-	-	-	-	-	1
42	+	+	+	+	+	+	+	7	+	-	-	-	+	+	-	2
43	+	+	+	-	-	+	-	4	-	-	-	-	-	-	+	2
44	-	-	-	+	+	-	+	3	-	+	+	+	+	-	-	4
45	+	+	+	-	+	+	-	5	+	-	-	-	-	-	+	2
46	+	+	+	+	+	+	+	7	-	-	-	-	-	+	-	1
47	+	+	+	+	-	-	-	4	-	-	-	-	+	-	-	1
48	+	+	-	-	+	+	+	5	-	-	+	+	-	-	-	2
49	-	+	+	+	+	+	+	6	+	+	-	-	-	-	-	2
50	+	+	+	+	-	+	-	5	-	-	+	+	-	-	-	2
Total	45	43	41	38	36	36	30		21	19	18	17	16	14	13	

$$LD = \frac{UR + LR \times 100}{T}$$

Where: LD = level of difficulty of an item
UR = Upper Right
LR = Lower Right

$$D.P = \frac{UR - LR}{(1/2\ T)}$$

Indices of difficulty and discrimination

Indices of difficulty and discrimination power of the criteria-referenced tests is given in the following table

Item	Score of high achievers A	Score of law achievers B	Proportion of correct answer p	Proportion incorrect answers q	px q	Index of difficulty in A + B/14) x 100	Index of discrimination (A-B)/7
1	6	3	0.64	0.36	0.23	64	0.43
2	7	3	0.71	0.29	0.21	71	0.29
3	7	3	0.71	0.29	0.21	71	0.30
4	5	2	0.50	0.5	0.25	50	0.43
5	5	2	0.50	0.5	0.25	50	0.43
6	4	2	0.43	0.57	0.25	43	0.57
7	6	2	0.71	0.29	0.21	71	0.30
8	6	2	0.57	0.43	0.25	57	0.57
9	5	1	0.43	0.57	0.25	43	0.57
10	5	3	0.57	0.43	0.25	57	0.43
11	5	2	0.50	0.50	0.25	50	0.50
12	4	2	0.43	0.57	0.25	43	0.30
13	5	3	0.57	0.43	0.25	57	0.43
14	6	3	0.64	0.36	0.23	64	0.43
15	6	3	0.64	0.36	0.23	64	0.43
16	5	1	0.43	0.57	0.25	43	0.57
17	6	4	0.71	0.30	0.21	71	0.30
18	7	3	0.71	0.30	0.21	71	0.57
19	5	1	0.43	0.57	0.25	43	0.57

20	6	2	0.57	0.43	0.25	57	0.57
21	7	2	0.64	0.36	0.23	64	0.71
22	5	1	0.43	0.57	0.25	43	0.57
23	4	2	0.43	0.57	0.25	43	0.30
24	7	3	0.71	0.30	0.21	71	0.57
25	6	4	0.71	0.30	0.21	71	0.30
26	5	2	0.50	0.50	0.25	50	0.50
27	6	4	0.71	0.30	0.21	71	0.30
28	4	2	0.43	0.57	0.25	43	0.30
29	7	3	0.71	0.21	0.21	71	0.29
30	6	5	0.79	0.29	0.21	71	0.29
31	5	4	0.64	0.36	0.21	64	0.43
32	6	2	0.57	0.43	0.25	57	0.57
33	5	3	0.57	0.43	0.25	57	0.29
34	5	1	0.36	0.64	0.23	36	0.64
35	5	2	0.50	0.50	0.25	50	0.57
36	4	2	0.43	0.57	0.25	43	0.29
37	4	1	0.36	0.64	0.21	36	0.57
38	4	2	0.43	0.57	0.25	43	0.57
39	5	1	0.36	0.64	0.23	36	0.64
40	7	2	0.57	0.43	0.25	57	0.43
41	4	1	0.36	0.64	0.23	36	0.64
42	7	2	0.57	0.43	0.25	57	0.43
43	4	2	0.43	0.57	0.25	43	0.39
44	3	4	0.50	0.50	0.25	50	0.17
45	5	2	0.50	0.50	0.25	50	0.43
46	7	1	0.57	0.43	0.25	57	0.85
47	4	1	0.36	0.64	0.23	36	0.43
48	5	2	0.50	0.50	0.25	50	0.43
49	6	2	0.57	0.43	0.25	57	0.57
50	5	3	0.57	0.43	0.25	57	0.29

Then the quality of each question item is evaluated based on the tool owing table. According Garrett (1962) in Koul both the level of difficulty and discriminative values are to be used to value the quality of the item. Therefore item with validity index of 25% and more and difficulty index of 0.40 to 0.60 are regarded satisfactory. But items having zero or negative validity are useless and must be discarded.

Item difficulty level (1)	Item discriminative power (index)			
	<0	0-0.3	0.3 – 0.4	0.5-1.0
> 75%	Bad item	Easy item	Easy item	Easy item
Between 40% - 75%	Bad item	Middivn (marginal)	Very good item	good item
Between 26% - 39%	Bad item	Difficult question	Difficult question	Difficult question
< 25%	Bad item	Very difficult		Very difficult

Source: National organization for examination (NOE, 1994: 124).

From the above valid questions the researcher has selected 47 items for the final data collection instrument.

19. ቐሊሎምከብዝቐረቡ ስጉምቲታት ንምውሳኽ መቐት ዓለም (global warming) ንምንካይ ዝጠቀም ስጉምቲ እየናይ እዩ?
ሀ. ኣብገዛና ንፍልፍል ጉልበት ነዳዲን ዕንፀይቲን ጥራሕ ብበዝሒ ምጥቓም::
ለ. ዳግመ ግረባ ፕሮግራም ብስፍሓትን ብቐላልነትን ምክያድ::
ሐ. ኣግራባት ብፋብሪካታት ምጥቓም ናብ ጣዒላ ወረቐትን ችፕዊድ ምልዋጥ::
መ. ኣብ ሃገርና ዘሎ ናይ ፋብሪካታትን መካይንን ቐፅሪ ብዝላዓለ ብርኪ ምውሳኽ::
20. ቐሊሎም ካብ ዝተዘርዘሩ ሜላታት እቲ ሓደ ፍግረ መሬት ንምክልኻል ኣይጠቅምን::
ሀ. ንጋድም ወይ ንጉኒ ምሕራስ::
ለ. ዝተፈላለዩ ዝራእቲ ኣብ ሓደ ናይ ሕርሻ ቦታ ብሓደ ጊዜ ምዝራእ::
ሐ. ኳናታት ምስራሕ::
መ. ብላዕሪን ተኽልታትን ዝተሸፈነ መሬት አቃሊልኻ ንሕርሻ ቦታ ምጥቓም ::
21. ኣብ ክልል ትግራይ ብተደጋጋሚ ዝኸሰት ከባቢያዊ ፀገም አየናይ እዩ?
ሀ. ድርቅን ጥምየትን ለ. ምንቅጥቓጥ መሬት
ሐ. ምፍንዳእ እሳተ ገሞራ መ. ብሰንኪ ፅዑቕ ዝናብ ዝፍጠር ሓደጋ ውሕጅ
22. ኣብ ኢትዮጵያ ቐንዲ መበገሲ ምኽንያት ከባቢያዊ ፀገም\ብርሰት ከባቢ\ አየናይ እዩ?
ሀ. ተፈጥሮኣዊ ኩነታት ኢትዮጵያ ለ. ኣግባብ ዘይብሉ ኣጠቓቕማ ሃፍቲ ተፈጥሮ
ሐ. ምውሓድ ዕድል ዘለዎም ህዝቢ መ. ናይ ፈጣሪ መቕፃዕቲ
23. ካብዞም ዝስዕቡ ሜላታት ምጣነ ስድራ እቲ ሓደ ዝሓሸ አይኮነን::
ሀ. ኮነዶም ምጥቃም ሐ. ክኢን መከላኸሊ ፅንሲ ምጥቃም::
ለ. ሓንቲ ሰበይቲ ወይ ሓደ ስብኣይ ምሓዝ መ. ኣብ ውሽጠ መህፀን ዝኣቱ ሉፕ ምጥቃም
24. ኣብ ከባቢ ሩብታት ኣላማጣ ኣብዚ እዋንዚ ንብክለት ማይ መበገሲ ዘይኮነ አየናይ ኢዩ::
ሀ. ሳሙናን ኦሞን (detergents) ብምጥቓም ሕፅበት ክዳን ምክያድ
ለ. ደረቕን ፋሳሲን ወገዳ\ጉሓፍት\ ፋብሪካታት
ሐ. ኣብሕርሻ ቦታኢ ካርቦናዊ ድኸዓን ፀረ-ባልዕ መድሐኒትን ምጥቃም
መ. ኣብ ከባቢ ማይ ዝድብረይ ናይ ሰብን እንስሳትን ፍታን
25. ከባቢያዊ ፅርየት ምሕላውን ናይ ተፈጠጥሮ ሃፍትታት ምዕቃብን ብቐናነት ናይመን ሓላፍነት ‘ዩ?
ሀ. ናይ ሕድ ሕድ ከባቢያዊ ሕብረተሰብን ዉልቀ ሰብን ::
ለ. ናይ መንግስቲ ኣካላት ወይ ድማ ናይ ፖለቲካ መራሕቲ::
ሐ. ናይ ሰራሕተኛታት ግልጋሎት ጥዕና ::
መ እዚ ዋኒን ንቐዳማይ ብርኪ ተምሃሮ ዝምልከት አይኮነን
26. ካብዞም ዝስዕቡ ሓደ ምኽንያት ብኽለት አየር አይኮነን::
ሀ. ኣብ ነብስ ወከፍ ዝ ፍሓም ዕንፀይቲ ነዳዲን ምቕፃል::
ለ. ንፋብሪካታትን መካይንን ሞተር ከምፍልፍል ጉልበት ነዳዲ\ፔትሮሊየም\ ምጥቃም::
ሐ. ከም መሰቦ ካብ ዝምሉ ፋብሪካታት ዝወፅእ ዶሮናን ትኪን::
መ. ተሓሚቦም ካብዝነቐፁ ክዳውንቲ ዝሃፍፍ ማይ::
27. ብርሰት ሓፍትታት ተፈጥሮ ንምክልኻል ፅቡቕ መፍትሒ አየናይ እዩ?
ሀ. ኣግባብነት ዘለዎ ዕቀባን ክንክን ብምግባር ምስ ከይዲ ተፈጥሮ ዝጠዓዓም ምዕባለ ምርግጋፅ::
ለ. ድ ሰነት ንምንካይ ሃፍትታት ተፈጥሮ ብቕልጡፍ ብምጥቃም ቕልጡፍ ዕቤት ቁጠባ ምርግጋፅ::
ሐ. መፍረያይ ዝኸነ ሓይሊ ስብ ንምርካብ መጠን ዕብየት ህዝቢ ብናህሪ ምዉሳኽ::
መ. ናይ ዘመናዊ ሕርሻን ኢንዱስተሪ ስራሕቲ ብስፍሓት ምግፋሕ::
28. ካብዞም ዝስዕቡ መማረፂታት ማይ ወለድ ሕማማት ንምክልኻል ትኽክለኛ ዘይኮነ ስጉምቲ አየናይ እዩ?
ሀ. ውልቀ ፅርየት ምሕላው::
ለ. ከባቢያዊ ፅርየት ምሕላው::
ሐ. ጥራሕ ናይ ጥዕና ሳራሕተኛታት ምውሳኽ እኹል ኢዩ::
መ. ኣብ ክንዲ ኬሚካላዊ ድኸዓታት ናይ ተፈጥሮ ድኸዓታት ምጥቃም::
29. ናይ ከባቢያዊ ብኽለት አየር ሳዕቤን ዘይኮነ አየናይ እዩ?
ሀ. ከባቢያዊ መጠን ረስኒ ምንካይ::
ለ. ኣብ ተኽልታትን እንስሳትን ዝበፅሕ ጉድኣት::
ሐ. ናይ ነባሪ አየር ለውጥን ሓደጋ ውሕጅን::
መ. አሲድ ዝትሓወሰ ዝናብን ዝለዓለ ፍግረ መሬትን

30. ቫሚሎም ካብ ዝተዘርዘሩ ጉድኣታት ሓደ ሓደገኛ ናይ ዝኾነ ጨረራት ፀሓይ\አልትራ ቫዮሌት ረይስ\ ሳዕቤን ኣይኮነን፡፡
ሀ. ናይ ቆርበት ካንሰር
ለ. ናይ ህይወታዊያንን ትሑት ዝኾነ ዓቕሚ ምክልኻል ሕማማት
ሐ. ናይ ከባቢዊ አየር መጠን ረስኒ ምውሳኽ
መ. ናይ ከባቢያዊ አየር መጠን ረስኒ ምንካይ

31. ካብዞም ዝስዕቡ እቲ ሓደ ብወዲ ሰብ ዝፍጠር መበገሲ ብኽለት አየር ኣይኮነን፡፡
ሀ. ተፈጥሮኣዊ ነዳዲ ንፍልፍል ሓይሊ ምጥቃም፡፡
ለ. ካብ ገዛውትን ኢንዱስትሪታትን ዝወፅእ ትኪ፡፡
ሐ. ካብ እሳተ ጐመራ ዝወፅእ ትኪን ደሮናን፡፡
መ. አብ ከባቢ ከተማታት ዝፍጠር ደበና ዝመስል ትኪ (smog)

32. ንድኹዒነት ዝጠቅም መኣድን አየናይ እዩ?
ሀ. ፎስፌት ለ. ግራፋይት ሐ. ወርቂ መ. ፊሓም እምኒ

33. ካብዞም ዝስዕቡ ፀባያት ድምፂ ገዋሕታ ንክፍጠር ምኽኒያተ ዝኾኢን አየናይ ኢዩ
ሀ\ፅብረቓ ለ\ ርግብግቢት ሐ\ለዉጢ አንፊት ብርሃን መ\ ምጥማር

34. ንመሰርሒ ህንፃታት ገዛዊትን ንጠቀመሱ ዓይነት ጨው አናይ አዩ፡፡
ሀ. ኢብሰም ጨው ለ. ካልሲየም ካርቦኔት
ሐ. ባሪየም ሳልፌት መ. ሶዲየም ባይካርቦኔት

35. አሲዳዊ ባህሪ ዘለዎ ሓመድ ንምሕካም (ንምስትክላል) አብ ሕርሻና ብምፍሳስ ንጥቀመሱ ሕሱር ቤዝ አየናይ አዩ፡፡
ሀ. ሳላክድ ላይም (ካልሲየምሓድሮኦክሳይድ)
ለ. ኮስቲክፖታሽ (ፖታሲየምሃይድሮኦክሳይድ)
ሐ. ኮስቲክሶዳ (ሶዲየም ሃይድሮኦክሳይ)
መ. ሶዳኣሽ (ሶዲየም ካርቦኔት)

36. አብ ዝሰቱ ማይ ዝርከቡ ሓደገኛ ጀርምታት ንምቕታል (ንምውጋድ) ናብ ማይ ዝውሰክ ኬሚካል
ሀ. አሉሚኒየም ሳልፌት (አሉም)
ለ. ክሎሪን ጋዝ ወይ ድማ ክሎሪን ዘመንጭዉ ዉህድ
ሐ. ሜሪኩሪን ካድሚያምን እየናት ዘሓዘ ከሚካላዊ ዉህድ
መ. ክምሳልፈሪክ አሲድን ናይትሪክ አሲድን ዝበሉ ሓየልቲ አሲዳት

37. ካብ እነሰሳት ፍታን (animal Waste material) ዝምረትን አብ ዉሽጢ ገዛ ክምፍልፍል ጉልበት እንጥቀመሱ ጋዝ አየናይ አዩ?
ሀ. ባዮጋዝ ሐ. ዋተር ጋዝ ለ. ናቹራል ጋዝ መ. ፕሮዲሰር ጋዝ

38. ካብዞም ዝስዕቡ አብነት ሓይሊ ንኽክእ ዝኾነ አየናይ ኢዩ
ሀ\ ሓይሊ ፍሕፍሕ ለ\ማግኔታዊ ሓይሊ ሐ\ ሓይሊ ስሕበት መ\ ኤሌትሪካዊ ሓይሊ

39. ካብዞም ዝስዕቡ ጉልበት ኤሌክትሪክ ንምትሕልላፍ ዉፅኢታዊን ቆጣቢን ዝኾነ አየናይ ኢዩ
ሀ\ልዑል መጠን ቮልተጅን ልዑል መጠን ኮረንቲን
ለ\ትሑት መጠን ቮልተጅን ትሑት መጠን ኮረንቲን
ሐ\ ልዑል መጠን ቮልተጅን ትሑት መጠን ኮረንቲን
መ\ ትሑት መጠን ቮልተጅን ልዑል መጠን ኮረንቲን

40. አብ ከባቢ ጉድኣት ዘይስዕብ ፍልፍል ጉልበት አየናይ ኢዩ
ሀ\ ጉልበት ኒዩክለር ለ\ጉልበት ሃይደሮ ፓወር
ሐ\ጉልቤት ፋሓም ከርሰ ምድሪ መ\ ጉልበት ፀሓይ

41. ካብዞም ዝስዕቡ መሳርሕታት ካብ ፀሓይ ብርሃን ሓዊ ክንፈጥር ዘክእሌና መሳርሒ አየናየ ኢዩ
ሀ\ በትኒ ሌንሰ ለ\ አካቢ ሌንስ
ሐ\ ፀፈሕ ምስትያት መ\ ሓባጥ መሰትያት

42. ካብዞም ዝስዕቡ ሜላታት ምቁዕፃሪ ሕማም ዓሶ እቲ ዝበለፀ አየናይ ኢዩ
ሀ\ መከላኸሊ መረበብ \ዛንዚራ\ አብ መሸኾት ምግባር
ለ\ ማንጡ ዝራባሓሉ ዕቓር ማይ ክፈስስ\ ክነቅፅ\ ምግባር
ሐ\ ናብ ዝዓቐረ ማይ ዘይቲ ምንፃግ
መ\ ንዝሓመመ ሰብ ብመድሓኒት ምሕካም

43. ንጥዕና ብዙሓት ደቂአንስትዮ ዝጎድእ ድሑር ባህላዊ ልምዲ አየናይ ኢዩ
ሀ\ ፀኒሕኻ ምምርዓዉ ለ\ ክኒን መከላኸሊ ጥንሲ ምጥቃም
ሐ\ ግርዛት ደቂአንስትዮ መ\ ግርዛት ተባዕትዮ
44. ካብዞም ዝስዕቡ አክሳይዳት ብስርዓተ ስትንፋስ ወዲ ሰብ አትዩ አብ ዑደት ደም ብምአታይዉ ንወዲሰብ ዝቐትል ጋዝ አየናይ ኢዩ
ሀ\ ካርቦን ዳይኦክሳድ ለ\ ካርቦን ሞኖኦክሳድ
ሐ\ ሃይድሮጅን ኦክሳይድ መ\ ናይትሮጅን ኦክሳድ
46. ካብዞም ዝስዕቡ ጨዋት ጎምዳድ ማይ እቲ ማይ ብምፍላሕ ብቐሊሉ ናብ ዘይጎመዳድ ማይ እንቕይሮ አየናይ ዓይነት ጨዉ ዝሓዘ ኢዩ
ሀ\ ሶዲየም ባይ -ካርቦኔት ለ\ማግኒዚየም ሳልፌት
ሐ\ ካልሲየም ሳልፌት መ\ ማግኒዝየምን ካልስየምን ባይካርቦኔት
47. ካብዞም ዝስዕቡ ዓለማት ንፀሓይ ሓደ ዙር ንቕትዘውር ዝሓፀረ እዋን ዝወስደላ አየኑቲ ኢያ
ሀ\ ማርሰ ለ\ ቬኑስ ሐ| ጁፒቴር መ\ መሬት

መምርሒ 2፡- ቐሊሎሞ አብ ዝቐረቡ ሙልእ ሓሳባት ቕድሚት 5፡ 4፡ 3፡ 2፡ 1 ዝብሉ መማረፅታት ተዋሂቦሞ አለው፡፡ ናይቶም መማረፅታት ደረጃ ስምምዕ መግለፂ፡-
5፡ ብጣዕሚ ኢያ ዝስማዕማዕ (Strongly agree)
4፡ እስማዕማዕ (agree)
3፡ ንሞውሳን ያሸግረኒ (undecided)
2፡ አይስማማዕን (disagree)
1፡ ብጣዕሚ አይስማማዕን (Strongly disagree)
እቶም ዝቀረቡ ሙሉእ ሓሳባት ብዋንታዕን አትኩሮትን ብምንባብ ዘላካ(ኪ) ደረጃ ስምምዕ (ውሳነ) ናይ (√) ምልክት ብምጥቃም መልሲ ሃብ(ቢ)፡፡

	መጠይቅ	ብርኪ ስምምዕ				
	ሀ) ከባቢ ምጥቃም ዝምልከቱ ናይ ዝንባለ መጠይቓት	5	4	3	2	1
1	ብናተይ ርእይቶ መሬትና ዘይዉዳእን ቐልጢፉ ዝትካእን ሃፍቲ ስለዘለዋ ናይና ዕላማ ከምይ ናብጥቕሚ ከምነዉዕሎ ምምሃር ጥራሕ ክሸዉን ፡፡					
2	አነ ከምዝሰማዓኒ ናዚ ሐዚ ዘሎ ወለዶ ናብ ዝላዓለ ምቕታዊ ናብራ ከየብፃሕካ ብዛዕባ ዝቕፅል ወለዶ ምሕሳብ ትርጉም ዘለዎ አይኮነን፡፡					
3	ብናተይ እምነት ዝኾነ ሰብ አግራብ ቆሪፁ ዕንፀይቲ ብምሻጡ ከኩነን የብሉን ምኽኒቱ ዘለዎ መማረፂ ንሱ ጥራሕ ብምኻኑ፡፡					
4	ብናተይ እምነት ሀዚ ብአግራብ ተሸፊኑ ዘሎ መሬት መንጪርኻ ናብ ተሓራሳይ መሬት ብምልዋዋ ሀዚ ዘለናሉ ደረጃ ድኽነት ብዝላዓለ ብርኪን ቐፃልነት ብዘለዎ መንገዲ ምንካይ ይከኣል፡፡					
5	አነ ከምዝሰማዓኒ ከምመረዓ አብዝበሉ ባህላዊ ድግሳት ዝላዓለ ሃፍቲ ዝዋፍኡ እንተኾኑኳ ባህልና ስለዝኾኑ ክነበረታትየም እዩ ዘለና፡፡					
6	አነ ከምዝሰማዓኒ ምዕባለ ሳይንሰን ቴክኖሎጂን አማዒቢልና ዘይንፈትሖ ዋላ ሓንቲ ፀገም ከባቢ አይህልወን፡፡					
7	ብናተይ ርእይቶ አብ ከባቢና አጋጢሙ ንዘሎ ብርሰት ሃፍቲ ተፈጥሮ ብቐዳምነት ክሕተት ዘለዎ መንግስቲ ኢዩ፡፡					
8	ከምናተይ ርኢቶ ኬሚካላዊ ድኹዓ ብዝላዓለ መጠን ምጥቓም ምህርቲ ይወስኽ እምበር ዋላ ሓንቲ ዘስዕቦ ፀገም ከባቢ የለን፡፡					
9	ብናይ እምነት ተፈጥሮዊ ሚዛን መሬትና ብቐጠባዊ ማሕበራዊ ቴክኖለጂካዊን ፖለቲካዊተግባራት ወድሰብ ዝዛባዕ አይኮነን፡፡					
	ከባቢ ናይ ምክልኻልን ምዕቓብን ዝምልከት ናይ ዝንባለ መጠይቓት					
	ሐ/ ክንክን ሓለዋን ከባቢ ዝምልኩ ናይ ዝንባለ መጠይቓት					
1	ብናተይ እምነት መሬት ዘለዋ ሃፍቲ ዉስን ብምኻኑ ዓቂብናን ተንከባኺብና ንቐፃሊ ወለዶ ክናዕነሓሉም ይግባእ፡፡					
2	ከምናተይ እምነት ናይዚ ወለዶ ካብ ዓቐን ዝሓለፈ ምቕታዊ					

	መነባብሮ ንምርግጋፅ ተባሂሉ ዝወፅእ ወፃኢ ነኪና ንዝቕፅል ወለዶ ዝኽዉን ሃፍቲ ናይምፅናሕ ግዴታ አለና፡፡					
3	ብናተይ ርእቶ ሓረስቶት ኢ--ካርቦናዊ ድኽዊ ምዋቓም ጎዲፎም ካርቦናዊ ድኽዊ ጥራሕ ክጥቀሙ ይግባእ፡፡					
4	ብናተይ ርእቶ ከምድርቂን ጥሜትን ዝመሰሉ ከባቢያዊ ፀገማት ዋና መበገሲ ወዲሰብ ኢዩ፡፡					
5	ከምናተይ እምነት እንስሳትና(ጥሪትና) አብ ገዛ ወይ ዉስን ቦታ አሲርና ምቕላብ ፍግረ መሬት ንምክልኻል የኽእለና፡፡					
6	ከምናተይ እምነት ሐዚ ኢጋጢሙ ዘሎ ዓለምዊ ፀገም ከባቢ መበገሲ ዝለዓለ ምዕባለ ሳይንስን ቴክኖሎጂ ኢዩ፡፡					
7	ከም ናተይ እምነት ተኽልታትን እንስሳትን ከምወዲሰብ አብዚኣ ዓለም ማዕለ ናይምንባር መሰል አለዎም፡፡					
8	ብናተይ ርእቶ ወዲ ሰብ ተፈጥሮዊ ከባቢኡ ካብ ግብኡ ንላዕሊ ከምድሌቱ ናይምጥቃምን መሰል የብሉን፡፡					
9	ብናተይ ርእቶ ተፈጥሮዊ ሚዛን መሬት ብተግባራት ወዲሰብ ብቐሊሉ ክዛባዕ ዝኽእል ተኻኣሒ ነገር ኢዩ፡፡					

	ለ) ከባቢ ምድናቕ ዝምልከት ናይ ዝንባለ መጠይቓት	ብርኪ ስምምዕ				
		5	4	3	2	1
1	እነ ከምዝስማዓኒ ፀጋታት ተፈጥሮ ክሕለዉን ክዕቐቡን ዘለዎም ብአፃር ቁጠባዊ ረብሓ ጥራሕ ኪይኮነስ ምንጭታት ተፈጥሮዊ ጥበብን ፅባቐን ስለዝኾኑዉን ኢዩ፡፡					
2	ብናተይ እምነት ዝኾነ ሰብ ናይ ተፈጥሮዊ ጥበብን ፅባቐን(አማራብን እንስሳተዘቤት) ርእዩ ብምድናቕ ካብ አዕምሮ ጭንቀት ክፍወስ ይኽእል፡፡					
3	ብናተይ እምነት ታሪካዊ ሓድግታት ምጉብናይ ግዘን ገንዘብን ካምዋፋእ ሓሊፉ ዋቕሚ የብሉን					
4	ብናተይ ርእይቶ ምምላስ ሃዉሊቲ አክሱም ንህዝቢ ከተማ አላማላ ዋቕሚ አለዎ፡፡					
5	ብናተይ ርእይቶ ኩሉሰብ ናይ ከባቢኡ ህዝቢ ዝኽተሎ ባህሊ ክኽብር ክድንቕን አለዎ፡፡					
6	እነ ከምዝስማዓኒ ኩሉ ሰብ ናይ ባህላዊ ሳዕስዒት ምስዕሳዕ ናይ ምፍላጥ ግቡእ(ግዴታ)አለዎ፡					
7	ብናተይ እምነት ከተማታት ንመዘናኒ ዝኽውን ሓሞላዋይ ቦታ (green park) ኽህልወን ይግባእ					
8	እነ ከምዝአምኖ እንሳሳት ከምወዲሰብ ናይ ጥሜት፣ ፍርሓት፣ ስቃይ ሰምዒት ስለዝስመየም ክንክናኽኖም ይግባእ፡፡					
9	እነ ከምዝአኖ ኩሉ ሰብ ተፈጥሮን ማሕበራዊ እሴታት ከባቢኡ ናይ ምቕብን ምክለኻልን ሓላፍነት አለዎ፡፡					

	መጠይቅ	መዐቐኒ				
		5	4	3	2	1
1	እነ አብ ቤት ትምህርቲ ብብዕለቱ ዝተጠቐምኩሎም ወረቓቕቲን ሶፍቲን\ናፕኪን\ አብግቡእ መጉሓፈ ይድብርዮም					
2	እነ ክም ሰብ ሓደ አካል መበገሲ ክባቢያዊ ብክለትን ብርሰትን ምኻነይ ፈሊጠ አብ ከይዲ ዕለታዊ መነባብሮ ካባይ ዝሕለወ ጥንቓቐን ተገዳስነትን ክባቢ ብምግባር ሓላፍነተይ ይዋሃእ					
3	እነ ብወልቀ ተብግሶ ተፈጥሯዊ ዕባቐ ቤት ትምህርተይ ንምሕላወ አብ ቤት ትምህርተይ ዝርከቡ ተክለታትን ዕምበባታትን ማይ ብምስታይ ይክናኸኖም					
4	እነ ብድሌተይ ብቤት ትምህርቲ ወይ \ብቀበሌ\ አብ ዝተዋደደ ወፍሪ ምትካል ፈልስታት ይሳተፍ					
5	እነ ብውልቀ ተብግሰይ ብዛዕባ ክባቢያዊ ፀገማትን መፍትሒምን ምስ ስደራይቤተይ ይመያየጥ					
6	እነ ክባቢያዊ ፀገማት ንምፍታሕን ንምክኻል ሓሲብ ፍልጠተይን ክእለተይን አብ ጣቢያይ (ቀበሌ) ንዝርከቡ አባል ሕብረተሰብ የመሓላልፍ					
7	እነ ቤት ት/ቲ ወይ ዝነብረሱ ቀበሌ (ጣቢ.ያ) አብዝፀወኦ ወፍሪ ክባቢያዊ ዕሬት ፡ ዳግመ--ግረባ ዕቑባ ሓመድን ማይን፡ ወዘተ ብድሌተይ ይሳተፍ					
8	እነ ካብ ማሓዙተይ ሓሳብ ይቕበል ይህብምስ ክምኡዉን ዘጓንፅ ነገር እንተጋጥመኒ ስርዓት ብዘለዎ ምይይጥ ንቲ ጎንፂ ይፈትሕ ፡፡					
9	እነ ምስ ወለደይ ብዛዕባ ዕልዋ በዝሒ ሰድራን አገዳስነት ምጣነ ስድራን ምስወለደይ ይመያየጥ					

መእታዊ፡ ናይዚ መጠይቕ ዕላማ ንትምህርታዊ ፅንዓት ዝኸውን ሓበሬታ ንምእካብ እና፡፡ እዚ አጠይቀ ክትምልኡ ተለኽም እትህብዎ ሓፈታ ተክሰኛነት ንቲ ፅንዓት ዓብይ ግደ አለዎ፡፡ ስለዚህ እቶም ዝቐረቡ መጠየቃት አንቢብኽም ትክለኛ ናኹም ዝኾነ ባህሪ ዝኾነ ሓበሬታ ሃቡ፡፡ መልሲ ንምሃብ ንክጥዕመኩም ናይቶም አብ ሕድሕድ መጠየቃት ቅድሚት ዝተቐመጡ ቁፅርታት ትርጉም አዩ፡፡

5 - ኩል ግዜ
4 - ዝበዝሕግዘ
3 - ሓሓሊፍ
2 - አብ ብጣዕሚ ውሕዳት ግዘ
1 - ፈፂሙ ገይረዮ አይፈልጥን

ሰለዚ እቶም መጠየቃት አንቢቢኽም ምስተረዳእኽም ናትኩም ዝኾነ ባህሪ (ተግባራዊ ምንቕስቓስ) ዝውክል ቁፅረ ብ(√) ምልክት ተጠቂምኽም መልስኽም ሃቡ፡፡

	development of science and technology.					
7	U7 = I feel government is the primary accountable body for environmental degradation in our locality.					
8	U8 = In my view using large mass of chemical fertilizers have no impact on the environment but increasing Agricultural yield.					
9	U9 = I believe that the balance of nature is unaffected by any human activities actions.					
	Attitude scale for protecting the environment					
10	P1 = I believe that earth' resource is limited and must be conserved and preserved to sustain future generation.					
11	P2 = In my view instead of spending much to luxury life of the present generation we have an obligation to preserve and protect resources for our future generation					
12	P3 = In my view farmers must only use animal dung or compost to their garden instead of inorganic chemical fertilizers.					
13	P4 = I feel man's own activities are the main causes of environmental disasters such as drought and famine.					
14	P5 = I believe that if we develop a habit of feeding our animals at home or limited area we can easily prevent environmental degradation such as errosion.					
15	P6 = I believe the current global environmental problems are results of fast development of science and technology.					
16	P7 = In my view plants and animal have as equal right as human beings to survive in this world					
17	P8 = I feel we human beings have no the right to abuse nature to satisfy our unlimited needs and interests.					
18	P9 = I think balance of nature is sensitive and easily disturbed by human interference.					
	Attitude scale for appreciating the environment					
19	E1 = I feel that forest must be protected and conserved because it is source of wisdom and beauty nature.					
20	E2 = I believe that any of us should develop a habit of refreshing our self by visiting forest area and wild animals in it.					
21	E3 = In my view every one of us have to develop a habit of visiting cultural heritages.					
22	E4 - In my view the return of Aksum obelisk has no use to people of Alamata.					
23	E5= I think every one of us should appreciate and obey the culture of our local community.					
24	E6 = I feel every body should know 6 dance how to cultural dances.					
25	E7= In my view cities must green and area for recreation.					
26	E8 = I feel we have to conserve the forest for its esthetic value than its economical value.					
27	E9 = I believe that every one of us has the responsibility of conserving both natural and social aesthetic values.					

Behavioral scale

Objective:- This behavioral scale is developed to test students commitment to action (their participation) for environmental issues after their environmental education in science

Please indicate your level of agreement on each of the following statements by putting tick mark /√/. The scales are: Always = 5; Q usually = 4; Sometimes =3; Seldom = 2; Never = 1

S.N.	Item	Level of agreement				
		5	4	3	2	1
1	I take concern to dispose my daily school wastes (torn paper, napkin, rubbish etc) in appropriate garbage place.					
2	I take concern& care not to cause any environmental problem (pollution, deforestation etc) in my daily life activities.					
3	I care school plants (trees, flowers, grass) for keeping my schools natural beauty.					
4	I willingly participate in mass movement for planting tree which is organized by my school or kebele.					
5	I take concern to discuss with friends about local environmental problems and their alternative solutions.					
6	I take concern to share my environmental knowledge and skill to my local community members.					
7	I willingly participate in environmental sanitation, rehabilitation, soil conservation etc mass action which was organized by school or kebele.					
8	I give and take ideas from friends & solve conflicts through mutual dialogue.					
9	I take concern to discuss about impact of family size the need for family planning with parents					

4. Pre observation Checklist for Classroom Observation

	Item	poor	good	V.Good	Excellent
1.1	Incorporate EE themes in planning lessons for instruction				
1.2	Use of curriculum materials for lesson planning development				
1.3	a) Integration of cognitive EE objective b) Integration of psychomotor EE objectives c) Integration of affective EE objectives				
1.4	Plan content and methods in line with the curriculum document				
1.5	Plan by modifying curriculum contents and methods to students local environment				
1.6	Plan appropriate teaching resources				
1.7	Plan appropriate evaluation strategies				
	2. Lesson plan checklist				
2.1	use of teacher dominant methods 2.1.1 Use lecture				
	2.1.2 Teaching – learning focus on mastery of facts found in students text				
	2.1.3 Teachers demonstrate experiments to students				

	2.1.4 Teachers incorporate local specific environmental issues through their explanation through their explanation and examples of their lesson planing				
2.2	Use of student centered method in planning 2.2.1 Use of group discussion and debates on environmental issues				
	2.2.2 Facilitate students own or group learning by posing problems and make students find solutions in or out of the classroom				
	2.2.3 Use of out door teaching strategies such as field trip, project work etc in ecological or social environments				
	2.2.4 Make students to learn by observing or doing in their real environment through experimentation, problem solving.				
2.3	Use of appropriate real or simulated teaching resources in the school or the local community				
2.4	Use of appropriate evaluation techniques to assess achievement of objectives.				

5. Classroom Observation Checklist

	Teaching learning strategies (methods) applied by teachers' instructional process for acquiring EE objectives.	Yes the task is accomplished	Not the task is not accomplished
1	Effective use and implementation of EE contents (facts, issues and problems) for cognitive development of students using teacher center methods.		
2	Infusion of local specific environmental issues appropriate to immediate reality of learner environment.		
3	Proper usage of available school resource pertinent for teaching EE learns (laboratory pedagogical center, science kit etc.		
4	Use of local community issues ecology and human resource for teaching and learning purpose		
5	Use and effective implementation of teaching strategies appropriate for EE as suggested in curriculum documents:- a) Outdoor methods (field trip, field work, etc.		
	b) Affective educational methods (value-clarification methods) such as role play, debate, games group discussion.		
	c) Problem solving, project work, case study		
6	Evaluation of intended EE objectives in light of cognitive affective domains.		

5. Observation Checklist for the School Compound

Objective:- This checklist is prepared to assess the holistic activities of the school that intended to achieve environmental education goals.

	Item	Availability		Rate of usage for EE teaching learning			
		Yes	No	1	2	3	4
1	Availability and usage of school vegetation for teaching learning process 1.1 Trees and flowers, in the school compound 1.2 Student and teachers use of school vegetation for teaching learning process 1.3 Involvement of students in caring and managing school vegetation individually or in group						
2	Availability of school garden and usage of it for teaching learning process						
3	Availability and usage of buildings for teaching learning process 3.1 classrooms and their standards 3.2 laboratory and its usage by teachers and students 3.3 pedagogical centre and sue of it for making EE teaching aids 3.4 latrine and clean usage by students						
4	Availability and usage of school waste garbage 4.1 Clean and attractive school compound 4.2 Students willingly participate in cleaning their classrooms and school compounds						

6. Semi structured interview questions for teachers

School _____ Qualification _____

Service year _____ Subject of teaching _____

Grade _____

1 Do you have any idea how EE is given in grades seven and eight curriculums?

2. Have you ever integrate local specific environmental issues and problems in classroom instructions? If yes in which of the chapters? For how many often?
3. How often do you use curriculum documents for your lesson preparation & instruction?
4. Do you apply all the methods suggested in curriculum documents if yes how? And if no what is the reason?
5. Have you ever applied teaching methods such as group discussion, field work, experiment, debating, role play, case study and problem solving in your subject's classroom instructions? If not what are major obstacles?
6. Which methods are your frequency used to teach students about Environmental issues?
7. Have you ever use local community resources such as ecology, environmental issue or resource persons for your teaching purpose?
8. What are the most frequent methods you are using for teaching? With what method do believe your students learn your subject best?

9 Can you brief me how you evaluate your students in relation to EE?

10 Have you ever trained how EE is integrated in classroom instruction?

Appendix -D

ኣዲስ ኣበባ ዩኒቨርሲቲ
ቤት ትምህርቲ ድህረ ምረቓ
ኣብ ኮሌጅ ስነ ትምህርቲ
ክፍሊ ስርዓተ-ትምህርቲን
ናይ መምህራን ሙያዊ ልምዓትን ፅንዓትን

መምርሒ፦ እዚ መጠይቕ ንልጋሎት ትምህርታዊ ፅንዓት ስለዝውዕል ብሙሉእ ተኣማንነት ከምትምልእዎ ተስፋ እናገበርኩ ንዘገበርኩምለይ ምትሕብባር ኣቐዲመ ብኽብሪ የመስግን።

ዉልቓዊ መረዳእታ ተሳተፍቲ(ተፀናፅቲ)

ብዛዕባ ዉልቐመረዳእታኹም ዝቐረቡ መጠየቓት ኣንቢቢኹም ንዓኹም ዝውክል ሓበሬታ ብ(√) ምልክትተ ጠቂምኩም ወይ ብፅሑፍ መልስኹም ሃቡ።

ክልል_____ ዞባ_____ ወረዳ _____

_____

መንበሪ፦ ከተማ ☐ ገጠር ☐

ፆታ፦ ተባ ☐ ኣነ ☐

ዕድመ፦ < 14 ዓመት ☐ 14 ዓመት ☐ >14 ዓመት ☐

ደረጃ ትምህረቲ ስድራ፦ ዘይተመሃረ ☐ እስካብ ቐዳማይ ብርኪ ዝተማህረ ☐

ካልኣይ ብርኪን ልዕሊኡን ዝተምህረ ☐

ልምዲ ምክትታል ማእከላት ሓበሬታ\ሬድዮ ቲቪ ወዘተ፦ ኩልግዜ ይከታተል ኩልግዜ ☐ ኣይከታተልን☐

ኣባል ዝኾንካሉ\ኽሉ\ ክለብ ብ ብ(√) ምልክትተ ጠቂምኩም መልስኹም ሃቡ።

ከባቢያዊ ፅሬት----------ዓድኻ ፍለጥ----------

ሕረሻ _____

ሓለዋ ከባቢ _____

ስነ ህዝቢ_____

ነቐር ክለብ _____

ክለብ ተፈጥሮ ሳይንስ_____

መምርሒ፡ - ኣብዚ ፈተናዊ ዘለው ሕቶታት ሓደ ትክክል ዝኾነ መልሲ ጥራሕ ዘለዎም ኢዮም። ስለዚ መልሲ እዩ ኢልካ(ኪ) ዘኣመንካሉ(ክሉ) ምርጫ ፊደል ብምኽባብ መልስ(ሲ)። መልሲ ንምኾያር እንተዳሊኻ (ኺ) እቲ ፈለማ መልሲ ኢዩ ዝበልካዮ(ክዩ) ምርጫ ብ x ምልክት ተጠቂምካ\ኺ\ ሰርዝ\ዚ\።

1. ናይ መሕረሲ፣ ናይ መዝርዒ፣ ናይ መሳየይን ናይ መዕፀዲን እዋናት ብግብኢ ሓሲኻ ብምጥቃም ፀረ-ዝራእቲ መቆጻፀሪ ሜላ _____ መቆጻፀሪ መይላ ይበሃል
   ሀ. ባህላዊ ለ. ኬሚካላዊ ሐ. ባዮሎጂካዊ መ. ፊዚካዊ
2. ኣብ ሓደ መንበር ህወታዊያን ክልተ ዝተፈለዩ ዘርኢ ዘለዎም ህይወታዊያን ብዛይገለ ምጉድዳእ ተሳሚዶም ዝነብሩስ ኩነታት _____ ተባሂሉ ይፅዋዕ
   ሀ. በለዓዊ ልፍንቲት ለ. ኢበለዓዊ ልፍንተቲት
   ሐ. ረብሓዊ ልፍንተቲት መ. ፅግዕተኛ ልፍንተቲት
3. ኣብ ራሕሲን ሙቐትን ዝረኽበ እንጀራ ወይ ሕምበሻ ዝዓብዩ ክሪ ዝመስሉ ነገራት እንታይ ይባሃሉ
   ኃ\ ፅሳዉ ለ\ቅጥሻራ ሐ\ ይስት መ\ፍሲ ቡኻሪያ
4. ኣብ ሓደ መንበሪ ቦታ ዝነበሩ ተክልታት በዝሐን ዓይነትን ንምግማት ንጥቀመሉ ዓይነት አወሳስዳ ናመና
   ሀ. ካድራንት ለ. አኻሪየም ሐ. ቴራርየም መ. ምድረሳዕሪ
5. ኣብ ዉሽጢ ስነ-ምህዳር ካብዝርከቡ ህወታዊያን ብዝለዓለ መጠን ናይ ፀሓይ ጎልበት ናብ ጥቕሚ ዘውዕል
   ሀ. በላዒ ተኽሊ ለ. በላዒ ስጋ ሐ. ሃመልማል ዘለም ተኽልታት
   መ\ ወድ ሰብ

6. ብዛዕባ ዝተመጣጠነ አኳሪየም (balanced aquarium) ሓቂ ዘይኾነ አየናይ አዩ
ሀ. ብዝሒ ተኽልታትን እንስሳትን ዝተመጣጠነ አዩ
ለ. እንስሳት ንተኽልታት አክስጅን ይህቡ
ሐ. ተኽልታት ንእንስሳት ምግቢን አክስጅንን ይህቡ
መ. እንስሳት ንተኽልታት ካርቦንዳይአክሳይድ ይህቡ
7. ካብዞም ዝስዕቡ መንበረ ህወታዊያን በዝሒን ዝርገሐን ህይወታዊያን ብዝበለፀ ዝሓቖፈ አየናይ ኢዩ
ሀ\ምደረ በዳ ለ\ ምደረ ሳዕሪ ሐ\አግራብ መ\ ቱንደራ
8 ካብ ስዒቦም ዝተጠቕሱ ሚላተት ምክልኻል ምምራት ሓዪን እቲ ሓደ ግቡእነት ዘለዎ አዩ፡፡
ሀ. ካብ ሓዪን ዝተሰረሐ አቕሓ ደጋጊምኻ ብማይ ምሕፃብ
ለ. ካብ ሓዪን ዝተሰረሐ አቕሓ እኹል አየርን ማይን አብ ዝረኸበሉ ቦታ ከይሸፈንኻ ምቅማጥ
ሐ. ካብ ሐዪን ዝተሰርሐ አቕሓ ብላስቲክ ምሽፋን
መ. ካብ ሓዪን ዝተሰረሐ አቕሓ ከይምርት ብብዕሉቱ ብዝተዘለለ አሲድ ብዕባዕ ምሕፃብ
9. ልዕሊ 300 ሚሊዩን ዓመታት አብ ዉሽጢ መሬት ተቐቢሮም ካብዝበሰበሱ ካርቦናዊ አካላት ተክልታት ዝፍጠር
ኮውሐ (rock) አየናይ አዩ
ሀ. ግራናይት ለ. ፀሊም እምኒ (ባዛልት) ሐ. እምነበረድ መ. ፋሓም እምኒ
10 ባርዕ ሓዊ ዘጥፍ ጋዝ አየናይ አዩ
ሀ/ 0_2 ለ/ $C0_2$ ሐ/ Co መ/ N_2
11. ብዛዕባ አክሲጂን ሓቂ ዝኾነ አየናይ አዩ?
ሀ. አክስጂን አብ ከባቢዊ አየር ይርከብ ከይኑግና አብ ውሽጢ ማይን ሓመድን አይርከብን
ለ. አክስጂን ንእስሳት ሂወት ምንባር ወሳኒ አዩ ከይኑግና ንተኽልታት ረብሓ የብሉን
ሐ. አክሰጂን ድሕሪ ምንዳድ ዕንፀይቲን ላንባን ዝርከብ ዉፅኢት ምቅፃልን ምብልዕላዕን አዩ
መ. አክስጂን ተኽልታት ብዝካይድዎ ምብልሓዕ ከይዲ ውህደ ብርሃን ዝፍጠር ጋዝ አዩ
12 ቐሊሎም ካብዝተጠቐሱ ፊዚካላዊ ለውጢ ዝኾነ አየናይ ኢዩ
ሀ\ምብስባስ ዕንፀይቲ ለ\ ምምራት ሓዪን ሐ\ ምፍጣር ደበና መ\ ምምፃዕ ስዋ
13 አብ ላዕለዋይ አካል መሬት (ክረስት) እቲ ዝላዓለ መጠን ትሕዝቶ (አባንደስ) ዘለዎ ባእታ አየናይ እዩ?
ሀ. አክስጂን ለ. ሲሊከን ሐ. ሓዪን መ. አሉሚኒየም
14. ቐሊሎም ካብ ዝተዘርዘሩ ቁምነገራት ነገራት ኩነታት አየር ካብ ነባሪ አየር ዝፈለየሉ ምኽኒያት በየናይ እዩ?
ሀ. ብንውሓት ጊዜ ለ. መጠን ረስኒ ወይ ዛሕሊ
ለ. ብዓይነት ንፋስ መ. ብዓይነት ደበና
15፡መሬት አብናይ ባዕላ ሓሳባዊ ዘንጊ (መሓንበቢ) ክትዘውር ከላ?
ሀ. 365 መዓልትታት የድልያ ለ. ዝተፈላለዩ ወቕትታት ይቀያየሩ
ሐ. ቐትርን ለይትን ይቀይየሩ መ. ነባሪ አየር ይቀያየር
16 መሬት አብ ዙሪያ ፀሓይ ዑደት ክትገብር ከላ?
ሀ. 24 መዓልታት ይወስደላ፡፡ ሐ. 24 ሰዓታት የድልያ፡፡
ለ. ናይ ወቕትታት ምቅይያር ይስዕብ፡፡ መ. ናይ ቐትርን ለይትን ምቅይያር የስዕብ
16.ሓቂ ዝኾነ ሓሳብ አየናይ እዩ?
ሀ. ብራኽ እንትውስኽ ናይ መሬት ሓይሊ ስሕበት ይዉስኽ፡፡
ለ. አብ ውሽጢ ማእኸል መሬት ሓይሊ ስሕበት የለን
ሐ. አብ ከባቢ አየር ዝለዓለ ትሕዝቶ ዘለዎ ጋዝ ናይትሮጅን እዩ፡፡
መ. አብ ከባቢ አየር ብራኽ እንትውስኽ መጠን ረስኒ አይቐየርን፡፡
17 ካብዞም ዝስዕቡ ቀንዲ ፍልፍል ጉልበት ኩሎም ህይወታዊያን ዝኾነ አየናይ ኢዩ
ሀ\ ሓመድ ለ\ ፀሓይ ሐ\ ማይ መ\ሓምላዋይ ተኽልታት
18. ናይ አግራባት ብርሰት ሳዕቤን ዝኾነ አየናይ እዩ?
ሀ. ወሰኽ ፍግረ መሬት ለ. ምውሳኽ ምህርቲ ሕርሻ
ሐ. ምውሳኽ ቐፅሪ እንሰሳ ዘገዳም መ. ምውሳኽ ቐረብ ዕንፀይቲን ፈሓምን

Model Coding Sheet of EE objectives For Grade Seven Chemistry Text BooK

K = EE knowledge = 0
S = EE skill = 1
A = EE Attitude = 2
P = EE participation = 3

List of objectives in chemistry text book	First coder				Second coder			
	K	S	A	P	K	S	A	P
1	0				0			
2	0				0			
3		1			0			
4	0				0			
5	0				0			
6		1				1		
7	0				0			
8	0				0			
9		1				1		
10		1				1		
11	0				0			
12	0				0			
13	0				0			
14	0				0			
15		1	2				2	
16					0			
17	0		2		0			
18		1					2	
19	0				0			
20	0				0			
21	0				0			
22						1		
23	0				0			
24		1		3				3
25		1						
26	0				0	1		
27		1				1		
Total	16	8	2		18	6	2	1

Pilot Test Result of Inter coder agreement for two coders of each subject

Po – Observed frequency
Pe – Expected frequency

$= \frac{Po - Pe}{1 \quad Pe}$ ---------- Scotts formula

First coder EE knowledge	Second coder				Row total
	EE knowledge	EE Skill	EE Attitude	EE participation	
	16 (10.7)	0(3.6)	0(1.2)	0(0.6)	16
EE Skill	2(5.3)	6(1.8)	0(0.6)	0(0.3)	8
EE Attitude	0(1.3)	(0.4)	2(0.1)	0(0.1)	2
EE Participation	0(0.7)	0(0.3)	0(0.1)	0(0)	1
Column Total	18	6	2	1	27

Po – Observed Agreement (common rating) $CR = \frac{2 \times M}{N1 + N2}$

$= \frac{2 \times 25}{27 + 27}$

$= \frac{50}{54}$

$= 0.92$

Pex = expected(chance) agreement $= \frac{2E}{N1 + N2}$

$= \frac{2 \times 6.21}{27 + 27}$

$= 0.23$

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

$= \frac{0.92 - 0.23}{1 - 0.23}$

$= \frac{0.67}{0.75}$

0.92

Similarly inter coder agreements were calculated for biology and physics text books. The results found were 0.90 and 0.91 respectively. According to Amare(1998) the recommended coefficient of agreement for two coders is 90 percent and above. Thus, the calculated values of the three subjects inter- coding agreements were reliable

Appendix-C

Criteria referenced test item development strategy

Background Information:-

Region _____ Zone _____ Wereda _____

Location:- Urban ☐ Rural

Sex:- M ☐ F ☐

Age:- < 14 years ☐ 14 years ☐ >14 years A ☐

Parent Education:- Illiterate ☐ Literate up to ☐ primary Education

Literate up to secondary and above ☐

(Radio, TV) Usage:- I use usually ☐ I don't use usually ☐

1. Criteria Referenced Environmental Education Test Items

Direction: Each question has only one correct answer. Therefore chose the correct alternatives and encircle your answer on the appropriate letters.

1. Controlling pest epidemics by adjusting time of ploughing sewing, weeding and harvesting is called _____ control.
   A. Cultural (traditional) B) Chemical
   C. Biological D. Physical
2. When two species live without harm in a given habitat, the relations is termed as _____
   A. Computation B. Commensalisms
   C. Symbiosis D. Parasitism
3. When bread or injera gets moisture and heat it forms a thread like substance called ____
   A) Mold B) Mushroom C) Yeast C) Busibukaria
4. To estimate the population size of plant species (vegetation) the best way of sampling is:
   A. Quadrant B. aquarium C. Terrarium D. grassland
5. Which one of the following organisms in the ecosystem utilize the largest amount of sun's energy?
   A. Herbivorous B. Carnivorous C. green plants D. Omnivorous
6. Which one of the following is false about a balanced aquarium:
   A. The number of plants and animals are balanced
   B. Animals give oxygen to plants
   C. Plants provide food and oxygen to animals
   D. Animals provide carbon dioxide to plants
7. Which one of the following habitat contains high number and type of living organisms.

A) desert B) grassland C) Rainforest D) tundra

8. Which one of the following method of preventing rusting of iron is appropriate?
   A. Repeated washing of iron tools with water
   B. Putting iron tool uncovered in air for long period of time
   C. Covering the iron with plastic
   D. Washing the iron with dilute acids every day before use.
9. Which one of the following is a type of rock which is made by very slow decomposition of vegetation over a period of 300 million years?
   A. granite B. Marble C. Coal D. Basalt
10. Of the following gases which one is a fire extinguisher gas?
   A. Oxygen B. Carbon dioxide C. Carbon monoxide D. Nitrogen
11. Which of the following is true about oxygen gas?
   A. It is naturally found in atmospheric air but not in water and soil
   B. It is essential for animals but not for plants
   C. It is a product of burning of wood and fossil fuels.
   D. It is produced by photosynthesis of green plants
12. Which one of the following is not a physical change
   A) decomposition of wood B) rusting of iron C) formation of cloud D) souring of Tela
13. The most abundant element in the earth's crust is:-
   A. Oxygen B. Silicon C. Iron D. aluminum
14 In which of the following factors is weather differs from climate?
   A. Length of time B. Magnitude of temperature
   C. Type of wind D. Type of cloud
15 When the earth rotates around its own axis:
   A. It needs 365 days B. It causes seasonal changes
   C. It is a cause of change in day and night
   D. It is a cause for change in climate
16 When the earth revolve around the sun
   A. It needs 24 days B. It causes seasonal changes
   C. It needs 24 hours D. It is a cause for exchange of day and night
17 Which of the following statement is true?
   A. The gravity of the earth increase as altitude increase
   B. There is no gravity as you go to the center of the earth.
   C. In the earth's atmosphere the largest component air is nitrogen
   D. As one goes up to the atmospheric air the temperature doesn't change.
18 Which one of the following is a source of enrgy for all living things.
   A) Soil B) Sun C) water D) Green Plants
19 Which one of the following is the consequence of deforestation
   A. Soil erosion B. Increase yield of agriculture
   C. Increased number of wild animals
   D. Good supply of wood and charcoal for household energy consumption
20 Which one of the following activities decreases the consequence of global warming?
   A. Burning of fossil fuels and wood at home
   B. Covering degraded land by forest in forestation and reforestation programs
   C. Fast usage of forest trees for house construction and industrial use

D. Increasing the number of factories and Vehicles

21 Soil erosion can not be prevented by:-
A. Contour ploughing B. Strip cropping
C. Terracing D. Clearing grasses and unwanted plants from garden

22 Which one of the following environmental problems frequently occurs in Tigray?
A. Drought and famine B. Earthquake
C. Volcanic eruption D. Flood due to heavy rainfall

23 The main cause of environmental problem in Ethiopia is
A. Natural phenomena B. Human unwise use of natural resources
C. Lack of people who produce much D. God's punishment

24 Which one of the following is not best way of family planning?
A. Use condoms B. Use contraceptives
C. Having one wife or husband D. Use loop

25 Which one of the following is not the most probable cause of current water pollution around rivers of "Alamata"
A. Usage of soaps and detergents in rivers
B. Usage of fertilizers and pesticides at garden area
C. Animal and human waste disposal industrial waste
D. Liquid and solid

26 Keeping the environmental sanitation and natural resource conservation is the responsibility of
A. All people in the society
B. Only the governmental bodies
C. Health service workers only
D. Students are not responsible because they are youngsters.

27 Which one of the following is not cause of air pollution?
A. Burning of charcoal at home
B. Burning of fossil fuel both at home, industries and vehicles.
C. Dust particles from factories such as "Mossobo"
D. Evaporation of water from lacks, ponds, and rivers

28 Which one of the following is good solution for preventing environmental degradation
A. Wise resource conservation and management
B. Fast usage of resources to alivate poverty.
C. Increasing population rate to get more productive forces
D. Increasing agricultural and industrial practices

29 Which one of the following option is not appropriate to control water born diseases
A. Keeping once personal hygiene
B. Keeping environmental hygiene
C. Increase health workers to treat patients infected with water born diseases
D. Organic fertilizers instead of chemical fertilizers.

30 Which one of the following is not the effect of air pollution in the environment
A. Decrease in atmospheric temperature
B. Health damage in plants animals including human beings
C. Weather change and disaster of flooding
D. Acidic rain and excessive soil erosion

31 One of the following effects is not the consequence of harmful rays of the sun
A. Skin cancer
B. Low acquired immunity of humans and other organisms for disease
C. Increase in air temperature
D. make organisms to resist diseases

32 Which one of the following is not man-made air pollution?
A. Natural oil burning for energy consumption
B. Smokes from home and industries
C. Smokes and dust particles from volcanic eruption
D. Smog formation on clouds of the sky of cities

33 Which one of the following minerals is used as fertilizer
A. Phosphate B. Graphite C. Coal D. Gold

34 Which one of the following properties is the major cause of "echo"
A) Reflection B) Vibration C) change in direction of light

35 A salt used as building material is
A. Iron B. Calcium Carbonate
C. Sodium Carbonate D. Epsom Salt

36 A cheap basic substance which is usually used to treat soil acidity is
A. Slacked lime B. Caustic Soda
C. Soda ash D. Ammonium nitrate

37 A chemical substance which is added to drinking water to kill pathogenic organism is _____
A. $Al_2(SO_4)_3$ B. Cl_2
C. Chemical that contain Cd^{+2}, Cd^{+2} & CN^- ion
E. Soaps and detergents

38 Which one of the following gaseous fuel is produced from animal dung?
A. Bio gas B. Water gas C. Producer gas D. hydrogen gas

39 Which one of the following is an example of force of contact?
A) Frictional force B) Magnetic force
C) Gravitational force D) Electrical force

40 Which one of the following methods is good for effective and efficient electrical transmition?
A) high voltage and high current system
B) low voltage and low current system
C) high voltage and low current system
D) low voltage and high current system

41 Which one of the following source of energy have no negative impact to the environment?
A) Nuclear energy B) Energy from hydroelectric power plant
C) Geothermal energy D) Energy from sum

42 Of the following instruments which one able us to form fire from sun radiations
A. divergent lens B. Convergent lenses
C. flat mirror D. concaveness

43 From the following methods of controlling malaria one is the best method for your locality which is it?

A. Putting mosquito net on windows
B. Removal of stagnant water in our surrounding
C. Adding oil to stagnant water
D. Treating paints with malaria drugs.

44 Which one of the following bad culture practice is a major cause of health problem of many females in Ethiopia?

A. late marriage B. Using contraceptives for long period of time
C. female circumcision D. male circumcisions

45 Which one of the following gases is poisonous and kill human beings

A. Carbon dioxide B. Carbon monoxide
C. hydrogen oxide D. nitrogen oxide.

46 Which one of the following salts contain an ion which found in temporary hardness of water?

A. Sodium bicarbonate B. Magnesium sulphate
C. Calcium salphate D. Magnesium and calcium carbonate

47 Of the following plants one rotates the sun in a shortest time compared with others

A. Mars B. Venus C. Jupiter D. Earth

Which one of the following natural resources is not renewable easily by natural process?

A. Soil and water B. Nitrogen and Oxygen gases of the air
C. Plants and animals in the ecosystem

17 Of the following one is true about air pressure in the environment

A. There is high air pressure at the lowland areas
B. There is low air pressure at lowland areas
C. There is high air pressure at lowland areas
D. Air pressure doesn't depend on altitude

2. Environmental Education Attitude scale

Direction:- Under each of the following statements scaling numbers 5,4,3,2 and 1 are given. The given numbers represent:- 5 = Strongly agree, 4 = agree, 3= undecided, 2 = disagree and 1 = strongly disagree. Put the level of your agreement by careful reading of each question.

	Item	Level of agreement				
	Attitude scale for utilizing the environment	5	4	3	2	1
1	U1 = In my view earth has unlimited resource, thus our aims should be learning how to use them.					
2	U2 = I think it is meaningless to think about the future generation without meeting the luxury life of the current generation.					
3	U3 = I believe that a person who cuts tree and sale for wood must not be blamed because it is the only choice to sustain his life.					
4	U4 = I feel that, increasing arable land by clearing the forest area helps us to decrees our current poverty level.					
5	U5 = I feel that though it spends too much resources, cultural ceremonies like wedding should not be discouraged.					
6	U6 = I believe that we can over come every sort of environmental problems through					

Appendix

Appendix A
Respondents of the study

Respondent Grade Eight Students

Area of study	School population	Sample schools														
Urban Alamata	6	Alamata UPS						Kokebtsibah UPS						Total sample size		
		Population			sample			Population			sample					
		M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
		192	211	403	30	30	60	117	135	252	30	30	60	60	60	120
Rural Alamata	8	Alembrhan UPS						Waja UPS						Total sample size		
		population			sample			population			sample					
		M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
		154	136	290	30	30	60	129	128	257	30	30	60	60	60	120

Respondent teachers

	Alamata UPS	Kokebtsibah UPS	Alambraha UPS	Waja UPS
chemistry	1	1	1	1
Biology	1	1	1	1
Phsics	1	1	1	1

Appendix B

I. Coding Sheet I for EE objectives

This coding sheet is developed to examine the integration of EE in upper primary natural science curriculum document of Tigray which were revised in 1999 E.C.

- Needed Data:- EE themes integrated in objectives developed
- Subject:- in the documents Biology, chemistry and physics Textbook
- Grade level:- seven and eight
- Unit of Analysis:- objectives developed I the text book
- Dimension of count or content unit:- EE objectives
- Recording unit for categories:- EE knowledge attitude, skill and participation type objectives.

Model EE knowledge objectives

The action verbs that were used to identify knowledge type EE objectives were recall, repeat, explain, list, give example, etc. For instance some of the models used to signify the knowledge type EE objectives for counting and recording purpose those stated like: -
Students will able to:-*State causes of pollution;List effect of fertilizers;*
Explain solutions for erosion, deforestation, waste disposal etc. (UNESCO, 1991).

Model EE skill objectives

EE skill objectives which are supposed to help learners in decision making, anticipating, and analyzing, predicting and evaluating issues related with the environment categories of skill type EE objectives higher level environmental education objectives that were supposed to raise students thinking skills (critical thinking, decision making skill and problem solving Skill) were used.
The action verbs which were used for identifying skill type EE objectives were: apply, organize predict, use, demonstrate, measure, collect, compare, make identify draw conclusion etc.

According to the above definition the model skill type EE objectives which were used for counting and recording purpose were those which stated like:-
At the end of this lesson students should demonstrate ability to:- *To use library resources; Interview experts to obtain information; Collect necessary specimen; Make choice between alternative ;Predict consequences or solutions for environmental problems for environmental problems ;Identify patterns or signs of environmental problems etc. (UNESCO, 1991)*

Model E E Attitude objectives

Attitude is considered to be the main component of EE and must be learned/or changed in addition to intellectual and motor skills (MoE, 19940). This component emphasizes on development of value clarifications, motivation and commitment in learners belief, emotions and actions. Similar to the former cases, some of the model examples used for categorizing EE objectives in two attitude type are objectives stated like:

At the ends of the topic (lesson) students show: *willingness to find things for themselves; Appreciation for their environment; care their environment; Concern for living and non-living thing (UNESCO, 1991).*

Model EE participation objectives

The objectives under this category are those which belonged to practical actions so as to solve environmental problems and acting and behaving one behavior and pattern of lifeFavorable for the environmental health, it includes doing something with the choices or decisions made and repeating the choice or decision in some pattern of life participate voluntarily and cooperatively in alleviation of environmental problems some of the models of EE objectives which were used in categorizing environmental participation objectives were those stated like:

At the end of this topic (lesson) students should:- Act based *on the decision made;Assist others in group work ;Act Participate in school clubs; Freely express their feeling ;Express concern over the distraction of habitat etc. (UNESCO, 1991).*

Direction:

Grade	Total objective	EE objectives	Categories of EE			
			knowledge	Attitude	Skill	Participation
7						
8						
Total						

Coding sheet II-EE contents

This coding sheet is developed to examine the integration of EE in upper primary natural science curriculum documents of Tigray which were revised in 1999 E.C.

General Information

- Need Data:- EE themes integrated in contnts developed
- Subjects:- Biology, chemistry and physics text books
- Grade level:- Seven and eight
- Unit of Analysis:- A unit (chapter) as a whole
- Dimension of count (content unit) = EE contents in a unit or sub unit
- Recording units for categories. Education about, in and for the environment.

A unit in document is considered as environmental education if it eclectically incorporated the three dimension of EE. That is education about, in and for the environment.

A natural science unit was considered to be environmental if it incorporation environmental facts and concepts, issues and problems with the intention of environmental awareness, appreciation and action (MoE, 1991).

Direction:- Read the contents presented in a unit or sub unit of the text books and Determine the content whether it incorporate environmental issues or not according to the operational definition given to EE contents then if the unit or sub unit you explored contain the three themes of EE (Education about, in and of the environment) record it in the table that follows.

Coding Sheet III – For EE methods of teaching learning strategies
This coding sheet is developed to examine the integration of EE in upper primary natural science curriculum documents of Tigray which were revised in 1999 E.C.

General information

- Needed Data:- EE themes integrated in teaching learning methods developed
- Subject: Biology, chemistry and physics teachers guides
- Grade:- seven and eight
- Unit of Analysis:- Teaching learning strategies (methods) developed in the material.
- Dimension of count (content units):- Teaching learning strategies (methods) appropriate to environmental education instruction.
- Recording units for categories:- experiments, field trip or field work, project work, debate group discussion, problem solving, role play and case study.

Direction:- After you explored the suggested methods under each topic and sub topic of the units developed in the teachers guide then determine whether the suggested method is appropriate to EE instruction according to the operational definition given to it.

Operational Definition Groups of Mental Skills and Teaching/Learning Strategies for Acquiring them

		Groups of Skills	Mental Processes	Teaching Learning strategies
Awareness	A	Investigative diagnostic decision-making	Observing analyzing measuring synthesizing	Field trips experiments project work problem solving
	B	Values clarification	Analyzing prioritizing comparing	role-playing and simulation debates discussion situation analysis
Understanding	C	Anticipatory	Hypothesizing inferring recognizing signs trends, patterns analyzing synthesizing	Experiments situation analysis
	D	Assessment evaluation	Analyzing discriminating application	Establishing criteria forming judgments
Participating	E	Action oriented	Planning problem identification evaluating decision-making	Project work

Source: UNESCO(1991:)

Coding Sheet IV for EE Evaluation Techniques

This coding sheet is developed to examine the integration of EE in upper primary natural science curriculum documents of Tigray which were revised in the 1999 E.C.

General information

- Needed Data:- EE themes integrated in evaluation techniques developed in documents
- Subject:- Biology, Chemistry and Physics text books
- Grade level:- Seven and eight
- Unit of Analysis:- item developed in the text book
- Dimension of counting (content unit):- Evaluation Technique appropriate to measure the three themes (dimension) of EE.
- Recording units for categories:
- Evaluation technique for measuring environmental skill (Problem solving) and attitude.

Ealuation of EE are processes of determining the extent to which EE objectives are being realized as intended changes in the behavior patterns of learners. For the assessment of achievement of EE objective a combination of two or more methods (techniques) can be applied. For instance knowlege and understanding about the environment can be evaluated using paper and pencil tests such as multiple choice completion, matching and true or false (MoE, 1994). Therefore low level cognitive EE objectives which are at the level of awareness and comprehension can be measured using this method. However according to MoE (1994) certain intellectual skills (higher level cognitive EE objective) and communication skill can beassessed by the use of essay type question and simulated situations such as role play.

Further more affective domains of EE can be assessed using check list of behaviors, rating scales and ranking scaes (MoE 1998). In addition to the above mentioned tools (instruments) performance tests can also be used to assess acquired skills such as manipulative skills, operating skill etc. Thus, the performance test can be used for assessing environmental skills.

Direction:- After you explored the developed evaluation strategies in the target document identify those which are appropriate to EE – themes. Then categorize the identified EE evaluation techniques in to the environmental knowledge, skill and attitude.

Subject _____

Grade	Total items developed	Items that intended to measure EE out comes	Categories of EE evaluation strategies		
			EE knowledge	EE skill (problem solving)	EE attitude
Seven					
Eight					