Developing Teacher Training Curricula to Promote Ecological Awareness at Tertiary Education

By
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To

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Modern Languages do hereby declare that the thesis (Title) Developing Teacher Training Curricula to Promote Ecological Awareness at Tertiary Education submitted by me in partial fulfillment of PhD degree, is my original work, and has not been submitted or published earlier. I also solemnly declare that it shall not, in future, be submitted by me for obtaining any other degree from this or any other university or institution.

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ABSTRACT
Thesis Title: Developing Teacher Training Curricula to Promote Ecological Awareness at Tertiary Education

This research had been planned to develop the Teacher Training Curricula to respond to the society’s call to promote ecological Awareness at tertiary education. The aim was to help produce more knowledgeable, motivated and responsible teachers and active citizens through improved and sustainable teacher education. The researcher proposed to adopt the Curriculum Development route to secure this objective. The researcher had based his approach on a combination of a model presented by Hungerford and Volk (1990). In broad general terms the curriculum development task of this nature had adopted constructivist approach of learning theory.

The research had undertaken the task of developing and proving a curriculum pertaining to one of the courses that may be taught as part of Teachers’ training curriculum. The course thus developed had been purpose-designed to enhance ecological awareness among trainee teachers. An Awareness scale had measured the pre-test and post-test levels of ecological awareness and relative gain had been used as an indicator of the success of the class experiment. The prosecution of central hypotheses had followed a combination of qualitative and quantitative approaches.

Curriculum development process had been guided by the following framework: (1) Review of Literature to establish the state of research on the subject, (2) content analysis of the prevailing curriculum in one of the ICT Teachers Training Institutes, (3) Development of the curriculum and the teaching contents/materials of one of the courses especially oriented to enhance ecological awareness in trainee teachers, (4) Class experiment, (5) assessment of gain, and (6) assessment of the success of the class experiment.

The study had been significant in enhancing the effectiveness of teachers’ training curricula in promoting ecological concerns at tertiary level of education. It had been expected that trainee teachers made conscious of their environmental responsibilities would help educate our future generations along these lines and produce environmentally responsible citizens. This would in turn help achieve national agenda on environmental protection aimed at preventing further damage to environment and initiating a recovery.

Key Words

(1) Environmental Science, (2) Environmental Activism, (3) Environmental Advocacy, and (4) Environmental Justice

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Sohaib Sultan
DEDICATION

In the honour
of my mother,
sister and brother
CHAPTER 1

INTRODUCTION

1.1 Background of the study:

In this study, the researcher attempted to integrate investigation into the content aspect of environmental education curricula employed in teachers’ training institutions in Pakistan with a focus on building human resource capacity at the level of the individual. The framework for HR development aimed at enhancing the quality of individual teachers, with a sharp focus on adaptive capacity at the level of the teacher when it came to the understanding of ecological system. The research had suggested a wide range of processes for this purpose. Emphasis had been placed on Responsible Environmental Behavior (REB) (Hungerford and Volk 1990) and activity theory. The research examined how environmental education contents found within teachers’ curricula in vogue in Islamabad Capital Territory in Pakistan meet or failed to meet the challenge faced by the nation to create ecological awareness amongst participants.

The inclusion of environmental concerns as part of teachers’ training curricula through added courses / modules fell under the concept of constructivism. The task called for developing courses / modules / lessons that, by and large, did not exist, or happened to be ineffective in securing their objectives. Diversity thus created through distributing multiple forms of knowledge among student teachers might contribute directly to increase environmental protection, enhanced quality assurance in enforcing environmental laws, and through would-be teachers, promoting awareness among student communities on these vital concerns.

There was little focus on environmental education in Pakistan as yet although it was one of the main issues on United Nations charter. One of the main objectives of
UN charter was to develop awareness regarding environment through teachers training programs while no emphasis was laid down in Pakistan on this subject. Chawla and Cushing described the principal focus area of actions and behaviors in relation with ecology education: “Environmental education has traditionally focused on how to foster changes in individuals that are associated with pro-environmental actions and behaviors (Chawla and Cushing 2007; Hungerford and Volk 1990).”

A large part of sensation would be dependent upon converting theory into practice that fosters such features in youth. One idea might be organizing volunteers from amongst young learners that might be engaged under the ‘stewardship’ thought, in water stream or channel refurbishment in communities where livelihood depends upon such a stream / water channel. The ventures that could be easily developed and supervised by local school teacher would help build social bindings (a part of social capital) and at the same time enhance entertaining opportunities, water quality, and other environmental services provided by the stream. Each school must be proficient to identify projects of this natural world that would respond to the environmental needs of the community. Even in current period of economic hardship, it was possible to fund these projects through local supporters rather than waiting forever for government funding or United Nation agencies. Several examples of self help were seen in the aftermath of the devastating earthquake in Azad Kashmir and northern Pakistan in 2005 and again in 2010 in Indus valley in Punjab and in Sindh when floods had swept away everything villagers living along riverbanks possessed. The same spirit is needed to undertake the ecological challenge.

1.2 Theoretical and Conceptual Framework

1.2.1 A Constructivist Approach to Learning

Constructivism is the philosophy of learning whose foundation is laid on the concept that by reflecting on experiences of learners, learners construct their own understanding of the natural world we live in. Constructive theories of learning had drawn attentions to how individuals make meaning of events and activities; hence, education is seen as the construction of knowledge. In constructivist approach to learning, the teachers performed as a guide and facilitator to students. Role of learners must be active as thinker, interpreter and energetic constructor of knowledge. The
researcher had followed constructive approach to develop social learning process from beginning to end expositions / discussions promoting the concepts of environmentalism. The learning would lead to synthesizing solutions for existing problems such as optimizing energy production exclusive of polluting the environment, finding alternative, a reduced amount of damaging, technologies and courses for industrial production. The success of efforts would stretch out in success of academic practices in promoting understanding for environmental concerns. For this purpose contents from the domain of environmental education had been added in teachers’ training curriculum adopting constructive approach to function in doing so.

1.2.2 Environmental Education and Responsible Environmental Behavior (REB)

The purpose of environmental education, dating back to the 1960s, has often been to produce more knowledgeable, motivated, and active citizens (Stapp, 1969). It was generally thought environmental behavior would change and improve as people became more knowledgeable and aware (Bruvold, 1973; O’Riordan, 1976), though more recent frameworks had emphasized the need for skill in action taking as well. The movement towards skill and action was also illustrated by a Hungerford and Volk (1990) study in which the authors argued that in order to promote REB in learners, information needed to be combined with favorable attitudes, action and skills. In their article, Hungerford and Volk developed a sequential model to aware about responsible environmental behavior (REB) with consideration given to previous behavior research. Their model was based in part on a previous model of REB developed by Hines, Hungerford, and Tomera (1986/87), despite the fact that in their model the researchers distinguished between minor and major variables that contribute to REB. Both of these models had drawn upon two theories from social psychology:

<table>
<thead>
<tr>
<th>Entry-Level Variables</th>
<th>Ownership Variables</th>
<th>Empowerment Variables</th>
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<tbody>
<tr>
<td>Environmental</td>
<td>In-depth knowledge</td>
<td>Knowledge of and skill</td>
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<tr>
<th>ENVIRONMENTAL BEHAVIOUR</th>
<th>ENTRY-LEVEL VARIABLES</th>
<th>OWNERSHIP VARIABLES</th>
<th>EMPOWERMENT VARIABLES</th>
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<tbody>
<tr>
<td></td>
<td>Environmental</td>
<td>In-depth knowledge</td>
<td>Knowledge of and skill</td>
</tr>
</tbody>
</table>
Table: Hungerford and Volk’s (1990) model of Responsible Environmental Behavior

The Hungerford and Volk model was a synthesis of research from many settings and suggests that REB is a function of a chain of three indices. The researcher had used that model for developing curricular contents of environmental education in teachers training. The model is briefly explained hereunder:

a. In first stage the new entrant model would be introduced to fundamental environmental issues to generate sensitivity. Entry level variants are (1) basic knowledge of ecology; (2) Nonviolent resistance; and (3) development of attitudes towards pollution, technology and economics;

b. Ownership variables had been placed at second level. In-depth knowledge of environmental concerns would be helpful in developing cognitive skills of learners. The individual must (1) make personal investment in environment at this stage; (2) be aware of negative and positive consequences of behavior; and (3) demonstrate a personal commitment to resolution of issues and conflicts.
c. At third stage the activist would be measured for empowerment variables. This would be demonstrated through development of affective behaviour: (1) in-depth knowledge of issues; (2) development of skills in using environmental action strategies; (3) activist’s locus of control; and (4) his or her intention to act.

Researcher had based his indicators for the purpose of measurement of change in behavior as a result of teaching of ecology-related contents on these variables in his questionnaires.

1.3 Research Questions:
1. How does ecological awareness ecological awareness amongst masses contribute to sustainable development of society?
2. Would greater ecological awareness enhance quality of life in Pakistan?
3. Who would be the agents of change in creating greater ecological awareness in society?
4. Would formal education be a potent source of developing ecological awareness in society?
5. If so, would measures to enhance ecological awareness of trainee teachers contribute to enhancement of ecological awareness amongst masses?
6. If so, would it lead to enhancement in the quality of life in Pakistan; for instance, would it lead to curbing the unchecked practice of making soakage pits in one corner of the house?
7. Would participation of community be greatly enhanced by introducing ecological awareness in teacher training curricula and in school curricula?
8. Have teachers’ training institutes included ecological agenda in their curricula?
9. Have teachers’ training institutes developed adequate curricular contents and adopted effective teaching strategies to enhance the effectiveness of trainee teachers in creating ecological awareness amongst their students?
10. What are emerging ecological issues in Pakistan?
11. What contents are required to be developed towards ecological awareness in Pakistan?
12. What contents and strategies have been developed towards ecological awareness of trainee teachers as part of B.Ed. and M.Ed. level of education?

13. Is there a need to design separate courses to develop ecological awareness among students of various levels?

14. Are there subject specialists / instructors available to teach ecological awareness related courses to students at various levels? If not, how are we going to arrange for them?

15. Are workshops / seminars / conferences routinely held to provide awareness on ecological issues at school, College, and university levels?

16. Have Awareness Development Programmes shown positive results?

1.4 Statement of the Problem:

The prevailing teacher training curricula in Pakistan needs innovation and modernization. The social ecological awareness is a challenge for Pakistani society as pollution is destroying the ecology of the country, poisoning our agricultural fields next to the industrial areas, endangering fish and marine resources in rivers and in North Arabian Sea, and taking a toll on personal health of the citizens. The root cause of the problem is general lack of awareness on environmental issues. This in turn precludes any effective collective action in support of environmental cause.

The researcher believes that there is a panacea – education. The researcher further believes that the best forum for promoting ecological awareness is formal education at school level; that the best way to ensure quality ecological education at school level is to make awareness of ecological concerns part of teachers’ training at tertiary level so that teachers enhance the ecological awareness of their students at secondary level and help develop the right attitudes.

Thus, through teacher training programs a huge mass of population can be guided to develop positivist and activist attitudes on environment, an issue that still continues to remain an emerging subject in our society. Environmental programmes hardly draw any attention or attract huge funds in Pakistan unlike western societies and Japan.

The research was undertaken to scrutinize teacher’s training curricula’s in relation to the task of developing ecological awareness in trainee teachers in
Islamabad Capital Territory, and further, investigate the strategies required to be developed at B.Ed; and M.Ed; level of education towards developing social ecological awareness among trainee teachers.

1.5 **Research Objectives:**

1. To identify the contribution of Ecological Awareness towards sustainable development of Pakistani society.
2. To assess the scope of enhancement in the quality of life through development of ecological awareness.
3. To pin-point emerging Ecological issues in Pakistan.
4. To develop an outline of contents that may be included in the curriculum of trainee Teachers to enhance their ecological Awareness.
5. To recommend the teaching strategies required to be adopted towards enhancing ecological awareness of trainee teachers at B.Ed; M.Ed; level of education.
6. To highlight the need for holding of workshops/seminars/conferences held routinely at schools, colleges and university levels to provide ecological awareness in society.

1.6 **Research Hypotheses:**

H$_{10}$ There is no relationship between ecological awareness amongst masses and sustainable development of Pakistani society.

H$_{20}$ There is no relationship between the ecological awareness of trainee teachers and enhancement in the quality of life in Pakistan.

H$_{31}$ Adequate curricular contents and effective teaching strategies have been developed and employed for the purpose of enhancing ecological awareness amongst trainee teachers in teachers’ training institutes in Islamabad.
Development of adequate curricular contents and adoption of effective teaching strategies will not enhance the effectiveness of trainee teachers in creating ecological awareness amongst their students.

1.7 **Significance of the Study:**

The study will be significant in enhancing the effectiveness of teachers’ training curricula throughout Pakistan in general, and in Islamabad Capital Territory, in particular. The research would be instrumental in developing effective strategies towards teaching of ecological concerns at tertiary level of education hoping that the awareness would trickle down to a much larger number of students and eventually to masses.

By scrutinizing the existing formulation of teacher training curriculum, this research would provide guidelines for the future researchers to undertake further research in areas of ecological significance for application in the field of education, environment technology and attitude formation.

It was noted that the ecological awareness had been a topic of research in education spheres in Pakistan but only a rare number of researches had been assigned to this topic in the field of pedagogy. Ecological research in Pakistan at tertiary level was rather scant as per the record of the Higher Education Commission of Pakistan.

The research would, therefore, be productive for the developers of teachers’ training curriculums in Pakistan in suggesting effective ways to develop contents in a qualitative manner. The current research had suggested innovative strategies and practices for the training of teachers in the perspective of 21st century concerns.

1.8 **Methodology**

The above listed hypotheses have been prosecuted in the following manner pursuing a qualitative descriptive methodology:

H⁰ There is no relationship between ecological awareness amongst masses and sustainable development of Pakistani society.
This hypothesis had been prosecuted by testing it against the views of authorities on the subject as found in the current reading lists of NUML library and digital sources of literature.

\( H_0 \) There is no relationship between the ecological awareness of trainee teachers and enhancement in the quality of life in Pakistan.

This hypothesis had been prosecuted by obtaining the view of subject specialists on this specific question and related questions.

\( H_1 \) Adequate curricular contents and effective teaching strategies have been developed and employed for the purpose of enhancing ecological awareness amongst trainee teachers in teachers’ training institutes in Islamabad.

This hypothesis had been prosecuted by scrutinizing the outlines of curricular contents in vogue in various teachers’ training institutes in Islamabad Capital Territory; and through establishing the strategies employed by the teachers in those institutes engaged in training of potential teachers.

\( H_0 \) Development of adequate curricular contents and adoption of effective teaching strategies will not enhance the effectiveness of trainee teachers in creating ecological awareness amongst their students.

This hypothesis had been prosecuted through class experiment in selected teachers’ training institutes in Islamabad Capital Territory. Selected curricular contents and chosen strategies had been introduced in “experimental groups” and not in the “control groups” in institutes chosen as sample. The data collected though pre-test and post-test of trainee teachers had been used as the criterion to accept/reject the hypothesis.

In doing so:

a. Qualitative content analysis method had been used for assessing the validity and relevance of written or visual communications material used in respect of ecological awareness presently employed in teacher’s training curricula;
b. Assessment of present situation in respect of ecological awareness contents used in teacher’s training curricula had been judged in the light of prevailing constructivist theories by specialists. Their views had been obtained on the validity of contents; and

c. Applicability of researcher’s recommended curricular outlines and selected strategies towards training of trainee teachers in respect of teaching / enhancement of ecological concerns had been determined through class trial in at least one university / teachers’ training institute chosen as sample. Learning gains demonstrated by trainees in interactive mode, measured though pre and post tests had been treated to statistical techniques to validate the conceptual assertion of the hypotheses.

1.8.1 Research Design

The research had been descriptive-qualitative in its approach toward content analysis of curricula to determine the relationship between ecological awareness amongst masses and sustainable development of Pakistani society. The same approach had been maintained in respect of exploration of relationship between the ecological awareness of trainee teachers and enhancement in the quality of life in Pakistan. Quantitative tools were limited to calculation of arithmetic means for comparison of gains attributable to teaching of modules and obtaining of reassurance of suitability and robustness of questionnaires developed for this research in possible re-use.

Adequacy of curricular contents and effective teaching strategies that had been developed and employed for the purpose of training of teachers was subjected to scrutiny of subject specialists to establish their validity. The same treatment would be extended to curricular contents teaching strategies that have been developed and employed for the purpose of K-12 education programs to gauge their effectiveness towards development of ecological concerns.

Quantitative techniques had been employed to the extent of treatment of class trial of contents developed by the researcher to prove his hypothesis on effectiveness of adequate curricular contents and teaching strategies when employed in aid of training of trainee teachers in creating / enhancing ecological awareness amongst their
students. The researcher had, in a university / institute chosen as the sample, introduced selected curricular contents and chosen strategies to “experimental groups” but not to the “control groups”. The data collected though pre-test and post-test of trainee teachers had been used as the criterion to accept / reject the hypotheses.

Questionnaires had been developed to formalize the pool of opinions of subject specialists on (1) existence of relationship between ecological awareness amongst masses and sustainable development of Pakistani society; (2) relationship between the ecological awareness of trainee teachers and enhancement in the quality of life in Pakistan, (3) validity of curricular contents employed in sample teachers’ training institutes, (4) teaching strategies employed therein; (5) to establish the level of awareness of students, at K-12 level as well as at higher education level, of environmental facts, perceptions and opinions on local, national and international environmental problems, and (6) to establish the potential of would-be teachers in respect of enhancing their adaptive capacity.

This had been facilitated the researcher in drawing a conceptualized set of outline plan for teachers’ indoctrination on environmental subjects and to formalize a set of strategies to be recommended for use in teacher’s training institutes that he concluded would be most effective in dealing with the task of enhancing awareness of social–ecological systems.

1.8.2 Population

All public and private universities recognized by Higher Education Commission (HEC) located in Islamabad Capital Territory (ICT), inclusive of Federal College of Education and National Institute of Scientific and Technical Education (NISTE), engaged in teaching the subject of education / technical education; and all teachers training institutes in ICT had been listed as the population of the study.

1.8.3 Sampling Technique

Random sampling had been used for the purpose of data collection except in case of class trial where integrity of one class had been maintained as a unit sample.

1.8.4 Sample
One to two public sector universities and three public sector teachers training institutes had been selected as the sample for the study.

1.8.5 Instruments

The instruments had been developed on the basis of review literature to measure ecological awareness through teacher training curricula. All the public and private sector universities had been considered as the population for the purpose of the research in Islamabad, while two to three universities / teachers’ training institutes had been considered as sample population.

The data had been collected with the help of questionnaires that had been designed in consultation with subject specialists. The data had been collected, analyzed and interpreted to deliver the research objectives.

The following questionnaires had been developed to formalize the pool of opinions of subject specialists:

1. Existence of relationship between ecological awareness amongst masses and sustainable development of Pakistani society;
2. Relationship between the ecological awareness of trainee teachers and enhancement in the quality of life in Pakistan,
3. Validity of curricular contents employed in sample teachers’ training institutes,
4. Teaching strategies employed therein;
5. To establish the level of awareness of students, at K-12 level as well as at higher education level, of environmental facts, perceptions and opinions on local, national and international environmental problems, and
6. To establish the potential of would-be teachers in respect of enhancing their adaptive capacity thereby contributing to the resilience of social-ecological systems in Pakistan.

1.8.6 Data Collection and Analysis

The data had been collected through personal visits / teaching the Experimental Group by the researcher in the sample universities and teachers training institutes. The researcher had arranged meetings with the faculty members of the universities and teachers’ training institutes.
1.8.7 Delimitations of the study:

1. Study had been delimited to B.Ed; M.Ed for the purpose of class experiment; and K-12 level of education for development of curriculum and general assessment of level of awareness.

2. Study had been delimited to geographical limits of Islamabad Capital Territory.
CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

This chapter takes a tour of notable literature on the subject with the observation that a literature is still recent and in a developmental stage on this subject. It does not appear in a regular form as for instance expected from that on the subject of Religion, Psychology or Philosophy. The available literature on environment includes UN reports, research reports, NGO’s reports etc. The subject is includable in the teaching schemes of schools, colleges and universities.

It is fact that humans have always inhabited two worlds, the world of Nature and the world of Social institutions both are essential for survival of human lives but integrating the two may spur out many problems. With the advancement of civilizations, humans have created more problems for themselves by extracting power from natural resources and altering the natural environment which threatened the environment globally.

In order to sustain a future, today we need to understand how the two worlds work in collaboration, how human activities are adversely affecting the environment, what we need to do for preserving it and how to improve it.

2.2 Environment

The word environment has been taken from the French word “environner”, which means to encircle or to surround. Literally it means the circumstances and conditions around the organisms. In light of this definition, when we peep into the deeper corners of environment, man lives in various sorts of circumstances, natural world, social world, technological world and cultural world, all constitute integral parts of environment.
SCIENCE: Science has a Latin origin which means to know or to investigate. Literally, it means the systematic acquisition of knowledge.

2.2.1 The Significance of Studies Towards Environmental Science

Environmental Science is relatively a new field and it is highly interpreting natural science social sciences and humanities in a broad sense. Moreover, environmental science is interdisciplinary and holistic studying the world around us. Further environmental science is mission oriented, in contrast to more theoretical disciplines. It seeks fresh, valid, contextual knowledge about the nature and impacts of human activities on nature. But the important thing is to create responsibility to get involved to do activities to resolve problems of natural world. Human beings are part of natural world as well as they build technological, cultural and social world, all these important parts constitute our environment. So environment is conditions and circumstances that surround a group of organisms to live together. Environment is the complex of cultural and social conditions through which community is affected.

Right from the birth of human beings they have always inhabited dual world. Plants, animals, soil, air, water and trees are part of natural world by billions of years. On the other hand human beings created social institutions and artifacts by using science and technology. The both world are interrelated strongly with each other and essential for human survival on planet. But human development is indicating massive use of natural resources from hundreds of years which ultimately causes enduring tensions. As a human being we have been sharing our planet from billions of years with other uncountable creatures, superior among all, we have a responsibility to care our planet. Due to advance technological progress in present era, we are extracting and consuming resources ridiculously as compared to earlier people on planet. So existence of human beings is being threatened day by day along with many organisms.

National environmental education advancement project in Wisconsin suggested a valuable criteria for environmental literacy as: Awareness and appreciation of the built and natural environment; knowledge of natural systems and ecological concepts, understanding of current environmental issues; and the ability to use critical thinking and problem solving skills on environmental issues.
The above mention criterion is comprehensive in all manners. Human beings should have awareness of natural and artificial environment and should have ability to appreciate the relation between it. The ability to use critical thinking should be promoted to develop problem solving skills on environmental issues. For getting such objectives, the basic knowledge of natural systems and ecological concepts should be strong. Moreover understanding of environmental issues should be high. The environmental issues are complex overall. They require attention and in depth focus in a right direction. But the focus is not being paid as it is essentially required all over the world. There is need to develop the spirit of environmental awareness in developing countries as it is being done in developed countries.

2.2.2 The Real Need for Acceptance and Implementation of Environmental Remedies

The Barbara World is pointing towards the real need of planet regarding environmental issue. Remedies are well understood now but the challenge is to make them acceptable economically, socially and politically. She indicates the practical implementation of environmental issues at public level. The villagers in developing countries should manage plantations at their own. Engineers should persuade factories to install necessary equipment to control pollution. And city planners should develop system of safe drinking water for poor members of the society.

2.3 Environmental Science

The environmental science is then the systematic or scientific study of environment. Environmental science is an emerging interdisciplinary field of knowledge that has extended its boundaries into various realms of knowledge. The following research question for the questionnaire was explored on the basis of literature to search out the existing situations.

| 1. | The systematic study of natural world along with human created technological world is environmental science. |

2.4 Environmentalism

Environmentalism is an extensive philosophy and social movement on the topic of concerns for environmental conservation and improvement of the health of the environment, particularly as the measure for this health seeks to incorporate the concerns of non-human elements. For this reason, concepts such as a Land Ethic,
Environmental morals, Biodiversity, Environmental science and the Biophilia hypothesis figure predominantly. At its crux, environmentalism is an attempt to balance relations between humanity and their broader organism and biogeochemical milieu in such a way that all the components are accorded a proper degree of respect. The exact nature of this balance is divisive and there are many different ways for environmental concerns to be expressed in practice. Conservationism and environmental concerns are often represented by the green color.

2.5 Environmentalism as a Social Movement

Environmentalism denominates a communal movement that seeks to influence the political process by lobbying, activism, and education in order to protect natural resources and ecosystems. An environmentalist is a person who may speak out about our natural environment and the sustainable management of its resources through changes in public policy or individual behavior by supporting practices such as informed consumption, conservation initiatives, investment in renewable energy, improved efficiencies in the materials economy, transitioning to new accounting paradigms such as Ecological economics and renewing and revitalising our connections with non-human life. In various ways for example, grassroots activism and protests, environmentalists and environmental organizations seek to give the natural world a stronger voice in human affairs.

2.6 Philosophical Discussions on Environmentalism

Environment is the combination of living things and closely related to the element of nature such as human, animal, as well as plants. Through this connection, there are such doctrines and beliefs from the aspect of philosophy regarding the emergence of this universe, and it has developed an awareness within humans self towards their responsibility to take care the environment.

2.6.1 Environmental Awareness from Pragmatism Point of View

It has been agreed by many philosophers that education and awareness towards environmental protection and conservation require knowledge, understanding, and the change of attitude by each individual. Within the context of education, it is the process to solve the problem which is need to be implemented
among the students since their primary school, as it able to provide them with the technique in dealing the difficulty within their life. This element is supported by the idea of western philosophy, which is the pragmatism movement. The philosophers believe that the role of adolescent and adult in taking care the environmental is different based on their development of age (Mak Soon Sang, 2000). This philosophy presumes that knowledge can be acquired from the relation between human and nature, as both elements are interconnected (Abd. Rahman Aroff and Zakaria Kasa, 1987).

Thus, within the context of education, the implementation of the environmental values among the students can be carried out by giving them the experience through the basic activities such as working together to remain the healthy environment and expose them with the impact of environmental pollutions. For instance, there are several ideology and philosophy that has been introduced, such as the programme of “green consumerism” by the consumer association and “green chemistry” that introduced by the chemist in order to reduce the effect of environmental damage (Zaini Ujang, 2008).

Through these activities, it shows that the students are not only trained from the aspect of their intellect and physical, but also from the element of spiritual and emotion through their courage and appreciation towards the programs. In addition, based on the doctrine of pragmatism towards the issue of environmental awareness, they believe that the speculation regarding the reality is useless, as the experience of human mainly exemplify the reality (Abd. Rahman Aroff and Zakaria Kasa, 1987). By looking at the present, the aspects of experience and students are the social organisms that are constantly interact with the surrounding, and change based on time and condition. Thus, the implementation and appreciation towards moral and value which involve the students within the activity and environment are more significant than the learning activity solely based on theory. It is because; the real achievement of students is based on their ability to cope with their problem, including the aspects of academic and the environmental aspect. By involving the students with the activity regarding the cleanliness of the school, students are implemented with the attitude to love and concern towards their school and the surrounding (Yahya Don, 2005). The knowledge that have been gained by this students is very useful within their life, as the function of knowledge towards the students is the beginning of intelligence and become the last objective of education (Abdul Fatah Hassan, 2001).
2.6.2 Environmental Awareness from Realism Point of View

According to philosophy, based on realism of epistemology, knowledge is a process to discover aching and new phenomenon, and the process should relate with the physical object that exist within the actual life, and be able to examine through human sense. According to this epistemology, the accurate knowledge is the knowledge that relate with the physical nature. This epistemology also focuses on the development of students’ potency, as well as encourages them towards rational thought and activity within the realm of education. For instance, the Science’s teacher can provide the knowledge, and at the same time ask the students to think on the greatest of God through the appreciation towards the nature. The students should be trained and guided to look at the creation of God which able to amaze and create the feeling of fear towards God within themselves. Thus, to produce a firm and balanced student, the students should gain a high awareness towards their surrounding. For instance, the student that studies Science should concern on the elements of the nature in making their hypothesis by using The Level of Environmental Awareness among Students to Fulfill the Aspiration of National Philosophy of Education the appropriate approach. Since most of the education concept share the same objective, it can be said that an awareness towards environmental is capable to fulfill the aspiration of National Philosophy of Education.

2.6.3 Environmental Awareness from Metaphysics Point of View

It is also very important that the aspect of environmental awareness is also discussed from the view of metaphysic. This branch of philosophy focused towards the elements of belief or we can say religion and the emergence of this universe which need to be emphasized within the education, in producing the balanced individual from the aspects of emotion, physical, intellect and spiritual. Based on this aspect of philosophy, there are several concepts that need to be focused within the life of students. Among of them are; the important of religion and belief within the education system, to produce a firm and balanced individual, the ecological protection, the reality of the creation of human and nature, as well as the awareness within the
individual itself. Thus, it can be said that the surrounding and environment play the significance role within the realm of education. It is because, the element of nature and human are closely related.

For instance, the environmental awareness among the students can be viewed and related with the belief of Islam. This religion is not only focusing on the aspect of intellect, but also the need of mind and spiritual within human self. It defines that the process of education should be included with the aspect of intellect, physical, emotion, and the development of manner, bravery, as well as the sense of respectability. It states that the belief and moral can not be separated as both aspects are based on Quran, which include the quality of moral and human behavior. For instance, the axiology of Islam states that the moralistic individual is the balanced individual from the aspect of manner and act, such as the awareness towards environment as the person is able to manage his emotion and action from spoiling the nature.

2.6.4 Environmental Awareness from Point of View of Axiology

According to point of view of axiology, it focuses towards the moral of students. Thus, consistent with the effort to produce the balanced individual from the aspect of intellectual, physical, emotional and spiritual, the awareness towards environment should be implemented among the students. It is because; from the aspect of axiology the theory of value is closely related with the element of belief and faith.

As the branch of axiology is divided in to two factors which are moral and esthetic, thus, the awareness towards environment should fulfill both aspects. In producing the ethical students, the students should obey the rule of society. If the rule concern on the awareness towards environment, the students will directly concern on the environment and produce the society that aware towards their surroundings. In addition, from the aspect of esthetic the students will reinforce their appreciation towards the beauty of nature and this will encourage them towards environmental awareness.

Furthermore, from the context of The National Philosophy of Education, the aspect of axiology plays the important role to produce the moralistic and responsible
students towards their surroundings. Hence, the level of environmental awareness among students is very important in fulfilling the aspiration of National Philosophy of Education. It is because, the good and healthy environment is able to encourage and develop students’ mind towards the learning process. However, most of students still not realize the fact that the surrounding plays the important role within their daily life. Thus, the aspect of consciousness along with the knowledge, understanding, the change of attitude and physical participation are very important to students in developing their highly awareness towards the environmental aspect, and directly apply the values within their life.

2.6.5 Environmental Awareness from Reflective Philosophy

According to reflective philosophical point of view, students are getting more opportunity to view the importance of environment. It is because, from the aspect of reflectively thought, the individual needs to examine the reality of emergence of the creator, the concept of knowledge and values with the deeply thinking. Thus, students need to be taught to think the existence of nature and its significance and implication within the human life, as the description of nature cannot be defined solely from the physically view. Since the students understand the concept of nature, they will realize the essential of harmonious environment.

Moreover, they will also encourage by the responsibility to analyze the cause and advantage of healthy environment. It is because, through the reflectively approach, students are taught to find the answer based on concept of cause and effect. Hence, the student that gains the awareness regarding their surrounding and environment is more concern on the cause of environmental problem. Besides, students are more incline to consider and analyze the implication of their behavior towards environment.

2.6.6 Environmental Awareness from Idealism Point of View

According to point of view of Western education philosophy which is Idealism, the element of moral is defined as universal and general concept and exists within the spiritual and mental. Thus, to fulfill the aspect of moral, environment is very important in producing the balanced individual from the aspect of spiritual and
emotion. This is because students need to be revealed with the important of the cleanliness and the beauty of nature.

### 2.6.7 Environmental Awareness from Islamic Point of View

According to the metaphysic of Islam, this universe is belonging to Allah SWT, not human. Thus, it is very important to maintain the ecological stability. Human should realize that they are appointed by Allah to become a caliph or leader in flourishing this earth, as they are provided with mind and potency to manage this world (Saidul Amin Usman, 2000). This accountability towards human has been stated in Quran, Surah An-Nahl:

Dialah yang telah menurunkan hujan dari langit untuk kamu sebagai minuman dan sebahagian menjadi tumbuh-tumbuhan yang pada tempat kamu mengembalakan ternakan.

According to this surah, it is clearly stated that this universe is entrusted towards human to be entirely benefited. As a human or individual who has been entrusted to inhabit and concern this world, it is their responsibility to make sure this expectation is well used. Thus, they should consider on their act and manner that able to spoil this nature. It is because, the pious individual would consider regarding the protection and nurturance of the environment (Zaini Ujang, 2008). Besides, Islamic Philosophy has been implemented within the National Philosophy of Education in order to produce the responsible, moralistic, and trustworthy individual (Mohd Salleh Lebar, 2002).

In addition, the highly environmental awareness among students gives them an opportunity to learn on how to nurture this nature and avoid themselves from exploit the sources. This will prepare the students to become the responsible individual that able to contribute towards the harmonious society and nation. Besides, based on the axiology of Islam the aspects of moral and belief are interconnected.

Thus, it is very important for students to have the highly environmental awareness by strongly believe on their religion and obey the moral rules, so that they are able to become ethical and moralistic person. It is because; the knowledgeable and educated person is the person that practices the highest moral standards for every sense and act of his life.
Within the context of education, in order to produce a balanced individual from the aspect of emotion, the awareness towards environmental is very important in generating the sense of serenity when they are closed with the nature. Furthermore, the balanced individual from the aspect of spiritual will amaze and praise with the creation of God. Thus, they will appreciate the significance of environment.

**The rain and vegetation of plants, fruits etc**

Seest thou not that Allah sends down rain from the sky, and leads it through springs in the earth? Then He causes to grow, therewith, produce of various colours: then it withers; thou wilt see it grow yellow; then He makes it dry up and crumble away. Truly, in this, is a Message of remembrance to men of understanding. (39:21)

And from the fruit of the date-palm and the vine, ye get out wholesome drink and food: behold, in this also is a sign for those who are wise. (16:67)

It is He who sends down rain from the sky: from it ye drink, and out of it (grows) the vegetation on which ye feed your cattle. With it He produces for you corn, olives, date-palms, grapes and every kind of fruit: verily in this is a sign for those who give thought. (16:10-11)

**The Mountains**

And He has set up on the earth mountains standing firm, lest it should shake with you; and rivers and roads; that ye may guide yourselves (16:15)

And the mountains, how they are firmly fixed (88:19)

The Atmosphere:

And We have made the heavens as a canopy well guarded: yet do they turn away from the Signs which these things (point to)! (21:32)

It is Allah Who has made for you the earth as a resting place, and the sky as a canopy, and has given you shape- and made your shapes beautiful,- and has provided for you Sustenance, of things pure and good;- such is Allah your Lord. So Glory to Allah, the Lord of the Worlds! (40:64)

**The Seas**

It is He Who has made the sea subject, that ye may eat thereof flesh that is fresh and tender, and that ye may extract therefrom ornaments to wear; and thou seest the ships therein that plough the waves, that ye may seek (thus) of the bounty of Allah and that ye may be grateful. (16:14)

He has let free the two bodies of flowing water, meeting together: Between them is a Barrier which they do not transgress (55:19-20)
Weather patterns
It is He Who sendeth the winds like heralds of glad tidings, going before His mercy: when they have carried the heavy-laden clouds, We drive them to a land that is dead, make rain to descend thereon, and produce every kind of harvest therewith: thus shall We raise up the dead: perchance ye may remember. (7:57)
It is Allah Who sends the Winds, and they raise the Clouds: then does He spread them in the sky as He wills, and break them into fragments, until thou seest rain-drops issue from the midst thereof: then when He has made them reach such of his servants as He wills behold, they do rejoice! (30:48)
It is He Who doth show you the lightning, by way both of fear and of hope: It is He Who doth raise up the clouds, heavy with (fertilising) rain! (13:12)

2.7 History of Conservation and Environmentalism
In present era, growing human population along with technological power has enhanced concerns about what we are doing to environment. The environmental activists divide conservation history into four distinct stages. The first is pragmatic resource conservation. The second is moral and aesthetic nature preservation. The third is related to growing concern about health and ecological damage caused by pollution. The fourth is global environmental citizenship. Although different problems are focused in each era and subsequently solutions are suggested but global environment citizenship is modern and dynamic concept.

A concern for environmental protection has recurred in diverse forms, in different parts of the world, throughout history. For example, in the Middle East, the earliest identified writings concerned with environmental pollution were Arabic remedial treatises written during the "Arab Agricultural Revolution", by writers such as Alkindus, Costa ben Luca, Rhazes, Ibn Al-Jazzar, al-Tamimi, al-Masihi, Avicenna, Ali ibn Ridwan, Isaac Israeli ben Solomon, Abd-el-latif, and Ibn al-Nafis. They were concerned with air pollution, water pollution, soil pollution, solid waste mishandling, and environmental assessments of certain localities.

In Europe, King Edward I of England prohibited the burning of sea-coal by proclamation in London in 1272, after its smoke had become a problem. The fuel was so common in England that this earliest of names for it was acquired because it could be carted away from some shores by the wheelbarrow. Air pollution would carry on to
be a problem in England, especially later during the Industrial Revolution, and extending into the recent past with the Great Smog of 1952.

### 2.7.1 Historic roots of nature protection

The early historic roots of nature protection were found by great Greece Philosopher Plato who complained in the 4th century B.C. about Greece attitudes towards nature. He complained about trees cutting to build houses and ships which resulted as heavy rains washed the soil into sea. A former executive director of the United Nations Environment said. “The problems that overwhelm us today are those we failed to solve decades ago.” It is obvious that by ignoring environmental issues from decades today the problems are looking beyond control. In eighteen century, some British and French colonial administrators carried out scientific studies of environmental damages because they considered responsible environmental stewardship as moral priority and aesthetic as well as economic need. In those studies, a strong relationship between deforestation, soil erosion and local climate change was observed. Stephen Hales, the pioneer British plant physiologist pointed out that by conserving green plants means preserved rainfall. In 1764, on the Caribbean islands of Tobago, his ideas were put into practice as 20 percent of land was marked as ‘reserved in wood for rains’. Mauritius, an island in Indian Ocean, is considered as a model for balancing climate along with human needs. The large percentage of forest reserves gives shelter to its original flora and fauna than any other human occupied islands. The reason behind it is the order of farmer French governor of Mauritius, Pierre Piovere in 1769, that one quarter of the island was to be preserved in forests, particularly on steep maintain slopes and along water ways.

### 2.7.2 Pragmatic Resource Conservation

“Man and Nature” was written by geographer George Perkins in 1864. The book was considered as the wellspring of environment protection by many historians in North America. He alarmed about deforestation and profligate waste of resources. He warned of its ecological consequences also. In 1873, as a result of his book, national forest reserves in the United States were established for giving protection to endangered watersheds and dwindling timber supplies. Gilford Pinchot was first chief of the United States forest service and founder of the utilitarian conservation movement. In 1908, he organized and chaired the white house conference on natural resources. The conference perhaps was considered as the most influential
environment meeting ever held in the United States. Former American President, Roosevelt also promoted the cause of environment preservation. He met naturalist John Muir in 1903 at Glacier point in Yosemite Natural Park to promote natural preservation. The basic policies of President Roosevelt and Pinchot were “pragmatic utilitarian conservation”. They argued that “forest should be saved not because they are beautiful or because they shelter wild creatures of wilderness, but only to provide homes and jobs for the people (Muir: 1903).”

In the above statement it is obvious that environmental preservation is related with social, economical and moral needs of the society. Further the principles of conservation were focused and it was argued that conservation is defined as development and use of natural resources. A geologist, author Sierra club first president, John Muir wrote: “the work we are told was made for man. A presumption that is totally unsupported by the facts... Nature’s object in making animals and plants might possibly be first of all the happiness of each one of them... why ought man to value itself as more than an infinitely small unit of the one great unit of creation?” John Muir presented a true picture as an environmentalist. The human beings are sharing this planet with thousands of creatures among all are plants and animals etc. so it is responsibility of human beings to care for nature rather going for its destruction. While utilizing the resources, it should be taken as precautions that life of animals and plants should not be destroyed. Nature preservation should be at top priority while doing any action on earth. Later on Muir fought hard and long for the establishment of kings Canyon and Yosemite National parks.

2.8 Origins of the Modern Environmental Movement

In 1273 in England, King Edward I threatened to hang anyone if found burning coals in London because it produced acrid smoke. John Evelyn, the English diarist in 1661 suggested that city air be purified by planting sweet smelling trees to minimize the effects of noxious air pollution caused by factories and coal fires. At last, a national fog and smoke committee was formed to combat the problem of smoke attacks in Britain in 1880. Rachel Carson wrote a book “Silent Spring” in 1962 in which she pointed out threats of pollution and toxic chemicals to humans along with other species. The movement that was endangered by her might be termed as environmentalism because she extended her concerns to include both pollution and environmental resources. The author was inspired after observing tremendous
industrial expansion after Second World War. The environmentalism movement was carried on by activist David Brower and Scientist Barry commoner. Brower, while serving as executive director of the sierra club, launched many techniques in the favor of promoting modern environmentalism. He introduced books and calendar publishing and use of mass media for publicity campaigns. Commoner was a molecular biologist and considered as pioneer in developing a link between science, technology and society. Consequently, the modern environmental movement remains hallmark of both activism and research. The expansion of environmental agenda was observed in 1960’s and 1970’s and many issues were included such as human population growth, recycling, air soil and water pollution, wilderness protection etc. under the leadership of many brilliant and dedicated scientists and activists. The first national earth day was celebrated in 1970 in America under the umbrella of environmentalism movement. Due to such efforts the environmentalism got popularity worldwide after 1970.

In Europe, the Industrial Revolution grew to modern environmental pollution as it is normally understood today. The emergence of great factories and consumption of massive quantities of coal and other fossil fuels gave rise to unprecedented air contamination and the large volume of industrial chemical discharges added to the emergent load of untreated human waste. The first large-scale, modern environmental laws came in the form of the British Alkali Acts, passed in 1863, to regulate the deleterious air pollution (gaseous hydrochloric acid) given off by the Leblanc process, used to produce soda ash. Environmentalism grew out of the amenity movement, which was a reaction to industrialization, the growth of cities, and worsening air and water pollution.

In Victorian Britain, an early "Back-to-Nature" movement that anticipated recent environmentalism was advocated by intellectuals such as John Ruskin, William Morris and Edward Carpenter, who were all against consumerism, contamination and other activities that were harmful to the natural world. Their ideas also inspired various proto-environmental groups in the UK, such as the Commons conservation Society, the Kyrle Society, the Royal Society for the Protection of Birds and the Garden city society, as well as encouraging the Socialist League and The Clarion movement to advocate measures of natural world conservation.

In the United States, the beginnings of an ecological movement can be traced as far back as 1739, though it was not called conservationism and was still considered
conservation until the 1950s. Benjamin Franklin and other Philadelphia residents, citing "public rights," appealed the Pennsylvania Assembly to stop waste dumping and remove tanneries from Philadelphia's marketable district. The US movement expanded in the 1800s, out of concerns for defending the natural resources of the West, with individuals such as John Muir and Henry David Thoreau making key thoughtful contributions. Thoreau was interested in peoples' association with nature and studied this by living close to nature in a simple life. He published his experiences in the book Walden, which argues that people should become closely close with nature. Muir came to believe in nature's inborn right, especially after spending time hiking in Yosemite Valley and studying both the environmental science and geology. He successfully lobbied congress to form Yosemite National Park and went on to set up the Sierra Club. The conservationist principles as well as the trust in an inherent right of nature were to become the bedrock of modern environmentalism.

In the 20th century, environmental ideas continued to nurture in popularity and acknowledgment. Efforts were starting to be made to save some natural world, particularly the American Bison. The death of the last Passenger Pigeon as well as the endangerment of the American Bison helped to focus the minds of conservationists and popularize their concerns. In 1916 the National Park Service was started by US President Woodrow Wilson.

In 1949, A Sand County Almanac by Aldo Leopold was published. It explained Leopold’s belief that humankind should have moral respect for the atmosphere and that it is unethical to harm it. The book is sometimes called the most dominant book on conservation.

Throughout the 1950s, 1960s, 1970s and beyond, photography was used to enhance public awareness of the need for protecting land and recruiting members to environmental organizations. David Brower, Ansel Adams and Nancy Newhall created the Sierra Club display Format Series, which helped raise public environmental consciousness and brought a rapidly increasing flood of new members to the Sierra Club and to the ecological movement in general. "This Is Dinosaur" edited by Wallace Stegner with photographs by Martin Litton and Philip Hyde prevented the construction of dams within Dinosaur National Monument by becoming part of a new kind of activism called environmentalism that combined the preservationist ideals of Thoreau, Leopold and Muir with hard-hitting advertising, lobbying, book allotment, letter writing campaigns, and more. The powerful use of
photography in addition to the written word for conservation dated back to the manufacture of Yosemite National Park, when photographs convinced Abraham Lincoln to preserve the beautiful glacier carved landscape for all time. The Sierra Club Exhibit Format Series galvanized public opposition to building dams in the Grand Canyon and protected many other national treasures. The Sierra Club often led a coalition of many environmental groups including the Wilderness Society and many others. After a focus on preserving wilderness in the 1950s and 1960s, the Sierra Club and other groupings broadened their focus to contain such issues as air and water contamination, population organization, and curbing the utilization of natural resources.

In 1962, Silent Spring by American biologist Rachel Carson was printed. The book cataloged the environmental collisions of the indiscriminate spraying of Dichlorodiphenyltrichloroethane (DDT) in the United States and questioned the logic of releasing large amounts of chemicals into the environment without fully accepting their effects on natural science or human health. The book suggested that DDT and other insect killer may cause cancer and that their agricultural use was a threat to wildlife, particularly birds. The resulting public concern led to the formation of the United States ecological security Agency in 1970 which afterward banned the agricultural use of DDT in the US in 1972. The limited use of DDT in disease vector manage continues to this day in certain parts of the world and remains controversial. The book's legacy was to produce a far larger awareness of environmental issues and interest into how people affect the environment. With this new curiosity in environment came interest in problems such as air contamination and fuel spills, and environmental interest grew. New pressure groups formed, notably Greenpeace and Friends of the Earth.

In the 1970s, the Chipko movement was formed in India; influenced by Mohandas Gandhi, they set up nonviolent resistance to deforestation by factually hugging trees (leading to the term "tree huggers"). Their peaceful methods of objection and motto "ecology is permanent economy" were very influential.

By the mid-1970s, many felt that public was on the edge of environmental disaster. The Back-to-the-land movement started to shape and ideas of environmental ethics joined with anti-Vietnam War sentiments and other supporting issues. These individuals lived outside normal culture and started to take on some of the more radical environmental theories such as profound ecology. Around this time more
mainstream environmentalism was starting to show power with the signing of the Endangered Species Act in 1973 and the arrangement of Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora in 1975.

In 1979, James Lovelock, a previous National Aeronautics and Space Administration scientist (NASA), published Gaia: A new look at life on Earth, which put forth the Gaia Hypothesis; it proposes that life on Earth can be understood as a single creature. This became an important part of the Deep Green philosophy. Throughout the rest of the history of environmentalism there has been discuss and argument between more radical followers of this Deep Green ideology and more conventional environmentalists. Environmentalism has also changed to agreement with new issues such as global warming and genetic engineering.

The environmental movement (a term that from time to time includes the conservation and green movements) is a varied scientific, social, and political movement. In general terms, environmentalists advocate the sustainable supervision of resources, and the protection (and reinstatement, when necessary) of the natural environment through changes in community policy and individual behavior. In its recognition of civilization as a participant in ecosystems, the movement is centered about ecology, health, and human rights. Though the movement is represented by a range of organizations, because of the addition of environmentalism in the classroom curriculum, the environmental movement has a younger demographic than is common in other social movements (see green seniors).

Environmentalism as a movement covers broad areas of institutional oppression. Examples of these oppressions are: utilization of ecosystems and natural resources into dissipate, dumping waste into disadvantaged communities, air pollution, and water pollution, and weak infrastructure, exposure of natural life to toxins, monoculture, and various other focuses. Because of these divisions, the environmental movement can be categorized into these primary focuses: Environmental Science, Environmental Activism, Environmental Advocacy, and Environmental Justice. For the questionnaire the following research question is searched out to explore the existing situations on the basis of literature.

2. International conventions and treaties have been playing a marvelous role in protecting environment globally since 1960.
2.8.1 Global Concerns

Our planet was announced as “global village” in 1960’s by Marshal McLuhan. The human beings are connected in various ways in this village. Global environmentalism might be fourth wave of ecological concerns in which we observe our home planet as fragile, beautiful, rare and small. Two major environmental conventions have been held such as in 1972 UN conference in Stockholm and in 1992 in Rio de Janeiro as UN Earth Summit.

2.8.2 Earth: A Marvelous Planet in the Solar System

In present era the human efforts have made possible journeys to space, moon and mars. So comparisons can be dawn between those and our planet. We have comfortable and sustainable conditions on earth because fertile soil, fresh water and clean air are regenerated spontaneously and endlessly by biological and geological cycles. Rich diversity of life exists on earth. Millions of beautiful species populate the earth and vast multitude of life creates interrelated communities in a complex manner. Viruses, fungi, bacteria and other tiny like forms make up self sustaining life delightfully diverse communities including most dense forests, towering trees, huge animals, vast sunny savannas and richly colourful coral reefs.

2.8.3 Environmental dilemmas

A comprehension report was prepared for the world summit on sustainable development in 2002 in Johannesburg, South Africa, United Nations launched an assessment report on global environment. In the report, the dilemma of over population was mentioned on the top. It was indicated that some 85 million people were adding every year in the world. It was estimated that projected population of the world would be 8 to 10 billion by 2050. The present figures endorse the facts in the report 2002. Water scarcity might be the most critical issue in the twenty first century. About 1.1 billion people couldn’t have access to safe drinking water. In coming decade water wars might be major international conflicts. More than two billions don’t have proper sanitation due to which ill health is a major issue. Polluted water and bad sanitation was estimated the cause of nearly death of one billion people out of which 15 million are children.

It is threatened in the UN reports that by 2025 that three fourth of the people could live under conditions of water scarcity. The reports were given by soil scientists
about degradation of agriculture lands. Two third of agriculture lands are showing signs of erosion which is alarming. Chronically undernourished people were more than 800 million in 2002 out of which 60 million were facing acute food shortage. Although intensive farming techniques and biotechnology are helpful in fulfilling present food requirements but these methods are expensive and not affordable for poor farmers.

Fossil fuels like oil, coal and natural gas provide about 80% of industrial use all over the world. Supply of these fuels cause air and water pollution, ship accident, mining damage etc. Burning of fossil fuels making cement, clearing forests, cultivating rice paddies, and other miscellaneous human activities release carbon dioxide and other greenhouse gases and consequently heat is trapped in the atmosphere. Atmospheric CO$_2$ concentration has risen about 30% over the past 200 years which is alarming. If current pace continues till the year 2100 A.D. then global temperature will increase probably 1.5$^\circ$C to 6$^\circ$C. It is very dangerous for variety of biological species. The UN environment program reported that over 800 species have disappeared during the last 100 years. Further survivals of around 10,000 species are under threat due to global warming issue. Fresh water fishes and many plant species are included in it. The fish hunting has exceeded its limits by leaving it under threats. Almost half of the forest existing globally a century before have been cut down vigorously. Many species depend on such forests for habitat but unfortunately they are being cut ironically. Severe weather events are likely to cause largely due to global warming including floods in some areas and droughts in others. Alpine glaciers and snow fields are melting which could threaten water supplies in future to millions of people. Floods are already coming due to rising sea level mostly in low lying islands and coastal regions. Rising sea level issues is threatening the survival of many species globally including human beings. There is need to pay attention to cleaner renewable energy resources like solar power, wind, biomass and geothermal. By investigating in these together with conservation we could use cleaner less destructive options. In many areas air quality has dramatically worsened.

A two mile thick toxic haze of ash, aerosols, dust, acids has been shown by satellite images over southern Asia recently. The Indian subcontinent is under cover for more of the years by these photo chemical products. More than two billion tons of air pollutant is added every year but emission of carbon dioxide or wind-blown soil is not included in it. So life is becoming tough for people here due to severe threats of
diseases by air pollution. These worse effects of air pollution are traced in some days on the west coast of North America also. So it is obvious that air pollution is merely no longer a local problem but global. Nobel Laureate Paul Crutzen estimated that three million people die each year only because of diseases caused by air pollution. A meeting was held in 1997 in Kyoto, Japan where 160 nations agreed to roll back emission of greenhouses which was a great achievement by environmental movements. Unfortunately, United States refused to ratify this treaty. The 25% of all greenhouse gases although is produced by United States all over the world which is a serious threat to climate. The under mentioned research questions have been derived for the questionnaire, based on the discussion on basic environmental issues, to bring out existing realities.

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<td>3.</td>
<td>Severe acute respiratory syndrome is one of the emergent diseases in recent years due to multiple environmental degradation activities.</td>
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<td>Diluted and dispersed pollutants are causing some of the serious problems of pollution during the last few decades all over the world.</td>
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### 2.8.4 Climatic Change and Environment: Organizations and Movements

Environmental degradation in general and climate change in particular are just as devastating in their potential impact “as weapons of mass destruction and terrorism” ‘there will be no genuine security’ he warned if planet is ravaged by climate change.

The above mentioned statement of former British Prime Minister is most relevant to the voices of environmental organizations. He said this as sitting prime minister of United kingdom in the Kyoto conference in Japan in 2004. He pointed out American towards climate genuine threats of loss of life on planet due to negligence towards climate change. He argued that genuine security in planet would be preserving the climate along with all natural resources and species. The prime minister indicated severe issues of climate change would be more dangerous than threats of weapons of mass destruction and terrorism. The environmental degradation should be given top most priority among all issues globally as wished by former prime minister. The
following research question is included in the questionnaire to analyze the importance of environmental dilemmas.

| 6. | The environmental dilemmas on planet are not serious threats to human beings to be addressed on prior basis. |

### 2.8.5 Signs of hope

The movements of environmental degradation have been working from last five decades. The good thing is signs of hope which are shown in the latest reports by environmental organizations. The progress has been observed in many areas by minimizing pollution and curbing wasteful resource use. In Europe and North America, many cities are now much more livable and cleaner than they were hundred years back. The issue of over population has been addressed successfully all over the world as it is proved by giving authentic figures. After 1990, the number of children born per women worldwide has decreased from 6.1 to 3.4 which is a big indicator. The struggle is continues and it is estimated by the UN that by the year 2050, fertility rate per women would be replaced by 2.1 in developed countries as well as 75 percent of the developing countries also. On the basis of this prediction the world population would be stabilize around 8.9 billion rather than 9.3 billion as estimated previously. During the last century, the incidences of life threatening and infectious diseases have been reduced at large scale in most countries.

The entire Europe region was declared free of polio in 2003 while in India 165 million children, under the age of five, were vaccinated by volunteers in just six days against this crippling disease. More than 800 people have been provided access to modern sanitation and quality water supplies since 1990. Another important aspect is the actual decline of the number of people globally facing chronic hunger and food insecurity inspite of the fact that nearly one billion people added in population during 1990’s. The deforestation is being slowed down as it was above eight percent in 1980’s in Asia while in 1990’s it was noted to reduce to less than one percent. Nature preserve areas have enhanced during the last two decades. The suggested viable sample of world’s biodiversity is twelve percent while it is 8.2% of all land areas presently which is good achievement. The use of renewable energy resources is being shown dramatic progress especially in developed countries. The European Union has developed a goal of fulfilling its maximum requirements from renewable sources by 2015. The former British Prime Minister Tony Blair laid down ambitious plans in
2003 by cutting emission of carbon dioxide by 60% and intended to switch to renewable. If renewable energy technology is made accessible to worlds developing countries, the promotion of human development may be possible by reducing environmental damage simultaneously. Presently 500 or so international environmental agreements are in effect now such as the Montreal protocol protecting stratospheric ozone and the convention on international trade in endangered species.

The united nation environment program identified important challenges in planning and policy which are

1. Capacity building for participation of public
2. All stakeholders standing in environmental decisions may be recognizing
3. Insisting on sustainability in all economic sectors
4. Measuring progress in governance as a key environmental indicator.

2.9 Evangelical Environmentalism

Evangelical environmentalism is an environmental movement in the United States in which some Evangelicals have emphasized biblical mandates concerning humanity's role as steward and subsequent accountability for the caretaking of Creation. While the movement has focused on different environmental issues, it is best known for its focal point of addressing climate action from a biblically grounded theological perspective. The Evangelical Climate Initiative argues that human-induced climate change will have severe consequences and impact the poor the hardest, and that God's mandate to Adam to concern for the Garden of Eden also applies to evangelicals today, and that it is therefore a moral obligation to work to alleviate climate impacts and support communities in adapting to change.

2.10 Preservation and Conservation

Environmental protection in the United States and other parts of the world, including Australia, is viewed as the setting aside of natural resources to stop damage caused by contact with humans or by certain human activities, such as logging, mining, hunting, and fishing, often to replace them with new human activities such as going to places of interest and recreation. Regulations and laws may be enacted for the preservation of natural resources. The following research question is added in the questionnaire to check the ground realities.

7. Preserving rural culture is one of the strong helping tools to support local
agriculture and sustainability.

2.11 Environmental Organizations and International Conferences

Environmental organizations can be global, regional, national or local; they can be government-run or private (NGO). Environmentalist activity exists in almost every country. Moreover, groups dedicated to community development and social justice also focus on environmental concerns.

There are some unpaid assistant organizations. For example Eco world, which is about the environment and is based in team work and volunteer work. Some United States environmental organizations, among them the Natural Resources Defense Council and the Environmental Defense Fund, specialize in bringing lawsuits (a tactic seen as particularly useful in that country). Other groups, such as the US-based National Wildlife Federation, the Nature Conservancy, and The Wilderness Society, and global groups like the World Wide Fund for Nature and Friends of the Earth, disseminate information, contribute in public hearings, porch, stage demonstrations, and may purchase land for preservation. Smaller groups, including Wildlife Conservation International, conduct investigate on endangered species and ecosystems. More fundamental organizations, such as Greenpeace, Earth First!, and the Earth Liberation Front, have more directly opposed actions they regard as environmentally harmful. While Greenpeace is devoted to nonviolent confrontation as a means of bearing eyewitness to environmental wrongs and bringing issues into the public dominion for debate, the underground Earth Liberation Front engages in the clandestine destruction of assets, the release of caged or penned animals, and other criminal acts. Such tactics are regarded as unusual within the movement, however.

On an worldwide level, concern for the environment was the subject of a United Nations conference in Stockholm in 1972, attended by 114 nations. Out of this conference developed UNEP (United Nations Environment Programme) and the follow-up United Nations Conference on Environment and Development in 1992. Other international organizations in support of environmental policies improvement include the Commission for Environmental Cooperation (NAFTA), the European Environment Agency (EEA), and the Intergovernmental Panel on Climate Change (IPCC).
2.12 Environmental Education Philosophy in Educational System

It is very important as a researcher to discuss here that one of basis within the National Philosophy of Education is regarding the element of knowledge, which is the value of the knowledge itself, as well as the role of the premise within the development of individual and the society. The significance of knowledge comes from the basic truth of the knowledge that is not only functions to provide the explanation and information, but the most important, knowledge emerges as the medium in influencing, developing, and also shaping the notion of human and the society itself. This element has make knowledge gain its high value.

As the fundamental concept within the realm of academic, National Philosophy of Education focuses towards the factor of individual within several relation and connection. This is applicable with the element of National Philosophy of Education which is the appreciation towards the creative education such as environmental awareness, since the objective of education is not solely based on the development and the tranquility of human itself, but also includes the improvement of the whole society, nation as well as the harmony of the environment.

National Philosophy of Education focused on the aspect of producing the holistic and balanced individual, which appear as the knowledgeable, responsible, as well as well-mannered individual that able to appreciate their surroundings. Thus, in relating to this aspect, the environmental awareness is the supportive element that should be implemented among the students in fulfilling the aspiration of National Philosophy of Education. It is because; the individuals that able to remain the healthiness of their surrounding would be able to keep the good relation with the society. This is one of the factors which show that the environmental awareness has been adapted within the National Philosophy of Education. By looking at the scopes and the impacts of environmental problems, this phenomenon has become very important issues on the international agenda since 1990s (Madruga, K., and Batalha daSilveira, C.F., 2003). As being capable to affect human beings and all living species (Gore, 1993 inÖzden, M., 2008), this nature’s catastrophe had brought the serious implication towards the earth such as choking air pollution, water pollution in the vast majority of rivers, water shortages throughout much of the country, ocean pollution, mountains of solid and toxic waste, acid deposition spoiling land and water,
destruction of the remaining scattered habitats, near-total deforestation, rampant overfishing, depletion of agricultural land, and conspicuous consumption of even highly endangered species for food and traditional medicine (Harris, P.G., 2006).

The issues of environment are the effect from the human’s activities that have no civic conscious and only think the profit without concern about the impact towards the environment and their future of life. The long term effect from the environmental pollution can be seen when the ecosystem is not able to endure the pollution (Zaini Ujang, 2008). According to Sardar and Ziauddin (1985), the major cause of this ecological crisis is regarding the value and belief in shaping human’s relation with the surrounding and the lifestyle itself.

Realizing of the extremely expanded environmental catastrophe, a preventive way should be carried out to slow it and thereby mitigating long-term environmental damage (Harris, P.G., 2006). Thus, one of the best ways of preservation is by creating environmental awareness among society especially students as they are future leaders, future custodians, planners, policy makers, and educators of the environment and its issues (Thapa, B., 1999). Students are also the right aim as they were the one who’s responsible to fulfill and realize the aspiration of the National Philosophy of Education (NPE) to develop high levels of personal well-being towards contribution to the harmony of society and nation (Curriculum Development Centre, 1990).

2.13 Educational Measures to Overcome Environmental Problems

Undoubtedly, the process of environmental education is complicated and should be reviewed deeply at the affective, cognitive, behavioral and meta cognitive levels (Sanera, 1998). Jaus in 1982 found that there is a positive correlation between environmental education instruction and favorable attitudes towards environment. Then, Worsley and Skrzypiec (1998) observed the environmental attitudes of senior secondary school students in South Australia and the results interpreted with respect to students’ regions, gender and socioeconomic status. Male students having lower socioeconomic status are pessimistic but supportive to environmental development and scientific solutions than females.

Since the solution for the environmental problems depends on the improvement of students’ attitudes, school plays an integral role as the educators have to seek new approaches and methodologies for students to understand that the
preservation of nature and efficient use of resources are vital to prevent environmental problems. Besides, many people believe that environmental education is one of the most important factors for preventing environmental problems (O’zden, M., 2008). According to Abd. Rahman Ariff and Zakaria Kasa (1987), students think based on the concept of psychology such as the emotion, observation, learning, as well as the aspect of consolidation. Their observation towards their surrounding will develop the empirical knowledge, which is the knowledge from the experience and the using of sense. Hence, the role of educators is very important to encourage the behavior of the students that parallel with the right and good attitude, along with the well and healthy environment (Sharifah Alawiyah Alagoff, 1992).

Among the endeavor that has been carried out in implementing the environmental education among the students is the theoretical model. Hungerford and Volk (1990) in Palmer (1998) has identify the critically components which need to be implemented within the educational programme in order to change the students’ attitude towards the environment. These components have been shown through the theoretical model which discusses the relation between knowledge and attitude. According to this theory, the knowledge regarding the environment and the skill of action are very important for an individual in changing his attitude. Theoretically, when the knowledge regarding environment is increase, the positive attitude towards environment is indirectly expanded. This model has been applied within the perlaksanaan of Environmental Education in Malaysia.

Moreover, by viewing from the context of education, the actual knowledge is not only focusing towards the fact, but also consider on the perception, observation, experience, as well as the reason. All of these elements come from the interaction process between human and the surrounding. If the environment is healthy and safe, the society will live within the harmonious and pleasant surroundings.

Thus, the significance of the concept of environmental awareness has been implemented since the primary school. For instance, the Primary School Curriculum has focused towards the aspects of spiritual, value and human’s behavior with their surrounding which had been taught through the subjects such as Islamic and Moral Education. It is because; the sensitivity towards the balance between human and environment is able to produce the balance of ability to think, as well as the physical and spiritual development. Thus, through the objective of Primary School Curriculum students are able to recognize and appreciate this balance, and generate the concerned
society towards the well and harmonious environment. This value is also practiced within the activity of co curriculum and this is the continuation from the lesson in classroom. Hence, it is able to increase the level of environmental awareness among the students in fulfilling the aspiration of National Philosophy of Education (NPE), since the involvement of the students physically and spiritually towards the environmental protection and conservation has develop the holistic individuals and the solidarity of this country.

On the other hand, it is widely known that the main characteristic of National Philosophy of Education is holistic and integrated approach, which the universal knowledge has taught by the educator and learned by the students (Chong, 2008). Thus, as the objective of National Philosophy of Education which is to produce the individual that intellectually, spiritually, emotionally, and physically balanced, as well as able to contribute towards the harmony and betterment of family, society and nation should be correlate to the individual that has a balanced deliberation and able to contribute towards the stability of environment.

It is because, logically the tranquility of environment that include the stability of the ecosystem will contribute towards the healthy society with values and also produce the generation that able to increase the productivity of the nation. Therefore, as school and the educators have become the societal agents towards students, the educators should present the good attitude in shaping element of environmental awareness among the students. The appreciation towards the subject that moral oriented should develop holistically by the educators through the teaching and learning process because they become the role model to the students. For instance, the aspects of environment should be apply within the process of teaching and learning, thus, students will realize their responsibility to care the environment.

In addition, the application of teaching media by teachers should include the elements of environment. Students should be provided at the early of their age regarding the knowledge of environment. As the belief of Confucianism, the National Philosophy of Education also aspires to produce the competent and moral individual (Choong Lean Keow, 2008). Thus, the need towards the implementation of environmental awareness should be focused in order to produce the generation that have praiseworthy personality and appreciate the creation of God. Besides, the appearance and the manifestation of the educator are very important in realizing the
objective of school management to implement the element of environmental awareness (Yahya Don, 2005).

However, the element of awareness is not sufficient without knowledge, understanding, the change of attitude and physically participation. According to Abdul Fatah Hassan (2001), no matter how much knowledge that has been gained by someone, it is still cannot be assumed as perfect as the individual does not applies the knowledge within his life to differentiate between the right and wrong.

Moreover, he believes that an appreciation is the important concept within human’s life, because the solely concept without the sense of gratitude and appreciation is worthless and the sense of gratitude without concept is blind. For instance, by looking at the context of environmental issues, there are lots of individuals that gain knowledge and awareness regarding environment, but still remain the irresponsible attitude towards their surroundings. They fail to interpret the environmental awareness as mutually commitment (Starke, 1990).

Moreover, according to Thapa, B., (1999) there were only a limited understanding of environmental attitudes and the relation to environmentally responsible behaviors among students. Due to the intensive environmental awareness promoted by the environmentalists, it is critical to observe if the future leaders of tomorrow which is students uphold positive environmental attitudes and practices of the environmentally responsible behaviors. Hence, it can be said that the level of students’ awareness towards environment and the values of humanism within their self are still low.

Concerning this issue, each individual especially student should have an awareness and responsibility towards environment within. As stated by the philosophy of metaphysic, the connection between human and nature with the creator is the abstract elements, which can not be discover without examine and believe it. Thus, we need to recognize and care for this universe and preserve the harmonious relation with this nature. Besides, the appreciation towards the gift of God needs a responsibility and realization from every human being.

2.14 Importance of Environmental Awareness in Education

In light of above environmental education refers to education about environment, its basic components, its issues and possible remedies.
In the present global perspective, when world is threatened by many environmental issues, there is abject need of environmental literacy. Environmental scientists work on subjects like the understanding of earth processes, evaluating alternative energy systems, pollution control and mitigation, natural resource management, and the effects of global climate change. Environmental issues almost always include an interaction of physical, chemical, and biological processes. Environmental scientists bring a systems approach to the analysis of environmental problems. Key elements of an effective environmental scientist include the ability to relate space, and time relationships as well as quantitative analysis.

Environmental science came alive as a substantive, active field of scientific investigation in the 1960s and 1970s driven by (a) the need for a multi-disciplinary approach to analyze complex environmental problems, (b) the arrival of substantive environmental laws requiring specific environmental protocols of investigation and (c) the growing public awareness of a need for action in addressing environmental problems. Events that spurred this development included the publication of Rachael Carson's landmark environmental book Silent Spring along with major environmental issues becoming very public, such as the 1969 Santa Barbara oil spill, and the Cuyahoga River of Cleveland, Ohio, "catching fire" (also in 1969), and helped increase the visibility of environmental issues and create this new field of study.

Environmental education can be considered as determined efforts conscientiously organized to teach or focus the attention of human beings about how natural environments function and how these human beings can oversee and look after them. Environmental fortification is therefore the aspect of environmental education that refers to put into practice that is aimed at protecting the surroundings by individuals, governments, nongovernmental or professional entities like teachers.

Environmental education covers wide choice issues whose endangerment is due to human activities. These issues contain global warming, greenhouse gas, ozone reduction, species extinction, poaching, endangered species, ineffective energy use, habitat destruction, air quality, light, noise and visual pollution, pollution of water like sea dumping, oil spills and urban runoffs; electromagnetic radiation and health, nuclear production and fallout, genetically modified foods, overgrazing, excessive use of pesticides and herbicides, intensive farming, land pollution and desertification, soil erosion and contamination, water crises, overfishing, illegal logging and deforestation.
Environmental education is therefore an important component of every ecological program and the principal aim of such education is to arrange not only the individual but also the society for the task and duty of caring the environment by raising their level of environmental knowledge, understanding, responsibility and ethics. One of the greatest challenges of environmental education is to bridge the gap between information and ethics, to internalize environmental knowledge so that it could be visible in new behavioral patterns and practices. In a bid to sustain the attention and participation of citizens in environmental issues in which eco-friendly behaviors are reflected, environmental education has to be based on the following three facts that: it is a study of the environment, that is, water, air pastures plants animals and forests; about the environment and the ecosystems and for the environment, that is their preservation and conservation.

The question of environmental education came out in 1972 when the United Nations Conference of that year encouraged member states to begin thinking about global environmental problems. The conference laid lots of emphases on environmental education. According to United Nations Educational, Scientific and Cultural Organization and United Nations Environment Program (UNESCO-UNEP) 1976, the following are the objectives of environmental education:

1. Understanding of environmental problems.
2. Basic awareness of the environment and its problems, and humans’ role in the environment.
3. An approach of concern for environmental problems.
4. Skills in overcoming environmental problems.
5. Ability to evaluate proposed solutions to environmental problems.
6. Involvement in solving environmental problems.

### 2.15 Teaching Environmental Education

According to Babcook (1993), successful language learning equally involves a successful combination of the micro and macro skills acquired into appropriate expressions of communication; and, environmental issues are rich subject matters of communication. While the most factors in this regard is teacher education programs if a nation wants to promote and train its future generations. The most crucial duty comes on the shoulders of the teachers.
Rethinking and expanding the aims of the teaching profession is another reason why it is necessary to involve environmental education in the profession. This has been necessitated by the beginning of more practical teaching approaches like the task-based and the content-based models which focus on the tasks and contents assigned to students rather than focusing overtly on the structures of the assignments. Still talking about the need to include environmental matters in teaching, Cates (1997:4) points out that we can’t call our teaching successful if our students, however fluent, are unaware of world problems, have no social conscience by using their communication skills for international crime, exploitation, oppression or environmental destruction.

This, according to Cates (2005), explains the growing interest over the last decade to incorporate environmental education into English language teaching. Studies like those of Brown, (1990); Friel, (1991); Gambee & Klausman, (1992); Jacobs, (1993); Jacobs and Cates, (1999); Trisler (1993) and Tang (2009) showed that global issues such as environmental harms and energy disaster affect each person on earth. Tang (2009) argues that these issues can be pertinent comfortable to be incorporated in language learning. Besides as a content-based teacher, Silver (1991) argues that students study best in the context of relevant, meaningful, motivating and authentic materials which motivate students to think and learn through the practice of the target language. Brown (1990) on his part holds that teachers have a mission of helping everyone in the world correspond with each other to solve the global problems. This is certainly because of the global position of the English language.

According to Tang (2009), the aim of integrating environmental education into the classroom is, to raise students’ understanding of global environmental crises. Knowledge of environmental security is at the core of environmental education and should be prepared with any age group (be it at the nursery, primary, secondary, post secondary or higher education levels), with any linguistic rules and language specifics like vocabulary, grammatical rules, syntax, semantics and discourse of the objective language. Thus, teaching English as a second or foreign language can highlight the language skills and environmental issues in the school background in order to raise awareness about international issues like environmental degradation. According to Jacobs and Cates (1999) Environmental awareness activities could consist of multiple tasks. The tasks can be: Writing letters to governments, organizations, and companies; growing trees and other plants; reducing use of paper
and plastic containers; reusing materials such as glass jars and bottles; recycling materials and buying recycled materials such as recycled paper; educating others and taking part in movements to persuade others to participate in environmentally friendly actions; raising funds for environmental causes; and boycotting environmentally unfriendly products, such as those made from endangered species, avoiding the consumption of endangered animal species like the apes and other primates and as a substitute buying environmentally friendly products, like refrigerators that do not use ozone-depleting chemicals. To these actions the following could be added; campaigns to discourage want on cutting down of trees for wood, burning of the soil for agricultural purposes (popularly referred to in the North West Region of Cameroon as ankara), the deforestation of water catchment area and the demolition of swampy and marshy areas for farming or building construction.

2.16 Material Development for Developing Environmental Awareness

Material for the teaching and development of environmental awareness among learners can be created both by the teachers and the learners. Students for example can create and develop materials in the following ways:

Examples

1. They can come to the classroom with articles or audio/videotapes from newspapers, magazines, radio, TV channels or from the internet. The Radio and Television has many programs that it broadcasts in collaboration with the country’s ministerial departments in charge of nature and environmental issues; that is the Ministry of Forests and Wildlife and that of the Environment and Nature Protection.

2. Performing a discussion and writing skill task of developing opinion poll on environmental issues for class mates and after that students do a questionnaire related to how environmentally responsive the questionnaire items are. For example, do they purchase or eat the flesh of endangered and protected animal species like gorillas, chimpanzees or elephants? Do they carry a cloth bag so that they do not collect plastic bags while shopping? After that they could create resolutions to adopt more eco-friendly behaviors.
3. Plantation week celebration: These types of activities can be arranged in schools, colleges and universities to enhance the environmental awareness among young generation. This is a potent source of sound learning at gross root level. Moreover, such activities can motivate the students to learn the subject in its true spirit.

4. Developing civic sense: This is crucial task for Pakistani society because no such platform is available at any level of education. Moreover, training of teachers is not available too. So developing civic sense among individuals is a challenging task. For this purpose a well planned teacher training programs are essential.

5. School Tabloos: The concepts of young generation about environmental awareness can be strengthening through organizing tabloos. The students participate directly and get a sense of ownership about issues in the society too.

6. Blending environmental education and English as second language: The concepts of environmental education can be delivered through English language also. This is modern infusion technique in developing curriculum. This technique has been adopted to teach many concepts by using English language.

7. The inclusion of critical thinking skills into the classroom can help further develop students’ communicative abilities and investigative thinking, and allows students to practice communicating in a variety of situations on global issues (Ishikawa, Sasaki & Yamamoto (2007). Critical awareness on ecology is an approach to produce ecological awareness that emphasizes the ideological aspects of environmental awareness, and the ways in which it relates to social issues.

Critical thinking has variously been defined and its role in human learning (behavior change) emphasized. Dowden (2002),for example, holds that thinking critically, is among other things, being fair and open-minded as one thinks carefully about what to do or what to believe. For Scriven and Paul (2004) thinking critically entails that mode of thinking about any subject, content or problem in which the thinker improves the class of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them, in
short, critical thinking is self-directed, self-disciplined, self-monitored, and self-corrective thinking.

Similarly, Hopper (2003:37) considers a critical thinker as one who is constantly asking questions, trying to distinguish between fact and opinion. Not about memorizing, but analyzing all sides of an issue to find more in the situation than the obvious and makes assertions built on sound logic and solid evidence.” Stroupe, (2006:3) cites Ennis (1978) as introducing critical thinking as “a process incorporating the skills necessary to decide what to do and believe.”

The above cited definitions view critical thinking in terms of the way information is processed and applied, and equally World Journal of Education highlight the consciousness or awareness of this practice taking place. This emphasis or awareness is essential for the facilitation of critical thinking in the classroom. It is this type of thinking that sharpens learners’ focus on environmental matters and supports them to react accordingly. More specifically, Halvorsen (2005) says that when we think critically about a given topic, we are forced to consider our own relationship to it and how we personally fit into the context of the issue. Tsui (2008) defines critical thinking as “a way of reasoning that examines the inherent structure and logic of one’s intellectual functioning,” and Tang (2009) says that critical thinking is one of the crucial aims of education as a whole, and is shaped by language. Therefore students will need to learn and apply critical thinking skills within the context of the ecological awareness in order to think, evaluate and express their ideas.

The inclusion of environmental education into curriculum will certainly enable students to get better on their critical thinking skills or abilities and at the same time contribute to their societal development since environmental issues such as global warming and energy crises are interesting, relevant and debatable content issues.

2.17 Teaching Environmental Protection in our Classrooms

Jacobs and Cates (1999) are of the view that the infusion of global education into teaching does not necessarily imply that every lesson, every reading passage; every group conversation should be about some global concern. The proposal here is that environmental education be a regular and consistent part of the curriculum, not just something that is thrown or casually done in once or twice a year.

2.18 Content Centered Learning Approach
Content and Language Integrated Learning (CLIL), according to Seregely (2009) is an educational background in which a foreign language, in the majority of the cases English, is used totally or partially as the medium of coaching in the teaching of subjects such as History, Natural sciences and in our context, Environmental Education. The main aim of the technique is to enhance students’ competence in language as well as related to environmental issues.

This method is based on J. Cummins’ research on interpersonal and cognitive educational language proficiency. According to Cummins, these types of developments differ because one is analytically based and the other is socially based. Cummins’ rationalization is that people develop two types of academic proficiency: cognitive academic and interpersonal and that these two types of skills vary depending on the context available to the learner and the level of cognitive challenge of the task. This approach utilizes cooperative learning techniques where students work in groups of multi-level speakers (peer tutoring) which seems to effectively eliminate barriers to ecological awareness.

Van de Brenden (2007:4) sees a task as “an activity in which a person engages in order to attain an objective and which necessitates the use of language”

Task-based teaching considers responsibilities as giving learners direct and immediate experience. Focused tasks, pre-tasks and feedback on tasks enable learners to notice language forms, to use them under genuine operating condition. A task can be based on any of the ecological themes or preoccupations motioned in the contents model section of this document. In other words the learners are declared successful if they got the task done, regardless of what language they chose to do the task. Nevertheless, the teacher keeps encouraging the learners to use the target language. For the task-based approach to work successfully, Beaven (2005:4) suggests the following measures:

a) Foster a class atmosphere that encourages reliance and sharing, so that learners are willing to share real information about each other.

b) During the Pre-tasks and Tasks activities, ensure that the learners understand what they have to do, assist them with any problems, and input language items if help is requested. Note down how the learners are coping with the task and note good or problematic use of language, but do not correct them and do not join in.

c) After learners have done a Task:
2.19  Environmental Education Context

In modern teaching techniques the teacher is no longer seen as the key foundation of knowledge for students. Instead of being 'Sages on stages', teachers are now "Guides on the side", facilitating learning, helping students discover how they can be independent learners. Today, teachers are no longer frightened to say to students, "I don't know. Why don't you find out and educate me and the rest of the class? Or "I don't know. How can we find out together?" In addition to gaining knowledge from and with the students, another place to twist is to teachers in other subjects. Cross-curricular projects have gained a lot of popularity nowadays and they propose excellent opportunities for teachers of different subjects to study from each other as they guide students' learning. Moreover, Richards (n.d.) says that teachers are now encouraged to examine and confront the underlying ideologies of texts and textbooks. Course books are no longer indispensable tools and are considered as controlling instruments that hinder the creativity of teachers.

2.20  The Sources of Materials for Environmental Education

Some English as a second or foreign language course books already contain lessons or parts of lessons related to global education. These materials should be developed at a local or national level. Other sources of information may include non-governmental organizations, governmental ministerial departments and the media. Furthermore, Lie in 1992 proposed that teachers can work together with others to create and share materials by taking for example, some global issues material from a newspaper article on solar ovens, and combine it with the jigsaw method for teaching reading in which a reading passage is divided into parts and groups of four or less students become experts in one part of the passage and then teach their part to others, after which students take a quiz or do a task based on the entire passage.

Environmental education materials can be developed by students (Deller, 1990; Jacobs, 1993). This is as a result of the swing from the traditional teacher-centred to the learner-centred approach. Following the shift, it has been found out those allowing students to look for and bring English language learning materials suitable for them to the classroom is a way to promote learner-centredness (Pramoolsook, 2009) and critical thinking. Tasks from the students’ materials have to
be designed to be similar to real-world tasks and activities that the students will face in their real life. To accomplish these tasks, the teachers should act as facilitators rather than the conductors and controllers of all learning activities (Tudor, 1997). Moreover, the evaluation should be based on both the products and the process of learning. The learner-centred approach requires the students to collaborate and team up in all aspects of learning, including selecting and creating materials appropriate for their own learning.

2.21 Ecological awareness defined

Ecological awareness is related with knowledge of climatic changes in surroundings. It is further related with knowledge of preservation and conservation of environment in its natural form. It is also related with knowledge of such a life style through which natural way of living can be promoted.

2.22 Factor effecting ecological awareness in Pakistan

2.22.1 Lack of awareness

It is observed hugely that most of people are unaware of the ecological issues due to lack of awareness. In Pakistani society there is still no plan to build the environmental awareness of individuals. Although some minor efforts are being done informally by electronic and print media but they are not sufficient. Further there is no provision in education system at all to develop ecological awareness among individuals. Due to lack of awareness people do not have any idea to care for their surroundings. We observe non hygienic atmosphere around us in Pakistan. People even don’t care for littering. Air and water contamination is ignored highly.

2.22.2 Non-availability of Curriculum Related to Environmental Issues at Primary Secondary Level of Education

Due to negligence the curriculum of environmental education in Pakistan couldn’t be designed in its true spirit. Although some efforts were done by ministry of education and curriculum wing but up gradation of curriculum is not done on regular basis. Further there is no mechanism still adopted to induce syllabus of environmental education in curriculum of matric, inter or graduation level.
2.22.3 Teacher training Programs do not have the Elements of Environmental Education

Teacher training is still being ignored from ecological perspective. It requires certain expertise and technicalities in teaching which must be fulfilled by teacher in classroom. There is still no focus on such a training because experts are needed. There is need to plan a proper teacher training program through which curriculum of environmental education can be implemented with technicalities and expertise.

2.23 Contributions of UNESCO to develop environmental education curriculum

A Prototype Environmental Education Curriculum for the Middle School was first published in 1989 under the auspices of UNESCO-UNEP. The purpose of that document was to present a framework, guidelines, and examples of environmental education curriculum for the middle grades. Those grades typically include youngsters ten to fifteen years of age. This publication represents a revision of that earlier document, and attempts to reflect recent changes within the environmental education community and, in a larger sense, the global political climate. It is evident from numerous public, private, and governmental policy statements, position papers, and reports that a new concept is emerging, one that will have far-reaching significance at local, regional, national, and international levels. That concept is called «sustainable development. Providing a meaningful definition of sustainable development either in political or educational contexts is not an easy matter. Because of the recent emergence of sustainable development and because of the continued evolving discussion, defining the term “sustainable development” is both complex and, at this point, without wholehearted consensual agreement. For those unfamiliar with the term, one sample definition follows:

Sustainable Development: According to ‘a process of change in which the use of resources, the direction of resources, the orientation of technological development, and institutional change all enhance the potential to meet human needs for today and tomorrow.

The Global Tomorrow Coalition, (1989) Additional clarification was provided by the World Commission on Environment and Development (Our Common Future,
Sustainable development involves more than growth. It requires a change in the content of growth, to make it less material - and energy-intensive and more equitable in its impact. These changes are required in all countries as part of a package of measures to maintain the stock of ecological capital, to improve the distribution of income, and to reduce the degree of vulnerability to economic crisis.

Thus, sustainable development involves institutions, resources, and technology in a change process that meets current and future human needs while preserving ecological integrity. Given a definition for and requirements associated with sustainable development, let us identify the goals and objectives associated with it. Some of the major objectives associated with sustainable development identified by The Global Tomorrow Coalition (1989) include the following:

a) Reviving economic growth, especially in developing countries.
b) Making economic growth less energy-intensive.
c) Meeting the essential needs of an expanding population in the developing world.
d) Ensuring a sustainable and stabilized population level.
e) Conserving and enhancing the resource base.
f) Reorienting technology and managing risks.
g) Merging environmental and economic concerns in decision-making.

Unfortunately, agreement is not easy. Many voices have much to say about sustainable development, and some of these pose different ideas. For example, the Environment and Energy Study Institute (1991) listed outcomes different from those noted above:

a) Sustainable production of energy . . . while neither polluting urban areas nor increasing global warming.
b) Sustainable management of forests, with the goal of conserving remaining natural forest areas and their diversity of species.
c) Effective pollution control, with goal of providing clean air and protecting public health.
d) Sustainable agriculture and fisheries, with the goal of meeting food and other agricultural needs without destroying the natural resource base.

Regardless of the perspective held by various agencies or nations, sustainable development typically includes human, technological, ecological, and economic
dimensions. Further, much of the current discussion concerning sustainable development has occurred at a political level among governmental agencies, policy makers, and decision makers. Thus, the definition, characteristics, and outcomes described are political goals, priorities, or outcomes to be achieved, to a large extent, by means of a political process that will vary from nation to nation. The current political context of sustainable development further suggests that its outcomes do not necessarily translate directly into educational goals. That is, it is not an appropriate education priority to provide “effective pollution control, with the goal of providing clean air and protecting public health”. It is evident; however, that all or most of sustainable development’s dimensions are imbedded within the major environmental issues facing human beings. And it is through the window of the environmental issue that sustainable development can be most appropriately addressed in an educational context.

How does environmental education address the dimension of sustainable development? The answer lies in an educational approach very similar to that taken in the first edition of this document. That approach, generically termed “environmental issue instruction”, uses the tenets of both science and the democratic process, attempting to educate future citizens in the craft of making informed personal and social decisions in their lives. The environmental issue as an educational context still offers the greatest potential for educators to address sustainable development. Environmental issues often contain the critical characteristics associated with sustainable development - human, technological, ecological, and economic dimensions.

According to United Nation, the environmental issue offers the greatest potential for educators to address sustainable development. Environmental issues often contain the critical characteristics associated with sustainable development human, technological, ecological, and economic dimensions’.

There have been numerous pleas and statements about the development of an environmentally literate global citizen. In almost all instances, this literacy brings with it a sense, at least a willingness, to become involved with environmental issues in an attempt to help resolve them at some level.

Where is this discussion taking us and what is the point of it? The point of all this focuses on the fact that, not only have there been changes in the philosophical thoughts about global environment since 1980, there have also been major changes in
what is known about “environmental behavior” or, in other words, what drives a citizen to try to solve or help solve issues that impact him or her. We now know, with great certainty, that, if educators want to develop learners who are both capable of and willing to respond to environmental issues in their communities and nations in ethically responsible ways, two things must happen:

a) The students must feel an ownership of the issue in question; and

b) The students must feel empowered to somehow effect change with respect to that issue. Once again, stated briefly and a bit differently:

According to United Nation, if we want to develop large numbers of learners who are skilled and dedicated environmental citizens, the learners must feel a sense of ownership toward the issues needing resolution and a sense of empowerment with respect to helping with that resolution.

Thus, this document is dedicated to the development of such an individual. The document recommends the development of curricula which are specifically designed to change learner behavior - to provide for the critical variables of ownership and empowerment. The research is very clear and straightforward on the matter. There seems to be little room for educators who wish to keep to traditional ways and stand in front of class and lecture to bored, uncaring learners about what needs to be done with the environment. Many are those who will argue the point, but these same individuals care more about their own points of view than facing up to a global crisis the intensity of which the world has never seen before!

For purposes of this document, then, the major goal of environmental education is accepted by the writers.

2.24 The Goal of Environmental Education by United Nation:

To aid learners in becoming environmentally knowledgeable and, above all, skilled and dedicated human beings who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between the quality of life and quality of the environment. There seems to be little room for educators who wish to keep to traditional ways and stand in front of class and lecture to bored, uncaring learners about what needs to be done with the environment. This definition suggests two important implications. First, the goal implies that environmental education (EE) must develop skilled problem solvers. Thus, EE itself
should use a problem solving (inquiry-based) approach. Secondly, it is important to note that EE is concerned with both a quality of human life and a quality of environment. Both of these latter concepts are closely imbedded in the overriding concept of “Sustainable Development”. With these statements in mind, a number of very important disciplined goal statements are presented here as guidelines for curriculum developers. These goal statements, sometimes called “Goals for Curriculum Development in Environmental Education” move hierarchically from science foundations to issue awareness through issue investigation and evaluation to citizenship action.

A review of the goal statements is presented in Chapter III. Goal Levels III and IV strongly indicate that EE curriculum provide students with experiences in environmental problem solving skills such as problem identification, evaluation, and implementation of environmental actions (issue resolution). The sample lessons included in the appendices illustrate how such an experience might be designed. It is not sufficient to tell students about ecology, or to present them with an awareness that environmental issues exist. Students must experience an EE curriculum which allows them to discover how they interact with the environment themselves and to assess their own impact on the environment. Learners further must be allowed to develop investigative skills, evaluative skills, and action skills by using these processes as well as learning about them. In this way, these learners might become intelligent consumers and processors of issue-related information throughout their lives. Only with these critical thinking skills will citizens the world over is able to make sound and responsible decisions about present and future environmental issues.

The consequences of failure to achieve the goals set forth in this document are clearly forecast One has merely to review the tragic loss of ecosystems as well as plant and animal species, global population pressures, air and water pollution, the disappointment with many technological resource-use projects throughout the world, the depletion of the ocean fisheries, oil polluted beaches and coastlines, land-use management crises, and acute energy issues in order to see just how critical environmental issues are worldwide. Indeed, the list of problems and issues seems endless and the message is clear. If sustainable development is to become the movement that saves the environment of the planet, all of these issues, and others, are ones to which we must attend. Human beings must learn to care and must learn how
to maintain the health of the global environment. Educators must prepare them to do this. It is that simple!

2.25 Core Issues in Environmental Education: The Issues which are discussed generally in every International, National and Local Settings in Curriculum

According to Chant Thomas, M.S. (2012), Heather Coey. (2012), Prof. Fumiaki TANIGUCHI. (2010), Dr. Steffen Schmidt. (2006), Seçken, Nilgun. (2005), Cavas, Bulent and Tekkaya. (2009) and Arnhem, C (1994) climate change, global warming, animal life, population, pollution, waste management, development of civic sense, water, plantation and health concerns are the basic and core issues of the environmental education curriculum. Arnhem, C (1994). developed Environmental Awareness Scale. This scale was based on two major parts and it was a combination of all above mentioned areas of environmental education. Seçken, Nilgun. (2005) indicated the same areas as the core areas to assess the environmental awareness in his research on The Relations between Global Environmental Awareness and Technology. After that Cavas, Bulent and Tekkaya. (2009) in their research on Turkish Students’ Views on Environmental Challenges with respect to Gender: An Analysis of ROSE Data also highlighted the almost same areas. Thus the same areas were selected by the researcher to develop the research instrument. These areas have been discussed as follows to explain the internal nature of these areas.

2.25.1 A divided world: rich/poor:

We live in a world of have and have not. Some people live in luxury life style while some people live without having the basic necessities of life. It is estimated by World Bank that nearly half of the population of the world is living under poor conditions. Moreover, nearly quarter population of the world is living under extreme poverty. The people living under poverty don’t have access to clean water, basic sanitation, decent housing, adequate diet, medical care, education etc. The proportion of people living under these poor conditions has declined since 1990 but because of continuous fast expansion in population, the total number of poor people has risen actually. The East Asia has shown great progress towards human development since 1990 as poverty factor is reduced in the region during the last two decades.
A beautiful idea was given by president of South Africa on the opening speech of world summit on sustainable development in 2002. The idea from researcher point of view is a great hallmark in the favors of environmentalists. Moreover, it is considered as indication towards collective global concerns. The statement is: “A global human society based on poverty for many and prosperity for few, characterized by islands of wealth, surrounded by a sea of poverty is unsustainable”.

In the above mentioned beautiful statement it was warned that the world with minor prosperity is just like an island of wealth but with huge poverty in surroundings. Its mean there would be no safety for such an island even the survival of such an island may be impossible. So the prosperity level should be increased globally. The necessities of life should be made accessible to poor people in the world.

The poor people are often victims and agents of environmental destruction both because they are forced to meet their short term survival needs but at the same time on the cost of long term sustainability. The bush meat trade is estimated to consume more than a million metric tons of forest animals in central Africa including gorillas, monkeys, elephants, chimpanzees and other endangered or threatened species. The people are fouling the air they breathe and water on which they rely for drinking and washing. The below delineated question is sorted out from the literature to develop conceptual understandings.

| 8. | Violence against oppressed people has been observed as related strongly with environmental abuse. |

### 2.25.1.1 Human development index: HDI

A scale has been devised by united nation development program UNDP which is called human development index HDI. The main purpose of it is to evaluate the real quality of life. The measurement of real quality of life is very tough although but in human development index HDI some factors are added keeping in view the environment aspects such as child survival, life expectancy, adult literacy, gender equity, childhood education, sanitation and access to clean water, and level of income. These all factors provide a clear picture of quality of life from environmental aspects. The HDI depicts very interesting figures about quality of life all over the world. The HDI is found lowest in the poorest countries of region sub saharan Africa while the
countries from North America and Northern Europe are found on the top rankings. It is also interesting that some countries having moderate economy but equitable distribution of wealth and power are placed in higher ranks as compared to some very rich countries having low HDI due to lack of equal wealth distribution and power. The following research question is put in the questionnaire to generate data about environmental concepts.

9. Natality, life span, fertility, survivorship and migration are essential components of population dynamics and their interrelationship provides complete code of life exponentially.

2.25.1.2 A fair share of resources:

The share of resources among all nations globally is not fair at all. The affluent life style of people living in rich countries is entirely different as they enjoy luxurious at the cost of producing high proportion of wastes and pollutants. Moreover the pinching factor is the use of inordinate share of natural resources by richer countries. For example, the population of US is less than 5% of total world’s population while on the other hand Americans consume nearly one fourth of total commercially traded commodities and as a result produce almost half of the industrial waste in the world. This profligate waste disposal and resource consumption strains the systems of life style on the earth we live. If everyone starts consuming as the approach of American then results would be disastrous overall. We must teach way to curb our wishes and produce materials we require in less destructive ways. Every year 160 million tons of garbage is thrown away, including 67 billion cans and bottles, 18 billion disposable diapers, 50 million tons of paper, two billion disposable razors and 25 billion Styrofoam cups. For the questionnaire the subsequent question is tied up to determine the environmental comprehensions in the local settings.

10. If everyone would live at the same standard of living in the United States, people would need four more planets for sustaining life.

2.25.1.3 ECONOMIC PROGRESS:

The rapid economic progress has been observing from last 60 years. Scientific breakthrough and technological innovations have been brought by human ingenuity at
a breath taking pace. During this period the world's gross domestic product has been increased more than ten folds from 2 trillion dollar to 22 trillion dollars per year. In 1960, nearly three fourth of the world's population lived in poor conditions but now less than one third is living under abysmal conditions. The income ratio between poorest 20% of the world and richest 20% of the world was 1 to 30 in 1960 while the ratio is now 1 to 100.

2.25.1.4 Sustainable Development:

A report was published in 1987 by world commission on environment. The commission was chaired by Norwegian prime minister Groharlem Brundtland and commissioned was named as Brundtland commission. Sustainable development was defined in the report as: "Meeting the needs of the present without compromising the ability of future generations to meet their own needs."

In the beautiful statement the future generations are targeted as it was said that needs of present shouldn't be fulfilling in the cost of destruction of future needs. The human beings are dependent on nature for fulfilling water, food, fiber, energy, waste disposal and other life supporting services. The resources can't be deleted and wastes can't be created faster than the pace of nature recycling process if we want to spend a good quality life on earth for a long period of time. The progress of human beings should be prolonged over many generations rather than for a period of few years only. This is the main spirit of sustainable development to provide benefits to all human beings rather than for people of some privileged groups only. The following research question for the questionnaire is explored on the basis of literature to search out the existing situations.

| 11. | Protection of natural sources can be made possible only by recognizing the rights of indigenous and native people on prior basis. |

2.25.1.5 Environmental Justice:

The concept of environmental justice is to combine civil rights with environmental protection to provide public a safe, healthy, neat and clean, and life giving environment to everyone. It is observed generally that people living in industrial colonies have high exposure to toxic chemicals and harmful industrial wastes. The people in urban areas have access to safe drinking water and sanitation on the one hand but on the other hand face a huge emission of carbon dioxide, toxic
waste dumps, landfills, smelters, refineries. The people in rural areas suffer in poverty and due to which face acute problems of even safe drinking water and sanitation. A lot of evidences of such violations of environmental justice are found in developed countries also like America. The reason behind it is the wide spread of industries without estimating safety measures. For the questionnaire the following research question is searched out to explore the existing situations on the basis of literature.

12. The respect of the rights and inherent values of all living things on the earth along with human beings is essential to maintain environmental quality.

2.25.2 MATERIAL CYCLES AND LIFE PROCESSES:

A constant recycling of materials is essential between living and nonliving components of ecosystems to maintain health and richness of environment on the earth. The first important cycle is hydrologic cycle. In this cycle the water evaporates from oceans and then precipitation back to oceans in a logical manner. The logic behind is that about one tenth of water evaporated from seas falls over land, then it is recycled by terrestrial systems and finally drains back through rivers to oceans. The advantages of water in the ecosystem are countless that’s why whenever astronomers seek for signs of life on other planets of solar system; traces of water are at their top priority while in searching options for life. Water is also responsible for flow of major nutrients through ecosystems. Water that condenses in the form of fog, rain or snow falls over land surfaces then is responsible mostly for all terrestrial ecosystems. The importance of hydrologic cycle is vital in the maintenance of natural climate globally so human beings should be conscious in their action to maintain its process but observations are found very different all over the world. As human actions are continuous source of disturbance of hydrologic cycle around all parts of the world so environmentalists are warning continuously for the protection of cycle by putting empirical evidences in front of public.

The second important cycle is carbon cycle as it begins with the intake of carbon dioxide by photosynthetic organisms. During photosynthesis carbon, hydrogen and oxygen molecules are incorporated into sugar molecules. Release of carbon and biological accumulation is a strong factor in a climate regulation. Carbon dioxide absorbs heat radiated from the surface of earth as it is one of the greenhouse gases. It is important to mention here that natural exchanges are balanced on the earth but due to human activities a net increase of carbon dioxide has been observed in the
atmosphere. Human created combustion of organic fuels like petroleum products, coal, wood etc, a huge quantity of carbon dioxide is released that seem to be passing the carbon dioxide removal pace. Massive deforestation, increased atmospheric carbon dioxide concentrations and due to pollution, reduced oceans productivity, are the major causes of disturbance of carbon cycle.

The third important cycle is Nitrogen Cycle. Plants take up inorganic nitrogen from the climate and consume it to develop their own molecules of proteins, which consumer organisms eat and consequently build their bodies. Nitrogen is sharing 78% in the total atmosphere but plants don’t have ability to intake it directly as \text{N}_2 molecule from the atmosphere. Nitrogen is available to organisms by cyanobacteria or some blue green algae. The organisms have ability to combine this nitrogen molecule with hydrogen to form an ammonia (\text{NH}_3) molecule. The green plants have tendency to develop nitrates (\text{NO}_3) and ammonium molecules (\text{NH}_4). They are useful for building amino acids for peptides and proteins. Nitrogen has potential to enter in the atmosphere through many ways. The death of organisms is also a source of it. Urinary wastes of animals are highly in containing nitrogen because they also contain the detoxified wastes of protein metabolisms. The soil fertility may be highly replenished by decomposition of by-products of living organisms.

During the last few decades, the nitrogen cycle has been altered profoundly by many human activities such as using synthetic fertilizers, burning fossils, fuels and cultivating nitrogen fixing crops. The amount of nitrogen is also doubled which is cycled through our environment. Due to excess input of nitrogen, acidification of rivers and lakes, rising concentration of green house gas nitrous oxide in the atmosphere and serious loss of soil nutrients like calcium and potassium is recorded.

The fourth cycle is phosphorous cycle. Phosphorous is a primary ingredient in fertilizers. In energy transfer reactions, phosphorous containing compounds are major participants. The phosphorous is transported to the environment in aqueous form. Phosphate ores are mined to produce inorganic fertilizers and detergents. In present era, the mobilization of phosphorous from source to sink is accelerated. Consequently, aquatic ecosystem is affected dramatically and explosive growth of photosynthetic bacteria and algae due to excess phosphates is upsetting ecosystem stability.

The fifth cycle is sulphur cycle. Sulphur is considered as an important component of proteins. It is present in rocks mainly in soil, water etc. It is cycled by decomposition in an ecosystem. The levels of sulphur compounds are increased in the
atmosphere by burning of fossil fuels which ultimately create acid precipitation problems. Sulphate aerosols and sulphur dioxide is responsible for human health problems, vegetation, reduce visibility and damage buildings. Ultraviolet radiations are also absorbed which produce cloud cover over cities that lowers down temperature in a particular area. Further rising carbon dioxide concentration may be offsetting house effects. The under mentioned research questions have been derived for the questionnaire, based on the discussion on basic environmental issues, to bring out existing realities.

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<tbody>
<tr>
<td>13.</td>
<td>For global scale distribution of heat and energy, the hydrologic cycle is most important for maintaining the flows of key nutrients through ecosystems.</td>
</tr>
<tr>
<td>14.</td>
<td>Human activities are responsible to produce a net increase of concentration of carbon dioxide in the atmosphere.</td>
</tr>
<tr>
<td>15.</td>
<td>The nitrogen cycle has been altered profoundly in recent years by using synthetic fertilizers, burning fossil fuels and cultivating nitrogen fixing crops.</td>
</tr>
<tr>
<td>16.</td>
<td>Inorganic fertilizers and detergents are major sources of accelerated mobilization of phosphorus from rivers to oceans.</td>
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**2.25.3 FOOD CHAINS, FOOD WEBS AND TROPHIC LEVELS:**

Tropic levels can be expressed as organisms feeding status in an ecosystem. In this way a food web can be expressed as an interconnection of many individual food chains. All ecosystems are based on photosynthesis or sometimes called chemosynthesis. For example, human beings eat egg while children eat corn; chicken could eat grasshoppers too which eat corn plants. In this way a complex food chain is developed in a natural ecosystem. Primary productivity is dependent on photosynthesis as it is the basis for all growth in an ecosystem. Herbivores eat plants; carnivores eat flesh while omnivores eat both animals and plants both. These all types are interconnected strongly through an ecosystem for their food requirements. The terrestrial food chains are short e.g., (seeds, mouse, owl). On the other hand equatic food chains may be long like (microscopic, algae, copepod, minnow, cragfish, bass, ospery).
From the above mentioned concepts it is obvious that in an ecosystem all organisms are interconnected and organisms are dependent on each other to fulfill their food needs. Consequently, human beings are directly linked with ecosystem but due to activities on the planet during the last two centuries the ecosystem is being disturbed at large scale. The evidences show that human activities are solely responsible for rapid changes in an ecosystem. So it is morally and ethically the responsibility of human beings to develop care in their actions. The tiny organisms shouldn’t be destroyed because human survival is dependent on them. The following research question is added in the questionnaire to check the ground realities.

| 17. | Environmental ethics describe the relationship between human beings and other components of world around us. |

### 2.25.4 CLIMATE CHANGE

According to American Geological Institute New data from millennium-long tree-ring analyses are indicating that mountains in northern Pakistan have grown significantly wetter over the past century than they had been over the last millennium quite possibly due to human-induced global warming. In Karakoram and Himalaya mountains in northern Pakistan, the upper reaches of the Indus Valley (which supplies the world's largest irrigation network), a group of researchers collected samples of Juniper tree rings that dated back as far as 828.

Numerous news accounts today would guide people to believe that climate change is a new phenomenon. In reality, however, the Earth's climate has changed continually throughout the history of the globe, long before humans existed. In fact, Earth has one of the liveliest and most changeable climates of every planet in our solar system, swinging from long periods of warmth through equally long ice ages. The difference is that today, the effects of humans on the planet appears to be accelerating the expected forces of climate change, posing a serious threat of exterminating not only endangered animal and plant species, but the human species as well. Throughout earth's geological history, natural events have affected the environment such as enormous volcanic eruptions. The famous explosion of the Indonesian volcano Krakatau in the 19th century spewed out so much ash and sulphur dioxide into the atmosphere that the Earth's global weather was cooled for three consecutive years. Beginning in the late 18th century, the effects of the Industrial
Revolution changed the symphony of the atmosphere through burning coal and other fossil fuels. While there are those who doubt that humans affected the global climate, scientific observations have clearly recognized changes that are traced directly to human activities such as deforestation, industrial output and waste disposal.

Pakistan is also facing the same problem in present years. The main reason in Pakistan is due to huge violations of civic laws. The civic sense is very low in Pakistani society while the potential to develop civic sense is still not getting its momentum. Deforestation is being carried on at fast momentum even in urban areas of the country while its importance is yet to be realized. Industries are being flourished at fast rate without taking safety measures while the offices which are responsible for such accountability are not performing their duties in full spirit. The concept of disposal waste in a proper way is entirely impossible in our society still. Even the waste dumps are not properly used in modern areas. The following research questions are included in the questionnaire to analyze the importance of environmental dilemmas.

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<td>18.</td>
<td>Ecosystem stability is upsetting in recent years due to excess amount of phosphate concentrations in lakes, rivers and oceans.</td>
</tr>
<tr>
<td>19.</td>
<td>There is need to know something about atmospheric processes for sound understanding of concept of global climate change.</td>
</tr>
<tr>
<td>20.</td>
<td>Musk oxen and polar bears have no place to go and may become extinct due to melting of arctic and alpine glaciers.</td>
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2.25.5 GLOBAL WARMING

From the first trees felled by our prehistoric ancestors to the naked hills of Haiti today, deforestation has been one of the most important environmental threats to the planet. Cutting down trees want only may afford economic benefits today, but the practice of deforestation has devastating consequences for Mother Earth and all who live upon here. It can be hard to comprehend why deforestation continues when we now know so much about the vital role forests play in Earth's ecosystems. Forests provide habitat for all kinds of wildlife in addition to filtering out detrimental carbon dioxide and other pollutants from the air. The oxygen and water vapor emitted by trees in their respiration process is connected directly to the quantity of rainfall in a
given region. Deforestation has profound effects on climate, and is one of the major factors that speed up harmful climate change.

The global warming is one of core environmental issue in Pakistan. Trees are being cut down at fast rate all over Pakistan. The quantity of trees in a particular area is essential due to phenomenon of rainfall. The quantity of rainfall has been decreasing during the last few years even in capital region Islamabad. Although some awareness campaigns have been launched about plantation of trees in Pakistani society but still required results are far ahead. There is need to save country from negative aspects of environmental issues because it is linked directly with quality of life also. The ecological system is being hit by global warming so preventive measures should be taken in a right way. Further public awareness programs can play a vital role in saving the environment. The below delineated questions are sorted out from the literature to develop conceptual understandings.

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<th>Burning fossil fuels are responsible primarily for large quantities of sulphur concentrations in the atmosphere.</th>
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<td></td>
<td>Everybody talks about the weather but nobody does anything about it. This is a serious issue of 21st century and requires attentions at prior basis.</td>
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**2.25.6 Animal Life: Need safe and healthy environment to survive**

There are six groups of living creatures on the planet earth that if not allowed to live, hunt, feed and procreate will become vanished: Amphibians, Birds, Fish, Invertebrates, Mammals and Reptiles. Amphibians are the solitary most endangered group of the six. When our ecosystems tip out of stability due to pollution, over killing, and habitat destruction, they are the first affected. The world would be in a widespread ecological downfall if there was all of a sudden a huge mass appearance of frogs and salamander deaths everywhere. It would probably be too late to recover. That is why watching for patterns and recovering the environment and taking steps to combat pollutions now, is so important to the world. There are 10,000 bird species and 1,200 of them are endangered or threatened. Over-fishing, pollution and loss of habitat are answerable for endangered fish and reptiles. 20% of Mammals are threatened or on the endangered list, many of them living in water. That percentage results in over 1000 species. Hunting, loss of habitats, pollution, overfishing of food
sources and noise from boat engines are blamed for the main reasons. Two mammals that are endangered are the Baiji and the Blue Whale. Baiji live in the Yangtze River system in China and search the muddy bottom for food. It is a toothed whale with an elongated sleek body and a long beak, and can reach 300 pounds. Because of collisions with boats, over-fishing, dams, water pollution and engine noises, they are away from help. They rely on their echolocation instincts to navigate, which has been compromised to deadly proportions. They are not expected to survive.

Pakistan is facing difficult situation for saving animal life. Most of unique animal species have been reducing in number from last five decades. The valuable birds that usually come in coastal areas of country during winter season have been hunted due to poorest awareness of respecting animal life. Further the huge problem for animal life is spread of industries without taking safety measures. The industrial waste is damaging animal life day by day. There is no visible movement of public awareness at all presently. Moreover, forests are being cut down at faster rate in most part of country. The situation is alarming for survival of animals. The awareness level to handle animal life is very poor as compared to international standards. The following research question is put in the questionnaire to generate data about environmental concepts.

| 23. | The wilderness and wild life protection is mostly affected by impacts of human activities towards deforestation phenomenon. |

### 2.25.6.1 Reduction Bird Species: A Complex Phenomenon

It has been shown in recent studies that loss of tropical forests is the threat for breeding habitat and nesting failures of birds also. Many bird species need deep wood area of ten hectares (25 acres) for breeding to raise their young. Due to rapid cutting of trees such species are also losing their lives rapidly due to loss of natural environment for their survival. Consequently a disturbance is seen in an ecosystem. A report was published in 2005 in which figures was given that in central America, around 1.4 million hectares forests are being cut down every year. If such pace continues then mostly forests would be lost in next 50 years. Horrible figures are being quoted regarding reduction of song bird species in America and Canada. They are reduced up to 75% to 90% as compared to 60 years back. On the other hand we come to the third world countries where conduction of such researches is very
difficult. So no authentic data is available in such countries about reduction of bird species. But the conditions are worse in developing countries in Africa and Asia including Pakistan. The forest cutting is fast in Pakistan so it is estimated that allied factors are affected at a rapid rate. The most important associated factors are the life of birds. The birds should be protected as they are beauty of the environment. Due to birds the beauty of greenery enhances and it creates pleasant effects on human health also. There is need to train the young generation from constructive approach towards saving their ecosystems around rather destructive approach to distort all around. For the questionnaire the subsequent question is tied up to determine the environmental comprehensions in the local settings.

| 24. | Biological productivity and resource availability differ greatly which is most important for understanding biome distribution. |

2.25.7 Over Population: A burning issue globally particularly in developing countries

The history of human population described many interesting facts. The historians quoted that human population reached 50 million by 500 B.C. when efforts of human beings made possible the reasonable food availability in their lives. The historical descriptions and archeological evidence suggested that at the time of Christ only 300 million people were living. Due to wars, diseases and famines the human population were held in check. The life was short and uncertain for most people. During the worst plague years in Europe between 1348 and 1350, almost one third of the European population perished unfortunately. In the world there were about 600 million people at the end of last great plague in 1650 A.D. It is estimated that human population growth has been rapidly increasing since 1600 A.D. A human population reached a billion in 1804 but in 1960 it was recorded three billion people. Moreover the population jumped to five to six billions in only 12 years from 1960 to 1972 astonishingly. That was enormous population expansion and it is a continue process still. It is estimated that human population is almost triple in the 20th century. The reason for this rapid expansion of human population in last two centuries is due to development in the field of medical science, communication, living standards and a general awareness level of public about sailing and navigating skills. In spite of all the positive factors in human development the rapid growth of population is a serious
There are very few humans who aren't entranced by the sight of an infant. In fact, there are few animal species that don't dote on their offspring for at least part of their development. Beloved as babies are to their families, too many of them puts nearly irredeemable stress on the surrounding environment. This condition is known as over population. Human populations have been adversely affecting the natural environment for millennia. Today, however, the Earth's 6 billion human inhabitants are more aware of their impact on the plant, but are sharply divided on how to cope with their effects. Human over population is the result of many factors, such as the improvement of life spans and quality of life in industrialized countries, along with the absence of any natural enemies (except one another). At the current rate of reproduction, another 1 billion people are added to Earth's human population every 10 years.

Over population is a serious problem of Pakistani society because it is a type of issue which couldn't be controlled even after spending money and awareness campaigns. Most environmental issues are actually linked with over population. Deforestation, poor management of waste and construction of housing societies without proper sanitation in many parts of the country are major issues. Further urbanization is another dilemma because it is also continuous vastly without any planning and management. Cities are becoming thickly populated day by day and facilities are becoming reducing. On the other hand, rural life is facing problems regarding quality of life. Although quality of life is a broad subject but our concern is related to environmental aspects. The relevant environmental issues are provision of clean drinking water, proper sanitation and dumping of waste. Most importantly is the development of awareness so that public can manage their issues at their own level. The potential to work as team members should be developed. The following research questions for the questionnaire are explored on the basis of literature to search out the existing situations.

| 25. | Problems of resource limitation can be overcome by addressing issue of population growth. |
| 26. | On the earth the life support systems are overloaded by the number of humans in the world and their impact on the environment. |
2.25.8 **Pollution: Issue that requires attention of general public in their daily life actions**

According to Centre for Environmental Economics and Climate Change (CEECC) and Pakistan Institute of Development Economics (PIDE), Islamabad, Pakistan Air pollution measure-SPM has exceeded the threshold level of SPM. It is 6 times higher than the WHO guidelines. The focus of research will be on formulation, identification of implementation strategies and on enforcement standards.

Since the mid-20th century, people have become more and more aware of how various forms of pollution are poisoning Earth and reducing the survival chances of every form of life. Consider these facts about pollution from the U.S. Environmental Protection Agency and other pollution-watch groups. Firstly, Americans use some 2.2 billion pounds of pesticides every year – poisons to which the target pests quickly develop resistance. U.S. groundwater, the source of much drinking water, has been found to harbour 73 different kinds of pesticides. More than 100 active ingredients in pesticides have been linked to cancer, birth defects and gene mutation. Researchers are finding that more and more pesticides disrupt immune and endocrine systems and have long-term impacts on human and animal offspring. In addition, 41 percent of all U.S. agricultural insecticides are applied to corn. Eighty percent of these are intended to treat a pest that could be controlled more effectively by rotating the corn annually with any other crop. Secondly, for an amount equivalent to the cost of one nuclear weapons test, 80,000 hand pumps could be installed in the villages of developing countries to provide clean water. Meanwhile, the EPA estimates that it will cost U.S. taxpayers between $100 billion and $400 billion to clean up 24,000 contaminated federal nuclear facilities. U.S. factories emit 3 million tons of toxic chemicals annually into the air and water, and onto land. In 1987, the United States released 1.2 million tons of toxic chemicals into the Earth's atmosphere, 670,000 tons into the soil, and 250,000 tons into the water, according to International Wildlife magazine. What's more, although PCBs have been banned for more than 20 years, "dangerous" levels of PCBs remain in the environment, threatening biological life. While essential for crops, too much nitrogen leaking into water sources causes nutrient pollution in streams, rivers and oceans, and results in nitrate pollution that harms humans. Air pollutants like gases in the atmosphere can have beneficial effects in one part, but
cause serious problems in other situations. For instance, ozone, a colorless gas, is the major component of smog at the Earth’s surface, but helps protect the planet from harmful solar radiation in the upper atmosphere. At the surface, ozone can irritate the respiratory tract; impair lung function and cause chest pain, cough, and lung inflammation. Meanwhile, carbon monoxide, an odorless and colorless gas emitted in the exhaust of motor vehicles reduces the blood’s ability to deliver oxygen, affecting the cardiovascular and nervous systems. Nitrogen dioxide, a light brown gas that produces brown urban haze, causes acid rain and smog, and can harm both people and plants in high concentrations. Another major component of smog is sulphur dioxide emitted mainly through burning fossil fuels; this chemical acidifies lakes and streams and harms people who suffer from asthma. Other toxic air pollutants includes arsenic, asbestos, benzenes and chlorofluorocarbons from industries, car exhaust, fuels, building materials, household refrigeration, car and home air conditioners and products made of plastic foam. Greater awareness of these pollutants in the past 50 years or so have led many industries to change their processes or the components of their products. For example, interior and exterior paints are now made without lead, a major threat to children, and without volatile organic compounds (VOCs) that contribute to air pollution.

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<tr>
<td>27.</td>
<td>Chemical pesticides are dangerous but their alternatives are limited and not easily accessible.</td>
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<tr>
<td>28.</td>
<td>Air pollution is a grave issue in the megacities of developing countries as compared to cities of developed countries.</td>
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<tr>
<td>29.</td>
<td>People are suffering health problems that are in a habit of eating fish regularly from the areas of highly polluted lakes and rivers.</td>
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The above mentioned factors have been affecting human health from the last many centuries. A proper awareness program is required to launch for general public. By making streamline efforts society can be made aware to ready to protect themselves from such hazards. This target can be achieved by adding environmental awareness programs in teachers’ training. A huge mob can be conveyed effectively ecological awareness. For the questionnaire the following research questions are searched out to explore the existing situations on the basis of literature.
2.25.8.1 Air pollution:

The human activities are responsible due to which wastes are released into the environment and damaging materials. A dense stagnant layer of air blanketed the city of London on December 5, 1952. The reason of that huge pollution was coal furnaces and industry in the city. Historically King Edward I warned to stop burning coal in 1272 in city while Queen Elizabeth 1 in 1578 complained about the worst air of London also. In 1879, a four month fog lasted from November to March which resulted sunless gloom. The citizens of London termed the air as “thick as peak as soup.” However, the attitude towards air pollution was changed entirely after suffering high number of deaths in London. Clean air act was enacted by parliament to restrict coal use and require filters in industries. The clean air act was passed in 1970 in the United States and seven major pollutants were designated in the Act. These are sulphur dioxide, particulates, carbon monoxide, hydrocarbons, photochemical oxidants, nitrogen oxides and lead. There are serious threats recorded due to such pollutants to environmental health and human health. The paper mills are source of most annoying pollutants such as sulphides and pungent organosulphur. Extremely dangerous organo chlorines like dioxins are also produced by chlorine bleaching. Poorly ventilated living spaces and kitchens cause cancer causing hydrocarbon, particulates and carbon monoxide which ultimately result in a poor health conditions of people. In such living conditions the women and specially children are at risk. In Copsa Mica, Romania soot from refineries and factories has turned shepherds sheep black along with streets and buildings. Thousands of tons of air pollutants are churned out by huge oil refineries, chemical and fertilizer factories every year.

Another alarming air pollutant all over the world is smoking. The EPA has investigated that indoor level of toxic air pollutants are often higher and more dangerous than outdoor. Heart attacks, emphysema, lung cancer, strokes etc. are caused mostly due to smoking. Even women are involving in smoking at huge rate than males in many developed countries including America. Lung cancer among women has increased six hundred percent since 1950. Lung cancer is second big dangerous disease in women after breast cancer all over the world. The under mentioned research questions have been derived for the questionnaire, based on the discussion on basic environmental issues, to bring out existing realities.
Most glorious buildings and works of art throughout the world are being damaged by acidic fumes in the air.

Respiratory diseases are comparatively high among people of those areas who breathe dirty air as compared to matching groups living in cleaner environment.

2.25.8.2 Dust domes and heat islands:

Atmospheric environment is observed quite differently in many large cities as compared to surrounding areas. The rainfall runs off quickly in urban areas due to high concentrations of glass and concrete along with sparse vegetation. This phenomenon creates high heat absorption in day time while at night it radiates. Due to this phenomenon temperature are frequently higher (30°C to 50°C or 86°F to 122°F) in the big cities as compared to countryside areas. Another problem which is observed in rural areas is due to downwind from industrial areas. Such rural areas face oftenly significant decrease in visibility and increased rainfall. Moreover, it has been observed in America that Houston, Louisiana, Lake Charles which have many petroleum refineries faced lightening strikes twice times as compared to neighboring areas with same climate conditions but with cleaner air. The wind also carries fine aerosols and dust to long distances even from one continent to another also.

The industrial belt between the Ohio River valley and the great lake is a source of contaminating the Canadian Maritime province and sometimes its effects can be traced as far as in Ireland also. Also storms from China’s TAkla Makan and Gobi deserts oftenly close factories, airports and schools in Korea and Japan. A research report showed that in 1998 due to severe dust storm in China seventy five percent of particulate pollution was seen in Washington, Seattle etc. A three km thick toxic cloud of aerosols, ash acids, dust and photochemical reactants covers the entire subcontinent region. Due to air pollution above two million people die each year in India alone. In subcontinent, due to burning of forests fires, agricultural lands, dramatic increase in burning of fossil fuels, the amount of solar energy reaching the surface of earth is cut by the Asia smog layer upto 15%. Metrologists have investigated that rainfall over northern Pakistan is less now as compared to 40 years
back and the reason behind it is disturbance in monsoon weather. Metrologists suggest that clouds out of which eighty percent are human created disrupt monsoon weather all over subcontinent. Shifting monsoon flows is also a serious cause of disasters in whole South Asian region including China and Afghanistan. Catastrophic floods have destroyed many parts in these countries and millions of people remain homeless from last many years. This cycle is continued from the last many years and disturbing the lives of billions of people of this region. The pollution index could be above 300 in many big cities of South Asia in afternoon timings which is considered as a big health hazard. The following research question is added in the questionnaire to check the ground realities.

| 32. | Damage buildings, reduce visibility in big cities, vegetation and many human health problems are the result of disturbance of sulphur cycle. |

### 2.25.9 Waste Management: Issue that is ignored particularly in developing countries largely

According to Centre for Environmental Economics and Climate Change (CEECC) and Pakistan Institute of Development Economics (PIDE), Islamabad, Pakistan In Pakistan less than 60 percent of the waste is collected and a smaller fraction is disposed off properly. There is a need to develop plans for proper waste management, and on formulation and enforcement of regulations for proper waste disposal, Sesame Street's Oscar the Grouch may love trash, but humanity is coming close to drowning in its own waste. Humans seem to be "wasters" to such a degree that archaeologists often focus on the garbage dumps of prehistoric sites to study how ancient peoples lived. However, scientists are beginning to experiment with better management of human waste in hopes it can solve some of the world's environmental dilemmas. Waste management is more than having the confined garbage truck pick up a week's worth of potato peels, paper towels and chicken bones. The management of waste materials include the collection, transportation, processing, disposal or recycling of waste, along with monitoring these materials. Waste management refers usually to the products of human activity, and aims to prevent disease, protect the natural environment and improve the aesthetics of human communities. Human waste includes liquid, gaseous, solid or radioactive substances. Each type of waste involves different management methods and encompasses different types of expertise, especially to reclaim resources from waste. What's more, management practices differ
between urban and rural areas, between residential and industrial producers and between developed and developing nations. In cities, local governments are accountable for waste management for homes and public institutions such as schools, while businesses and industries must carry out their own waste disposal. Anyone who's seen pictures of landfills or garbage scows can understand the challenge of waste management. Many municipalities today give confidence or even mandate recycling as part of their waste management programs in an effort to reduce the amount of waste for disposal. Some turn human bodily waste into fertilizer via anaerobic digestion by bacteria in treatment plants. One of the most intriguing techniques today is to convert liquid and solid wastes into a synthetic gas through plasma arc waste disposal. A gasifier vessel uses electrically charged gas (plasma) to turn wastes into more gas, which is then used to run electricity generators instead of coal, oil or other fossil fuels. Unfortunately, landfills – burying garbage – remain the top method of waste disposal in the United States and an often-used, inexpensive method in other countries as well. The Environmental Protection Agency reports that the United States generated 250 million tons of waste in 2008. About 54 percent of this trash ended up in landfills, which in turn are using up land at an annual rate of nearly 3,500 acres. In fact, some states have used up all their landfills and must send their waste elsewhere. The environmental problems of landfills, besides using up land, can be many. They can attract mice, rats, roaches and other vermin that feed on the garbage and carry disease elsewhere. Paper and other litter can be blown out of the landfill. Most of all, landfills can be smelly things to have around, as the decomposition of organic matter produces methane and carbon dioxide gases. Carbon dioxide is a greenhouse gas that increases global warming. "Recycling" is the popular term for collecting and reusing the elements in common containers such as aluminum beverage cans, steel food and aerosol cans, plastic bottles, glass bottles and jars, paperboard cartons, newspapers, magazines, and corrugated fiberboard boxes. Another form of recycling is biological reprocessing, known to gardeners everywhere as composting, that allows organic matter to decompose naturally, producing mulch and fertilizer and also produces methane gas that can be used for generating heat and electricity. These are but a few of the ways that waste management is seeking to reduce, reuse and recycle human products to create energy and cut back on resource depletion.
In capital Islamabad, a recycling plant has been constructed near residential area which is not good for health of residents. The disposal of waste is very poor. The manpower is not properly trained to dump garbage properly. The situation is worst even in metropolitan cities i.e. Lahore, Karachi, Peshawar, Quetta, Multan etc. Here the emergency is required to educate people. The clean and neat atmosphere should be made possible. For this purpose education is a potent source to serve the purpose. The students should be trained in such a manner that they can transfer further their plan of action in the society. The following research questions are included in the questionnaire to analyze the importance of environmental dilemmas.

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<td>33.</td>
<td>Significant amount of water can be recycled and reclaimed after paying some focused attentions and budgeting to build treatment plants in Pakistan.</td>
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<tr>
<td>34.</td>
<td>Streams and rivers can be saved from pollution by developing a mechanism for reclaiming industrial wastes.</td>
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### 2.25.10 Developing Civic Sense: Urgent need of Pakistani Society

Throughout recorded human history, the growth of civilization has been linked to the development of energy. In ancient cultures, animals were a major source of energy for the development of agriculture. More sophisticated cultures used human slaves as energy to build cities and monuments. Contemporary society, from the flip of a light switch to rockets blasting into space, is built upon readily available energy. Until the last 50 years or so, people took easy energy for granted. Today as concern rises about the effects of burning fossil fuels on climate change, along with increased attentiveness of declining oil reserves, Earth's people are looking for answers. For many scientists, the answer is solar power. Solar energy's benefits include independence from foreign oil suppliers, less air and water pollution causing climate change and decentralized energy production that could be better protected from terrorism. Noted ecologist Daniel B. Botkin, who has written broadly on environmental issues, including energy, argues that alternative energy sources are essential to preserving human civilization. He contends that one of the main reasons the human species has "won" the natural struggle to perpetuate our kind is because people learned how to gather more energy than other species, how to store and how to use it more efficiently. Without enough energy, people – in fact, all species of life –
barely subsist, unable to progress past procuring their next meal. The answer to this dilemma, says the ecologist, is raining down ceaselessly on our planet in the form of solar energy. In fact, all life can trace its existence back to the Sun's energy. Plants collect solar energy through their leaves, converting it to food by the process of photosynthesis. Animals and people alike eat plants for food, and people also consume animals and their products, such as milk and eggs. As a result of this chain of life, finding energy alternatives to fossil fuels isn't merely the concern of environmentalists; it bears on the future of every living being on planet Earth. Botkin and other scientists build a serious case for solar energy as the global solution to fossil fuel use. Botkin's primary example is the world's biggest solar electric installation on a farm in Bavaria, Germany, where solar panels generate 10 megawatts on a mere 62 acres. What's even more encouraging about this energy cause is that Germany's climate isn't the kind of always-sunny environment normally associated with solar power production. Nonetheless, the installation has been working productively for several years. What's more, Botkin calculates that Germany could supply all its energy needs if only 3.5 percent of its surface area – farm fields, rooftops, etc. – were dedicated to generating solar power. Botkin also points out in an online post that in 2002 Con Edison built New York City’s largest commercial rooftop solar energy system for $900,000, providing energy for 100 houses. Estimating an average of four people per home, the cost for installation is $2,250 per person. The United States could install solar generators for each of its 300 million people at a total cost of $675 billion, or less than the country's annual $720 billion a year trade deficit. So why are the countries of the Earth dragging their feet on converting from fossil fuels to solar power? Perhaps the horrendous oil spill in the Gulf of Mexico this year will convince the United States, the world's number-one energy user, to switch to the sun's energy and save the planet.

The solar energy system is being introduced in Pakistan. Although its momentum is slow but it is getting popularity in society. On the other hand the concept of optimum utilization of resources is very low. People are not aware of the resources they have usually. Most of tasks are not considered important and leave them for experts only. The mind of people must be made ready for action to preserve their resources urgently. The below delineated questions are sorted out from the literature to develop conceptual understandings.
Conservation of forests to agriculture or posture is an essential need of human beings in recent years.

The measurement of quality of life is related with use of energy per capita per person and living standard of people in respective area.

2.25.11 Resource Depletion: An alarming indicator of present era especially in developing countries

The past 210 years have seen some of the most amazing developments in human science and technology thanks to the developments of the Industrial Age and its successor, the information Age. However, the elements that make this highly sophisticated society possible are rapidly being depleted, leading scientists and environmentalists alike to growing concern about human survival. The reason for this concern is really simply. Today's industrial civilization is based on a trinity of resources: metals, hydrocarbons (fossil fuels) and electricity. Each of these elements is dependent upon the other two. Without electricity and metals, there would be no way to extract the hydrocarbons, or fossil fuels, that create more electricity and process more metals from ore. Without fossil fuels, there would be no efficient way to generate electric power. In fact, electricity is the most fragile of the triad, and electrical failure gives an early-warning signal that the entire basis of contemporary society may collapse. Worldwide electricity use increased by 70 percent in the period between 1990 and 2008. Contrast this 41 percent per capita usage increase with the fact that the generation of global energy per capita is not increasing significantly. In short, the world is using energy faster than it can be produced. Added to this grim reality is the fact that the global economy rests on fossil fuels such as coal, oil and natural gas. Not only do these petroleum products provide fuel, they're used in many other products of today's civilization, such as asphalt, fertilizer, lubricants, paint, and plastics. Between 1850 and 2010, people on Earth used about half of the world's estimated 2 trillion barrels of petroleum. Currently the world's population uses about 30 billions barrels of oil annually. Some analysts predict that by the year 2030, oil production will be down to about half of that amount. Highly polluting coal and difficult-to-transport natural gas also are disappearing. Meanwhile, global mineral depletion is more difficult to determine. That's because 1) recycling can reclaim usable minerals; 2) economic trade circles the planet, making it difficult to track mineral use; 3) sometimes one mineral can replace another. However, the U.S.
Geological Survey estimates that most nonrenewable resources have passed their peak amounts. Among these are bauxite (peaking in 1943), copper (1998), iron ore (1951), magnesium (1966), phosphate rock (1980), potash (1967), rare earth metals (1984), tin (1945), titanium (1964), and zinc (1969). Despite recycling, these resources continue to be depleted. Finally, the declining production of fresh, clean water is making this resource even more valuable than fossil fuels in some locations. The United Nations' Global Environment Outlook 4 report estimates that nearly 2 billion people—a third of the world's current population—will live in regions with water scarcity by 2025, while the remaining two-thirds are expected to be under "water stress." That means they will be poised at threshold beyond which there isn’t enough water to sustain agriculture, industry, energy production and domestic life. Added to an increasing decline of arable land for food production, the future of the world looks bleak from a global resource depletion viewpoint. The question that remains is whether humanity will make difficult decisions about such things as population and energy conservations in order to preserve the human species.

The consumption rate is very high in Pakistan regarding natural resources. The worst condition in this respect is about electricity and water. The production of electricity is not fulfilling the whole requirement in the country. The electricity is expensive too. The main reason behind this is not fully utilizing water resources. The condition of water resources is becoming worse day by day. New dams couldn’t be built in time due to political turbulence in the country. Even the existing water reservoirs are not being maintained properly. As a result water couldn’t be saved for daily usage of many kinds like agriculture, hydroelectric power etc. Another burning issue is the decreasing level of agriculture land in Pakistan. On the other hand a huge piece of land is useless in Baluchistan. There is still no awareness to develop a infrastructure to utilize that land for agriculture. The following research question is put in the questionnaire to generate data about environmental concepts.

| 37. | The continuous destruction of forests in many parts of the world is ultimately resulting water deficit in that region. |
2.25.11.1 Chronic hunger and food security:

There were nearly sixty percent people chronically unnourished in 1960 which means people couldn’t get nearly 2200 kcal per day for healthy productive life. Recently the population has almost doubled but undernourished proportions of people have fallen to fifteen percent. This figure depicts the progress all over the world by concrete efforts. The Food and Agriculture organization (FAO) by UN estimates that every individual will be provided 3050 kcal diet per day if distribute equally by 2050. The dilemma is that 815 million people are undernourished globally in sub-Saharan Africa, Asia and some part of Latin America. But on the other hand in developed countries like US, Australia, Canada, Japan and many European countries are producing more than enough to fulfill nutritional needs of their people but excess food in these countries is not being managed properly to deliver to poorer countries. The calculations are that only 11% of the earth total land area is cultivated currently and producing agriculture production (14.66 million km$^2$) out of (132.4 million km$^2$) total. Four times land could be converted potentially to cropland in future but major hindrances are steep slopes, shallow soils, metal toxicity, excess soluble salts or acidity, tillage problems, poor drainage etc. The production in developed countries has been increased due to increased fertilization, irrigation, pesticides use rather than preparing new land for excess production. In South America and Oceania, the farms are being developed by demolishing forests or grazing lands rapidly during the last four decades. On the other hand in Argentina, arms are being developed although but not on the cost of damaging local ecology or ecosystem and targets are being achieved carefully. For the questionnaire the subsequent question is tied up to determine the environmental comprehensions in the local settings.

| 38. | Family nutrition is a challenge in developing countries and can be overcome by giving women and children access to markets. |

2.25.11.2 Land degradation:

The international soil reference and information Centre in Netherlands reports that three million hectares of cultivated land are destroyed by erosion every year. Four million hectares are changed into deserts unfortunately while homes, shopping
centers, highways, factories, reservoirs etc. are built over 8 million hectares. 1.9 billion hectares of agricultural land which is greater than that of present productive area have already been degraded to some extent over the past 50 years. Out of which 910 million hectares is moderately degraded to some extent over the past 50 years. Out of which 910 million hectares (equal to size of China) is moderately degraded while around 300 million hectares is degraded strongly. The restoration of this land is very expensive and difficult. The causes of such extreme degradation of soil in different parts of the world are different. As in Africa it is mostly due to water erosion and wind in countries like Somalia, Ethiopia, Eritrea etc. while in central Asia it is due to salt and toxic chemicals. Wind and water erosion provide the factors for the huge majority of the soil erosion worldwide. 11 metric tons per hectare (five tons per acre) is considered the tolerable rate of soil loss at maximum level but many forms are losing soil at twice rate. Weed free fields are created due to heavy herbicide and deep plowing applications which looks neat and clean but ultimate result is erosion. China has a large area of windblown slit that was covered by thick forests and grass lands few years back. Due to deforestation and conversion of grasslands into cropland the soil loss is huge in such area. This results in a reduction of cropland and increasing soil erosion. The huge quantity of sediments is also observed in Huang river china due to this soil erosion. The following research questions for the questionnaire are explored on the basis of literature to search out the existing situations.

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<td>39.</td>
<td>Heavy erosion from logging of tropical rain forests is also a huge source of water pollution and dangerous to many forms of life in rivers.</td>
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<tr>
<td>40.</td>
<td>Over the years the land degradation particularly in Africa and Asia may result in a food shortage and hunger in future.</td>
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**2.25.12 Environmental Health and Toxicology:**

The diseases that are caused by external factors are called environmental health. The human beings are affected by the health of environment around them not only but the other species on the planet also. Chemical hazards, pesticides and hygiene are leading factors. Due to chemical hazards, the air pollution, water pollution and waste disposal etc. all such major environmental issues emerge. Further high risk natural environments such as wetlands are also a major source of diseases. Most importantly the toxic and hazardous substances shouldn’t be used in kitchen and
home appliances. As due to non-awareness factor, in most countries people are using toxic and other products in their daily life activities. Due to which the overall ecological life is disturbed. Endocrine disrupters are chemicals due to which normal hormones functions are disrupted. Some chemicals are termed as estrogens or androgens in environmental science and there pico gram concentrations in any process cause severe losses to reproductive health problems in females and males both. The toxins are harmful not only for humans but for animals and plants species also. The toxins disrupt metabolic functions and are responsible for life damage in many cases. A sound environmental awareness can bring sense in public to take care of such hazardous in their daily life. It is a challenging issue especially in those countries where awareness level is very low presently. For the questionnaire the following research question is searched out to explore the existing situations on the basis of literature.

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<td>41.</td>
<td>High quality protein to human diet can be provided by doing fish farming under the umbrella of maintaining international standards.</td>
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2.25.13 Water Reservoirs: Urgently need attention in Pakistani society

According to Centre for Environmental Economics and Climate Change (CEECC) and Pakistan Institute of Development Economics (PIDE), Islamabad, Pakistan Water availability in Pakistan has declined from 5000 CM per person in 1950 to 1200 CM in 2005. The research is needed to ensure efficient water use and conservation of this critical resource.

Pure water is in short supply. Our global reserves of drinkable water are a fraction of 1% and 1 in 5 humans does not have access to potable (safe) water. Many people do not realize that strife has already broken out in some stressed regions. There are many potential solutions, some promising, others challenging. Desalinization is an energy-inefficient, expensive option. But there are many things you can do.

The provision of clean water is very short in most parts of the country. People are not aware of the procedures of making water clean for domestic purposes. The herbs can be used for this purpose. There is need to aware people about the effective use of herbs. The herbs are cheap in price but their effectiveness is high. The addition of such concepts in the syllabus of environmental education for training of teachers
can serve the purpose at large in the society. Major issues of health are associated with use of clean water domestically. The most urgent is to raise awareness about saving water. The water is wasted in a huge amount in our society. The water shouldn’t be wasted not only household purposes but also in offices, educational institutions etc. Education is a powerful tool in the society and important concepts can be injected in the society effectively. Further the concepts can be transformed into plan of action through teaching practices in a right direction.

496,000 km³ water is evaporated by sun from the earth's surface each year. Water evaporates more in the tropics than at high altitudes globally. Ninety percent of the water evaporated from the oceans fall back again in the oceans as rain. The oceans contribute eighty six percent of total evaporation although the total area covered by ocean is seventy percent on the planet. Oceans maintain the temperature of the planet otherwise its temperature ranges from -130°C (night time) to 100°C (day time) as on the moon. The major water compartments are oceans, glaciers, snow, ice and rivers. The ground water is the largest source of clean water for domestic, agricultural and drinking purpose. The ninety five percent of the rural and urban population depends mostly on ground water. Salt water intrusion is one of the big reasons of depleting ground water especially in coastal regions in North America. Another big cause of depleting ground water is rapid expansion of big cities where huge demand of water is far beyond the available underground water. It has been investigated that water supply from one area to another demanding area is also a source of creating water scarcity in main areas. A salty desert lake area near Yosmite national park is created due to this factor. The renewable water resources which are readily accessible presently to mankind are very high approximately 1500 km³ (400,000) gallons per person in a year but it is not distributed equally all over the world. Some areas have acute water shortage while some have more than enough. When wetlands are disturbed, their natural capacity to water absorption falls rapidly. The under mentioned research questions have been derived for the questionnaire, based on the discussion on basic environmental issues, to bring out existing realities.

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<td>42.</td>
<td>In a natural forest, the rivers are mostly clean, clear and flow year round without hindrances.</td>
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<tr>
<td>43.</td>
<td>Depletion of ground water in recent years is a serious threat to agriculture</td>
</tr>
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</table>
2.25.13.1 Water Pollution:

Biological, chemical or physical change in quality of water that affects living organisms or water become not suitable for domestic uses is called “water pollution”. The pathogenic organisms are most dangerous water pollutants for human health. The pathogens presence in water cause cholera, typhoid, infectious hepatitis, bacterial and amoebic dysentery, malaria and yellow fever etc. The pathogens are produced in water by improper treatment of human wastes, animal wastes near the water reservoirs, inadequate treatment plants of factories and due to absence of sewage plants near residential areas. The amount of oxygen in any water sample indicates the quality of water but in present era the quantity of oxygen is dropping due to addition of wastes from factories and bad sanitation. Acid water pollution is a serious cause of diseases among human beings. The main source of acid water is factories of metal smelting and plating, leather tanning, coal mining, organic chemical synthesis and petroleum distillation. Fishes, aquatic insects and amphibians are killed generally by rising acid level in the water. Thousand lakes in eastern quebec Canada and 200 hundred lakes in Andirondack mountains of New York have been reported under threat of dangerous acid water. In 1948, in America Canada and UK, the sewage treatment plants were not adequate and sewage was treated improperly. But these countries have shown remarkable achievements to develop and maintain treatment plants to make the water safe and healthy for their people. On the other hand the conditions are worse in developing countries and especially in the region of sub continent. The issue is not being given due heed as it is linked directly to human health. In Pakistan, a sewage treatment plant is built in 2007 in the centre of twin cities Islamabad and Rawalpindi. The plant is still not being able to deliver its maximum benefits to local community rather adverse effects are seen. The sanitation engineers have developed very cheap treatment plant technology. This will be very helpful in developing countries to make water clean and safe on cheaper rates. There is need to focus on investigating such facilities actively and efficiently. The following research questions are added in the questionnaire to check the ground realities.

44. Twenty five million people die each year due to water borne diseases inclusive of two third mortalities of children under the age of five years.
A largest segment of population in South Asia is under a serious threat of naturally occurring arsenic in ground water due to rapid industrial growth and intensification of agricultural irrigation.

2.25.14 Plants: Their presence ensure healthy environment

Plants are the organisms which produce food in the form of carbohydrates. All the humans and animals to get energy for the functioning of their body systems consume this food. If there would be no plants there would not be the availability of food for the human and animals so they would not survive on the earth. Plants & trees are very important part of environment so as to contribute a lot to the ecosystem in which we live. Humans depend on both for different needs such as food, shelter, oxygen, medicines, fuel and produce different substances for human being use. Trees are essential, helpful and necessary to our existence. Without trees human would not survive on this beautiful world.

1. Trees and plants generate Oxygen:
2. Trees and plants clean the Soil:
3. Trees and plants give help to Control Noise Pollution:
4. Trees and plants Slow Storm Water overflow:
5. Trees and plants sink Carbon:
6. Trees and plants clean the Air:
7. Trees and plants provide us Shade and Cool:
8. Trees Act as Windbreaks:
9. Trees and plants fight against Soil Erosion:
10. Trees and plants enhance Property Values:

The situation about plants is not very good in Pakistan. As deforestation process is fast here so its impacts are being seen on plants too. Plants have multiple advantages to the people. The provision of plants is also important for us from our weather point of view. As our weather is generally hot in most parts of the country so its effects can be minimized by planting huge number of trees around. Further various types of rich food items can be collected from plants of various kinds. It is also very helpful in such a manner that our society is mostly lower middle class and hunger problem can be handled in this way. The awareness about growth and protection of plants can lead to fulfillment of dream of green society. The steps should be taken now to get desired
results in near future. The following research question is included in the questionnaire to analyze the importance of environmental dilemmas.

| 46. | Lakes, rivers and wetlands are fresh water aquatic systems which are major centers of biodiversity in the terrestrial systems. |

**2.25.15 Public Health Issues: Emergency is needed to address issue in Pakistani community**

Health is overall condition of the body which includes physical and psychological and even socio-economic factors. Similarly disease is an overall phenomenon and if a person does not feels happy due to some mental distress of physical impairment then he/she has said to have a disease.

Environmental health explores the ways in which natural, social, cultural and technological aspects can affect our health profiles in terms of pathogenic, physiological and deficiency diseases.

In this assignment we will discuss the impact of environment on health of one’s body or mind. It is very evident that environment can affect a living-being’s health, positively or negatively. For example if a man lives close to a garbage dumping site then he will have increased chances of getting variety of infections and he may undergo psychological stress due to his body condition.

There is a general understanding that health means physical well-being but experts and World Health Organization defines health as overall well-being of a person. In Pakistan and other under-developing countries there is a general understanding that a person is healthy if he has no physical disorder. But it is not the case and one should not include psychological impacts.

Our daily cleaners and sprays can cause us to suffer from health issues. We should minimize the use of such things. We should try to eat organic diet because the sprays used on inorganic diet can cause health issues for us.

Environment affects human beings, animals and all living organisms and since we all depend on each other (e.g we eat plants and animals) so the bad effects are transferable. At the end of the day it us human beings that are affected and therefore it is in our supreme interest to protect environment.

In 1992 Pakistan's National Conservation Strategy Report attempted to redress the previous inattention to the nation's mounting environmental problem. Drawing on the
Our tomatoes have fish DNA? Killer bugs are on the loose? Superweeds are taking over corn fields? Wild animals are sprouting extra limbs? Autism is on the rise? WTF! What on earth (literally) is going on? From genetic manipulation and cloning to public health issues and food and drug contamination, get to know the new, strange, important and most interesting green issues related to genetic science, agribusiness, public health and more. What’s this about electromagnetic fields? Is all that exhaust on my commute killing me? Do cell phones really cause cancer? Will soy milk give me man boobs? How much of our groundwater is contaminated? Is smog getting worse or better? How much acid rain is there? Why can’t I drink out of streams? These are just some of the fascinating questions you can read about here in future posts. You can look forward to sane analysis that debunks myth and takes fear-mongering to task. The below delineated questions are sorted out from the literature to develop conceptual understandings.

### 2.26 Effects of human activities on environment

Our earth is the only planet of the solar system where Free State oxygen and water vapor are present living organisms use oxygen in respiration. Atmosphere is an envelope of gases that covers the earth from all sides. But unfortunately human activities have bad effect on environment. Environment is affected because of all types of pollution. Pollution means, any change or change in the properties of air water or land, which have undesired able changes in environment and that effect not only human beings but also all living things. Human activities in the modern industrial world produce a large amount of wastes, Different gases, Smokes useless Particles and toxic water are released from factories and vehicles, leftover food stuff and domestic trash is also included in wastes causing pollution. Human beings get progress by leap and bound but it effects environment polluted water pollution is
generally caused when industrial wastes, trash and sewage from cities is discharged into the water bodies like rivers, ponds, streams, and oceans. Land pollution also has bad effect on our surroundings. Sewage sludge, agriculture waste, and chemicals from factories are major sources of land pollutions. Green house effect and global warming have many undesirable effects.

It has bad consequence on ozone layer. It present in the stratosphere stops ultra violet radiation. Destruction of ozone layer as a result of human activities is causing diseases like cancer. Ozone layer is very helpful for the human being because it saves us from radiation that are produced by sun it protect us from many diseases. Global warming is increased green houses are one of the cause of this warming. Human activities also increase pollution in world like people throw their garbage in streets so it increased or we can say generate problems for people who live in such surrounding. So science helps people in all fields of life. Science inventions save human time and makes life easy for us if we think about our forefathers’ time their life is much heard. If they suffers with any disease the only solution is death because they don’t have advance technology not such doctors that we haves. We can say it makes our life easy but it also creates many problems for human beings although science has brought prosperity and happiness to mankind yet it has also added to the miseries and unhappiness of mankind. All modern technologies have bad essence on our environment. The following research question is put in the questionnaire to generate data about environmental concepts.

| 49. | Urbanization is the result of huge number of people which are pulled in cities for opportunities and advantages as compared to available resources in rural areas which resulting ultimately in sustainable hazardous. |

2.27 Analysis of the researches done in the area of environmental education

In 2009 Veronica Gaylie, Pieterlen, Switzerland, Peter Lang wrote a book on ‘The learning garden: ecology, teaching and transformation’ in which the role of teacher education in developing environmental awareness in the community was highlighted. The target was to build the gardens by involving community at large. Further by looking after the gardens the environmental knowledge could be enhanced.
To develop a curriculum of environmental education for teachers’ training colleges, Daniel Kassahun Waktola (2009) worked on Challenges and opportunities in mainstreaming environmental education into the curricula of teachers’ colleges in Ethiopia’ in the same year. Again in May 2009 Mehmet Erdogan, Tom Marcinkowskib and Ahmet Okc published their work on Content analysis of selected features of K-8 environmental education research studies in Turkey, 1997–2007. The main aim was to analyze the syllabus of environmental awareness of eighth grade students and then its improvement according to latest developments. Then in 2007 Brett Bruyere and Peter E. Nash worked on predicting Participation in Environmental Education by Teachers in Coastal Regions of Tanzania. The main aim of research was to develop awareness among teachers of Tanzania. A teacher training course was designed to implement in local settings in Tanzania to aware teachers about local environmental issues. For this purpose an awareness level of teachers was checked initially. A workshop was also organized to enhance awareness level of local teachers.

The research produced fruitful results at the end. While in 2010 Marianne E. Krasnya and Wolff-Michael Roth came forward with their research on Environmental education for social–ecological system resilience: a perspective from activity theory to develop capacity building among participants in Ethiopia about local water sheds. The reason behind it was rapid falling level of water in Ethiopia. The training program was organized to enhance awareness level of local population. In the same year after two months of the research by Marianne E. Krasnya and Wolff-Michael Roth another research was published by Penny Singh on ‘Developing a community of thinking: assessment of environmental education with the aim was to build the concept of social constructive framework among participants about environmental education.

Pilar Aznar Mingueta, M. Pilar Martinez-Aguta, Belen Palaciosoa, Albert Piñerob and M. Angeles Ullc conducted research on Introducing sustainability into university curricula: an indicator and baseline survey of the views of university teachers at the University of Valencia to develop environmental sustainability among university teachers. Further curriculum was developed to enhance awareness among university teachers. In the same area of environmental education and ecological awareness in 2010 Cecilia Lundholma,c and Ryan Plummerb worked on Resilience and learning: a conspectus for environmental education to build the adaptive capacity and resilience of social ecological systems. For achieving this purpose human development was core issue. A lot of research work has been carried on globally. Many researches have been
designed to analyze environmental changes of poor countries by developed countries. In Pakistan, the subject is not being given due heed and still the researches are not being executed in this field.

2.28 Valuable Research work done in the area of Environmental Education to develop Environmental Awareness

1. The research “a predicting participation in environmental education by teacher in coastal regions of Tanzania” was conducted in coassted regions of Tanzania by Brett Brayer and peter e Nash. The research was originally planned and funded by Colorado State University, Fort Collins Colorado, USA. The main purpose of the research was to enhance the environmental awareness among the teachers of coastal regions of Tanzania. The teachers were given awareness about environmental issues at large scale. Through this effort a campaign was initiated to enhance awareness of students largely. For this purpose the theories of responsible environmental behaviour was applied. Further Hungerford and Volk (1990) model was used to administer and develop a quantitative survey in the research process. The results of the research were successful. The research was proved to be very useful for enhancing the environmental awareness among the youth of coastal regions of Tanzania. The educators were focused to develop skills to deliver environmental awareness among students in a local setting. The results proved that research was successful in achieving results. For this purpose the researcher has initiated to develop awareness of environmental education among teachers. The skills capacity of educators should be administered so that environmental education lessons should be delivered effectively. Through these efforts the potential for the betterment of environment can be managed.

2. The research “environmental education for social – ecological system resilience a perspective from activity theory” was conducted by Marianne E Kransy and Wolff Michael Roth. The research was originally funded by department of Natural Resources, Cornell University USA. The main purpose of research was to integrate the environmental education with a
focus on building capacity at individual level. Further the study was aimed to focus on adaptive capacity at the level of social ecological system. In this research a program was planned to foster learning among youth to contribute directly to environmental quality. The arrangements were made to distribute multiple forms of knowledge among stakeholders. Activity theory helps to engage individuals in the process of acting and how individuals constitute and inhabit these changes in the society. Activity theory is strongly helpful in mobilizing the individuals in the society. The potentials of the individuals could be mobilized to constitute social ecological resilience. This concept was analyzed in the research by giving envision among educators to intricate sustainability in the society. The results of the research proved that environmental education is a key subject to enhance sustainability in the society. For this purpose the educators must be trained to get its fruitful effects at large scale. It is concluded that quality of life can be maintained in a multiple manners but environmental awareness is one of the key factor to maintain its sustainability overall. For this purpose a huge number of people in the society should be given awareness in a right direction.

3. The research “Developing a community of thinking: assessment of environmental education” was conducted by department of information and corporate management, Durban university of technology, Durban, South Africa. The main aim was to assess an oral intervention in environmental education at two tertiary institutions in South Africa. The qualitative study was designed. Further the study was based on a social constructive framework. The main aim was to explore the learning and assessment of environmental education. The main aim was to assess an oral intervention in environmental education at two tertiary institutions in South Africa. The qualitative study was designed. Further the study was based on a social constructive framework. The main aim was to explore the learning and assessment of environmental education. The learning should be based on practical activities and first hand experience of learners. Basically the research was designed on developing thinking of a community about their environment and further to develop a mode to
convert thinking into practice. In this way the society could be able to solve their problems regarding environmental issues. The learning approach can be applied in tertiary institutions to enhance the interest of learners in formal environmental education. A new dimension of learning was given in the research. The classroom environment was made rich with dialogues on issues. Further the portfolios, projects, assignments and collaborative working patterns were introduced in classroom settings to enhance the interest of teachers. This could broaden the learners’ perspectives and perceptions about the ecological issues they face in daily life. Moreover, the benefits of such approach in turn would involve the community at large scale to resolve ecological issues independently with zeal and zest.

4. The research book “The learning garden: ecology, teaching and transformation” was written by Veronica Gaylie, Pietersen, Switzerland. The book is considered as an asset in ecology and addressed many important questions in ecology. The most important thing is the discussion on role of environment and community in teacher education. Further the teaching by using natural world is also an important feature of the research book. The book also focuses on role contact of nature with teacher education. The educators can be trained in such a manner to teach through nature. The concept is dynamic and it opens door for broad discussion on ecology in teacher education. The emphasis is laid down on the development and maintenance of garden in the educational institutions. Further the multi dimensional role of garden and its effects on environment and community is also highlighted. Many important teaching techniques have been highlighted out of which the collaborative working is important. The researcher concludes that book is very important in the filed of environmental education. It covers its importance in teacher education. Further the nature is considered as a teacher which is entirely a new and unique concept. The factors of quality teaching have been addressed also in the book for their due importance in ecology.
5. The research “challenges and opportunities in mainstream environmental education into curricula of teachers colleges in Ethiopia” was conducted by Department of Geography, East Los Angeles College, USA. The research was planned to introduce the environmental education in teachers training programs in Ethiopia. Severe environmental degradation is due to lack of environmental awareness in Ethiopia. For this purpose the research was designed to educate college teachers in Ethiopia regarding ecological awareness. The research was carried out for dual purpose from researcher opinion. Firstly the teachers are considered as seedbed of environmental awareness. Huge number of people can be made literate on environmental issues by using this technique. Secondly capacities should be developed in college curricula to address environmental issues. For this purpose the focus is laid down mainly on initial teacher education programs. It was presumed that future citizens should be educated about importance of environmental stability in the community. The teachers were considered as agents for such a change in future because a huge number can be given awareness by implementing changes in curricula of teacher education programs. It was assessed also that some people were already aware of the environmental degradation in capital city of Ethiopia, Adis Ababa but the problems were not taken seriously. Even the people were reluctant to take practical steps in environmental upgradation. Finally, the research concluded the positive effects on the minds of common people. The people who were aware of degradation at least started to raise awareness campaigns in the society. The knowledge of teachers could be enhanced. Through all these collective efforts in a research program, the people would be able to address sustainability practically in their community. The researcher considers this concept dynamic. The people can be made aware in the society through such efforts. In this way environmental hazards in the community can be addressed as was done in Ethiopia. The capacity building of teachers can be made practically possible. Further a momentum for constant efforts in the community can be built. As the researcher is inspired by studying deeply the features of above mentioned research project.
6. The research “Introducing sustainability into university curricula” was conducted at university of Valencia, Spain. The main aim of study was to introduce the concept of sustainability into the university curricula. For this purpose a survey study was planned. The faculty of the university was selected for data collection. A questionnaire was developed comprising of many variables to collect data from faculty. Most of teachers were in favour of introducing sustainability in the university curricula. It was recommended highly that higher education institution should be equipped with syllabi of environmental awareness. The students should be given opportunities in higher education to address sustainability according to their perspective. For this purpose a vigilantly designed curriculum is required in higher education. The survey was successful in favour of diffusing sustainability in university curricula. The researcher had examined the results of survey from many aspects. The recommendations and suggestions are fully in favour of proper curricula and teaching methodology in higher education level. The most important feature is to prepare students to face challenges in daily life and sustainability is a potent subject to handle such issues comprehensively in daily life settings.

7. The research “Resilience and Learning: a conspectus for Environmental education” was conducted by Cecilic Lundholm and Ryan Plummer at Department of education, Stockholm university, Stockholm. During the research process it was analyzed to maintain sustainability in the society through environmental education. For this purpose an overview of various theoretical perspectives of learning was presented in the research. The application of sustainability in relation to environmental practices was also highlighted. Further the changing nature of social ecological systems with reference to sustainability was also assessed. It was overviewed that adaptive capacity in the society could be increased at various levels by practicing concepts of environmental education. To achieve such landmarks at ground level, expertise in pedagogies was recommended. How the resilience could be brought by working together in the society was a key focus. Moreover, the steps towards collective management initiatives were indicated. The research in its multi-level and multi-loop
learning aspects in one of the dynamic asset for future researchers. As ecological awareness and its applications in the society has many dimension and require and in-depth analysis in different ecological issues. The research has contributed a valuable theoretical perspective towards sustainability in connection with resilience. At the end the researchers has clinched the essence of the research which is a most supportive factor taken by the researcher. As the students were recommended the potent source of agents of change either directly or indirectly in the society. The cognitive domain is important for indirect action while affective domain is essential for direct actions. Here it is concluded that students are strong agents of change in the society but for shaping right direction of students the role of teachers is vital. The training of teachers is compulsory for fruitful results in the system and same must be applied in case of ecological awareness. The teachers of good quality can serve the purpose in true spirit. As a result we can observe the ecological improvement in the societies through continues and directional efforts.

8. The research “content analysis of selected features of K-8 environmental education research studies in Turkey 1997-2007” was conducted by Department of Science and mathematics education, Florida institute of technology, Florida, USA on collaboration with Department of educational sciences, Middle East technical university, Ankara Turkey. The research was planned to review the content analysis of available syllabus of environmental education in the Turkey. As it was noted that subject of environmental education was not assessed before this. Firstly, the published material of ecology from 1997 to 2007 was analyzed. It was extensive work. Secondly, the fifty three researches were studied for making the process of research strong. The main focus was given to environmental problems and issues in the research. Further the focus was also given to develop responsible environmental behaviour among learners through developing continues process in education system. The research was significant in the sense that six most important components of environmental literacy were selected for review. Further the study was tended to build greater knowledge of ecology among learners. Moreover,
developing a rich interest was the attention among the students by reviewing a detailed content analysis. The research has its prime importance in the field of ecological teaching from researcher perspective. The research has opened the doors of multiple loop discussions for developing the curricula of ecological awareness from teachers training perspective. At the end recommendations were given for future researches. These recommendations provide a base line to carry on research process in ecological contents in any society around globe. The researcher has taken decision to highlight the fruits of above mentioned research in the current research process also.

9. The research “Environmental awareness among secondary school teachers in Iran and India” was jointly conducted in Iran and India. The participant from Iran was Sayed Muhammad Shobeiri from Department Of education, university of Pyam-e-Noor, Tehran and N. N. Prahallada, Regional institute of education, Karnataka, India. The main focus in the study was to check the awareness level of secondary school teachers in Iran and India. For this purpose 1004 secondary school teachers were selected from Mysore (India) and Tehran city (Iran). An environmental awareness scale was tested in the research and inferences were drawn accordingly. The result showed a difference between awareness level of science and art subjects teachers. Science teachers were more aware about environmental issues than arts teachers. But most important thing was the indication of making environmental issues as compulsory part of teachers training programs. The suggestions were given in the strong favor of introduction of environmental awareness in pre service and in service teacher education programs. The researcher considers the following international research as strong base for executing more educational research in the favour of ecology during teachers training programs. This may enhance quality living standards of common people atleast.

2.29 Environment and Energy study published in 1991 flourished different outcomes for sustainable development globally
Environment and Energy study published in 1991 flourished different outcomes for sustainable development globally. Here the focus was also given on human development to bring sustainability in the societies. The addition of environmental concerns in decision making processes by governmental agencies was also recommended in 1991. The main subject of ecology was addressed. The most important were regarding increasing global warming issue. Further, the deforestation was also given due weightage by conserving remaining natural forest areas. Moreover, public health was given importance by providing clean air though pollution controls process. Food and other agricultural needs were also given priority but without destroying natural resource base. It was finally estimated that all these objectives could be achieved possibly by massive involvement of people in the system. It was considered that teaching is a strong process to deliver such purposes. Environmental education must be made part of curriculum for achieving the objectives of sustainable development. Although the issues vary from nation to nation and in accordance to ground realities issues should be handled to a large extent.

The environmental issues, as a medium of instruction, offer the greatest potential for educators to address sustainable development. Environmental issues often contain critical characteristics associated with sustainable development, human, technological, ecological and economic dimensions.

The environmental issues mostly contain critical characteristics. They are linked with many aspects of life. Ecology is one of the key characteristics. The environmental issues should be addressed in terms of ecological dimensions. The future citizens should be educated in the craft of making social and personal decisions in the lives of individuals. Environmental issues as an educational context provide huge potential in a system to maintain sustainable development. Further the environmental issues provide a firm ground to address sustainability in both scientific and social sciences dimensions. The willingness should be created among learners towards sustainability around their surroundings. The willingness leads individuals towards practical steps to care for their environment. The citizens should be prepared to involve their potential and knowledge in resolving ecological issues in a right direction.
2.30 Contribution by United National world commission on environment and development (WCED)

United National world commission on environment and development (WCED) reported on sustainable development in 1987 that access to primary education especially in rural areas of South Africa is essential to fostering an appreciation and understanding among inhabitants of their actions and behaviors in and on the environment. It is obvious from above wordings that sustainable development must be made compulsory part of education from primary level. In this way a sense of ownership regarding environmental issues among participants can be developed. According to report the life standards can be enhanced too by introducing sustainability in primary level education at regular basis. Further a strong relation was indicated between sustainability and living style of people. Ecological education was recommended at primary level education in the report to upgrade the living standards of communities. Recommendation 121 was approved and published in the summits, report, recommending the integration of sustainable development into educational system at all levels of education in order to promote education as a key agent for change (United Nations 2002, 67). The conference was held at Johannesburg and addition of sustainable development in education system was strongly recommended. The sustainable development was given due importance in the commission. It is urgently required to bring this issue in practical shape. It has been observed that the developed countries are contributing huge towards ecological awareness. There is need to focus such issues in developing countries. For this purpose the findings of commission should be carefully studied and actions should be taken accordingly.

2.31 Contribution by UNESCO for Sustainable Development

Environmental education is a main focus of UNESCO also and for this purpose a massive contribution has been put by UNESCO during the last three decades. A prototype Environmental Education Curriculum for the Middle School was designed and printed in 1989. The effort was solely done under the umbrella of UNESCO-UNEP. The curriculum was comprehensive and advance in ecological knowledge. A framework was presented alongwith guidelines and examples of environmental education in daily life routines. The curriculum was prepared
particularly for the age of middle class students. The range of age of learners was ten to fifteen years. For preparing this curriculum a comprehensive review was done of earlier documents on ecology. The key concept which was presented in the curriculum was “Sustainable development”. So here it has been realized that sustainable development is urgent need of the present era. For the preparation of curriculum numerous public reports, governmental policy statements and privately published documents was reviewed. Further the local, regional, national and international levels of ecological issues were highlighted. The document was a precious addition in the study of ecology for the students. New concepts were added from the various documents and their worthwhile utility was highlighted. The researcher concludes that curriculum is highly valuable in the field of ecological studies. The document has dual advantage in a real sense as it is highly beneficial for students’ alongwith educators also. The educators may benefit highly from the derived curriculum also. The sustainable development is an emerging concept and many issues can be taught on its basis.

2.32 The Global Tomorrow Coalition 1989: A Landmark towards raising Environmental Awareness Globally

Sustainable Development: a process of change in which the use of resources, the direction of resources, the orientation of technological development, and institutional change all enhance the potential to meet human needs for today and tomorrow. (The Global Tomorrow Coalition 1989)

The above mentioned definition regarding sustainable development is comprehensive and it covers almost a broad scenario of life in multiple perspectives. Here a correlation is indicated between use of resources and their orientation alongwith technological development all over the world. It is obvious that technological development has brought revolutionary changes in the present era. It has entirely changed the picture of living standards. So there is urgent need to review the life style of public accordingly. The use of resources is also a key factor because resources should be utilized in an effective way. The utilization of resources by using technological developments is very crucial because environment shouldn’t be disturbed at all. It has been observed that in most cases the advancement in technology has given facilities although but on the other hand the ecological factors have been affected badly in particular regions or globally. Here the researcher
supports the concept of sustainable development so that a neat and clean environment could be maintained. For this purpose the institution should be developed to deliver the concept of sustainable developments to public. Such concepts should be devised comprehensively to maintain environment at local, regional, national and international levels. The developments of institutions is necessary to meet the needs of human being so that a prosper life could be achieved globally.

Some objectives had been developed by the Global Tomorrow Coalition in 1989. The main focus in the development of objectives was to maintain the sustainability of environment alongwith human needs. Further the human needs must be fulfilled but not on the cost of destruction of ecology. It was recommended that environmental concerns alongwith economic should be merged in decision making. From here it is strongly observed that there is need to merge environmental concerns in our life routines. Further stability in population levels was recommended which is a core issue of ecology. Moreover, managing risk was recommended on the basis of reorienting technology. The objectives that were established by the Global Coalition Tomorrow in 1989 should be focused in Pakistan too now. The most potent forum is education through which a message can be effectively transformed in the society. The educators should be given orientation in a comprehensive way about sustainable development. So that services in the right direction by educators can be expected. Finally, environmental degradation may be minimized through planned efforts.

2.33 Skilled and Environmental Dedicated Citizens: A revolutionary perspective of UNESCO

If we want to develop large number of learners who are skilled and environmental dedicated citizen, the learners must feel a sense of ownership toward the issues needing resolution and a sense of empowerment with respect to helping with that resolution (UNESCO, 1989).

The above statement is obvious in favour of environmental education at all levels as the above statement is a great support in favour of researcher’s topic. It is strongly suggested that environmental education must be made compulsory part of education so that large number of learners could be prepared. Further the sense of ownership is very important in understanding and resolving of ecological issues. As researcher is also working on the aspect of developing sense of empowerment and ownership in relation to environmental issues so the thinkers of UNESCO were
supporting the same ideology. The learners feel sense of ownership about issues which are generally taught right from early education. Further an infusion of subject in a continuous educational process develops a sense of empowerment among learners. Due to this reason the moral and ethical values alongwith religious values are made compulsory part of education. If it is linked with environmental concerns then learners can show dedication and devotion towards preservation of environment in their attitudes and behaviours. There is need to develop skilled and dedicated environmental citizens in Pakistan also because our country is facing various environmental issues while there is nothing to be seem to resolve these issues at urgent bases. For this purpose a strong curriculum should be developed about environmental education to empower trainee teachers. To develop sense of ownership among educators and learners in Pakistan is a great challenge presently in regarding to ecological concerns.

2.34 The support of thinkers of Environmental Education on its inclusion in the curriculum in multiple ways to develop impacts of Ecological Awareness in the society

The thinkers of environmental education are also supporting their subject in a multiple ways. They had shown their concerns in the global coalition tomorrow forum in 1989 also. There is a huge space for educators to accommodating new teaching methodologies and learning tactics in the teaching process while educating ecology in classroom settings. The traditional lecture method is often boring sometime and seems to be hectic for learners. For solving this problem, the environmental education can be taught in a verity of manners to eliminate monotonous inn teaching and learning styles.

The goal of environmental education by Untied Nations is to aid learners in becoming environmentally knowledgeable, and above all, skilled and dedicated human beings who are willing to work, individually and collectively, towards achieving and or maintaining a dynamic equilibrium between the quality of life and quality of environment.

The environmental issues are one of the core areas to be addressed by United Nations from the last three decades. The environmental protection is included in the millennium development goals also. The above mentioned goal is comprehensive
about environmental education and explains its prospects in numerous ways. The thinkers of environmental education considers its implication in every aspect of life at individual levels and collectively. Many concepts of learning process may be constituted under the umbrella of environmental education. There is entirely new orientation can be given to learners in the learning process. If we analyze deeply the above mentioned goal the depth in the concept is dynamic. The truth lies under above mentioned goal is most relevant to researcher’s ideology as researcher has made Volk and Hungerfolk model as base of the research. The goal clearly defines the need of knowledgeable individuals firstly. So there is need to develop knowledge among learners at initial stage. Later on the knowledge should be made broad and in detail. The interest should be developed among learners by using multiple teaching techniques. After developing interest among learners, the willingness towards ecological issues should be enhanced so that learners tend to serve individually or collectively for the betterment of environment. Here the learners may develop sense of empowerment and sense of ownership at subsequent stages of learning.

2.35 Developing sense of empowerment and ownership among citizens on Ecological Issues: A UNESCO perspective

“It is not sufficient to tell students about ecology, students must experience a curriculum which allows them to discover how they interact with the environment themselves. Only in this way will citizens the world over be able to make sound and responsible decisions concerning environmental issues (UNESCO, 1989)”.

The above statement indicates the spirit of teaching ecology in its real sense. Infact the environmentalist had realized that the curriculum of environmental education shouldn’t be traditional. Further the curriculum shouldn’t be taught in a simple way. The new teaching techniques alongwith innovative strategies should be introduced in the syllabus of environmental issues.

For injecting sense of empowerment alongwith sense of ownership among learners on environmental issues it is important to teach it with evaluative skills and action learning strategies. Here the researcher supports strongly the idea of intelligent consumers and processors. To infuse the concept of intelligent consumers and processors among learners it is required intelligently to design curriculum and its implementation in education system. It was recommended in 1989 by the Global
Coalition Tomorrow that the environmental issues of past present and future must be addressed. The curriculum must be framed in such a manner that learners should be able to understand the environmental issues from past and would be able to seen its impact in future life. The sustainable development has been recommended a broad philosophy by United Nations also. Although the efforts have been done to address the issues but still a lot of work has to be required especially from educational perspective. The researcher is very clear in his thoughts that my country Pakistan is far behind then many developing countries on addressing ecological issues. The environmental awareness is very poor as compared to developing parts of world. The steps should be taken to introduce curriculum of environmental education at all levels of education. The educators should be given orientation to teach the subject in its real strength. The curriculum in Pakistan should bear the environmental issues of past present and future. The environmental awareness and preservation of ecology is a great challenge for Pakistani government and society. The government should come in front to make arrangements of providing awareness to society at large scale. For this purpose the teaching mode is best option. The results can be achieved rigorously and in a right direction. The most important thing is to start the process in education system so the learners may get sense of ownership on ecological issues.

Several documents on environmental education have been published through UNESCO. A lot of research has been conducted on ecological issues and their resolutions for the betterment of society. The researches were conducted on many educational aspects. The curriculum designing was done by many researchers keeping in view the goals of Tblisi conference in 1978. The teaching methodologies were highlighted in the documents. But it was realized during the research process that educators were most important to deliver the ecological concepts. The prominent researchers were Hungerford, Peyton and Wilke and their research work were mostly utilized to develop curriculum of environmental education through UNESCO. These researchers conducted many researches and their follow up from 1980 to 1995. The framework developed through these researches gained a lot of acceptance at national and international levels. The fruitful effects of these researches were to highlight the importance of training of teachers in environmental education. It was recommended strongly in these documents that without the appropriate training of educators the desired results would be impossible to achieve. The developed curricular materials for teachers and students were used by many researchers in different countries like USA,
Australia, Canada, Malaysia and Turkey etc. The researcher concludes that benefits of such revolutionary ideas should be transmitted in the Pakistani society. The basic need is to transfer these ideas according to local settings and domestic ecological issues should be highlighted.

2.36 Developing dynamic equilibrium between the quality of life and quality of the environment: The ultimate aim of Environmental Education by UNESCO

“The ultimate aim of environmental education by UNESCO is to aid learners in becoming environmentally knowledge and above all, skilled and dedicated human beings who are wiping to work, individually and collectively, towards achieving a dynamic equilibrium between the quality of life and quality of the environment”.

The above statement clearly indicates that quality of life is related to quality of environment. As good quality environment is one of the important and essential factor of getting quality in standards of life. It is also obvious from above mentioned statement that collective efforts should be framed in the society or any local settings to bring quality in the environment. For achieving this purpose it is essential to prepare mindset of individuals. Man individuals working together in a group can serve several noble causes. The environmental education is a potent source of inducting such thoughts in a society. The people can be motivated to dedicate themselves for the betterment of their surroundings which ultimately not only beneficial for their personal lives but collectively for whole community also. The concept note is ideal for maintaining a dynamic equilibrium between environmental quality and life quality from researcher’s point of view. The researcher believes that such momentum should be built in Pakistani society by developing curricular efforts and their implications practically. There is need to induct ecological issues in Pakistani educational system but with the depths of addressing and investigating local issues and their resolution.

It is very important to mention here some important research work on asesting goals of environmental education. A series of researches were conducted from 1980 to 1995 to investigate the impact of goals of curricular materials. In those researches studies the educators were investigated also. Hungerford, Volk, Stevenson, Champeau and Hassan were the main researchers of that era. Champeau sampled k-
12 teachers to assess the curricula of environmental education in 1980 in United States. Hassan used a sample of sixth grade teachers in Malaysia while Volk in United States listed environmental education professionals as a sample in the study. The above mentioned three researches were conducted in three different settings although the results were nearly same. It was concluded in all these researches that ecological issues should be addressed at urgent basis in education system. Further for effective implementation there was established a need to train environmental educators. Two studies were also conducted in 1980 and 1981 by Kirlinger and Ramsey. In both studies the goals of environmental education was evaluated and subsequently their effects on learners were seen. The results depicted that students were able to apply the knowledge and skills to greater extent after getting instructions from well trained teachers. Several researches have been conducted so far on evaluating the goals of environmental education and its curricula. Researchers have given an in depth opinion about implementation of resolution of ecological issues at local settings.

2.37 The basic principles determined for the development of curriculum under the umbrella of UNESCO on curricular concerns of Environmental Education

The document designed under the umbrella of UNESCO on curricular concerns of environmental education was comprehensive. The syllabus outlined the subject in detail and focused on basic ecological issues. Although it is considered as universal but its interpretations can be made in various countries according to their local settings. The curricula are based on accomplishing the four goals which are to be fulfilled during the study. The first goal is related to basic knowledge of ecology. It provides a comprehensive knowledge of ecological foundations. The second goal is to develop conceptual awareness of the individuals. Here the emphasis is on the development of mindset of individuals to value ecological issues in their actions. The second goal is technical and it plays the role of bridge between theoretical knowledge and practical considerations of ecological issues in any society. The learners should be prepared to put their impact in a positive manner. The conceptual level is crucial stage where learners relate the basic ecological knowledge with their values and beliefs from researcher’s point of view. Here the teacher can play a pivot role to motivate learners. The motivation is a key note at this stage. The learners should be
motivated to address ecological issues at prior basis in their daily life actions. An expert teacher who may have good command and understanding over environment can serve the purpose in a right direction. The second goal is philosophical in nature and may help to strengthen the concept of responsible citizenship.

The goal level three is strongly based on the completion of second goal level. Here the learners would be able to apply their knowledge and investigate ecological issues from various perspectives. The goal level three is emphasized on developing investigative skills among learners. The goal level four is directly related to environmental action skills. The learners may be ready to do actions for the preservation of environment. The researcher concludes from the above discussion that level of goal four is comprehensive. It starts from the basic knowledge of ecology to strengthen the foundation of learners. Then a bridge is built by developing conceptual awareness and investigative skills among learners. The fourth goal is climax where learners perform actions for preservation and conservation of environment. A lot of research work has been done internationally to evaluate the outcomes of four goals. Pakistan is a developing country and it is facing various ecological issues which vary regionally. Although the efforts are being made to handle such issues but a huge research work is still required to bring the level of expertise in the society. For this purpose some revolutionary steps are to be needed. Although curricular documents are available but potential trainers are needed to implement syllabus effectively. The environmental teachers should be prepared in such a manner that a quality education can be delivered to young generation. It is also a strong component towards prosperous Pakistan.

Young learners are egocentric in time and space as well as in many other ways of life also. In the middle school syllabus, they are taught history and philosophical foundation of their society. Then a limited ability to project conditions of present events in life and their possibilities in future is developed in learners. Here is a strong stage to induct new ideas in the minds of learners to develop care about issues. George and Lawrence in 1982 also expressed such philosophy in relation to ecological awareness. It is obvious that a stage is built for the implications of choices and decisions in the life of individuals so learners can be motivated to preserve their ecological concerns at a greater extent. The young learners are very keen about their past, present and its consequences in the future. High quality instructions can set the minds of individuals towards positivity and resolution of issues. A well equipped
teacher with knowledge and skills can act as a role model for learners. Through this
philosophical approach momentum can be built to preserve environment in future by
the participants. The need is to maintain consistency with quality in the learning
process entirely. The researcher strongly advocates the induction of curricular of
ecology in teachers training programs through which young generation can be
benefited at large scale. The process may lead towards encouragement of independent
and critical thinking among learners. The foremost aim is to bring sustainability
around us to make future safe.

The environmental issues have been strongly associated with environmental
degradation and its day to day poor conditions on the earth. The ecological issues are
also highlighted in terms of broad spectrum by involving beliefs and values of
individuals also. Presently the problems are being increased as a result of day to day
activities of inhabitants. The ecological experts believe that environment is a beautiful
combination of natural resources, its preservation and conservation alongwith millions
of individuals. The most important issues are human population growth, ground water
contamination, water pollution, noise pollution, air pollution, nuclear power
generation, loss of genetic diversity in food crops, desertification, tropical rain forest
destruction, food production and use of pesticide, loss of non-renewable energy
resources etc. These all issues have been created due to negligence and carelessness
all over the world. Now the requirement is to develop care and potential among
participants to resolve such issues. The ecological thinkers categorize these issues in
two dimensions. Firstly, the environmental issues should be presented in a manner
that they would gain attention in the society. The community should relate these
issues as essential part of their lives. Secondly the issues should have social and
ecological significance. The issues must have direct implications on the lives of a
particular community. The researcher concludes that environmental issues are
alarming in Pakistan but the process of addressing their solution is very slow. There is
need to bring allure in the study process of these issue. This could be done only
through proper education which is not being delivered in true spirit.

2.38 Need to Develop Environmental Awareness among middle and
high school learners: A potent perspective by
Environmentalists
The middle school learners having age group nine to thirteen years show interest in learning process. They bear a marvelous potential towards learning and developing skills on many issues. Many psychologists like Piaget indicated this aspect in his researches. On these grounds the thinkers of ecology also recommend that middle level learners should be familiar with ecological issues in their surroundings. The maximum potential of the learners can be utilized to strengthen concepts in their minds. Moreover, action oriented skills can be developed to get benefits for the betterment of environment. A lot of teaching strategies have been invented during the last century. For this purpose new teaching strategies have been used effectively in the teaching learning process. These strategies have also been recommended by UNESCO forum to implement to teach environmental education. There researcher believes that these teaching cum learning strategies should be discussed in detail to provide seedbed for environmental education in Pakistan. As psychologists recommend that individuals invent their learning structures through experiences. So provision of such experience should be made compulsory part of environmental education.

2.39. Teaching Techniques Helpful To Deal With Environmental Issues at Tertiary Level of Education to develop in depth Environmental Awareness among potential teachers

2.39.1 The Case Study Approach: A research oriented skill to develop in depth knowledge

In this instructional method both primary and secondary sources are utilized to deliver information to learners. Anyhow it is important to mention here that a single issue can be picked to investigate in this teaching methodology. The task may be assigned to a single student in the class or group can be made to accomplish an assigned task. So by and large case study is a teacher directed analysis of particular environmental issues. Although the educationist believe that a case study is not an easy task and numerous activities are to be done for its completion. The case study is embedded with a substantial amount of flexibility and control. The solution of a topic is mostly in the hands of a facilitator and the extent to which topic is investigated mostly is in the hands of a teacher. But a good case study is loaded with handouts, field trips, panel discussion of members, printed materials or simulation activities etc.
The researcher concludes that by giving the concept of conducting case studies to potential teachers a valuable source can be flourished to train young generation in education system in future. A single issue can be investigated comprehensively and broad range of output can be expected.

2.39.2 The Investigation Skill Approach: Innovative methodology to develop skills among learners at tertiary level education

Merwin in 1976 commented (with reference to Brown and others) that skills of teachers are very much counted in this approach as its success or failure entirely depends on it. The confidence, enthusiasm and competence of teachers are essential to develop high understandings of concepts and principles among learners. The educationists believe that this approach is potent source of strong construction of knowledge among students because they develop it at their own insight. But on the other hand it is time consuming and it cannot be used in all situations. However, intuitive and creative thinking can be promoted through this approach.

The approach requires in depth analysis of the situation by the researcher. The investigation skill is related to the current research framework and main model. As it helps in building awareness level and excels through the action level. This method is very helpful in investigating environmental issues in a sense that by adopting this approach the learners may be able to develop in depth knowledge of problems and issues. Further the learners may be able to relate environmental issues with social settings. The learners may be trained to investigate ecological issues with social settings. The learners may be trained to investigate ecological issues by utilizing primary and secondary resources. The learners may be active learners in this approach and put in depth efforts to resolve the issues. The participants may feel the sense of ownership by using investigation skill. The investigation skill is highly inductive approach too as it works to input the sense of empowerment and sense of ownership both among learners. Consequently, the learners may be able to take actions and practical steps as per their learning perspectives. The investigation skill is also useful to develop useful citizens when it is combined to investigate environmental issues. The researcher concludes that investigation approach is time taking but in depth knowledge is developed. Further it is very useful in developing mindset of learners towards citizenship responsibilities. The approach is depicting clearly the picture of model which is being used in this study. Construction of ecological knowledge may
lead towards sense of empowerment to the sense of ownership. The trainee teachers should be given orientation with this approach to induct habit of deep thinking and action oriented skills in daily life routines.

2.39.3 Using Community Resources to Develop Ecological Awareness: Research oriented approach to strengthen concepts of learners

Community resources are very useful to utilize for enhancing ecological awareness of learners. The experts of ecology are in high favor of using these natural resources of community. It is obvious that mostly in our society teachers are not aware of utilizing these resources. The teachers should be acquainted with community resources. The teachers can be provided awareness regarding community resources by developing inventory resources. The resource inventory is basically a book or document which is prepared to aware teachers about available physical and human resources. The researchers found that the teachers who eventually involve themselves in the inventory process are the ones who may use inventories to a great extent. The reason behind it is their expertise to use inventories. Moreover it is essential to make habit of using available resources around us because it is naturally a rich resource available which due to our negligence goes waste. The researcher believes that inventory process is very useful and effective in teaching of environmental education. This methodology may be helpful in two ways. Firstly, it contributes towards strengthening knowledge of learners. Secondly, during this process the natural resources can be preserved. But the important role again here is of trainer. The trainer may act as facilitator to serve the purpose.

2.39.4 Field Trips: Important to enhance motivation among learners

Field trips are considered as good source of recreation and learning. Field trips are arranged normally in all educational settings. But these trips can be made fruitful if learning process is attached with such activities. A lot of environmental issues can be examined during the field trips. The teachers may plan activities based on learning either assignments can be given to students to prepare notes based on observations during field trips to study. The expertise is required on the part of a teacher to handle the class during picnic. The teachers should be trained to bear sufficient knowledge about ecological issues. The researchers conclude that field trips may be utilized effectively in promoting environmental education. The multiple tasks may be
accomplished regarding ecological issues through well planned and directional activities.

### 2.39.5 Using Role Playing and Simulations: Modern technique to make ideas of learners strong and logical

Brown and others commented on simulation in 1982 that it has been found valuable in training of teachers and in delivering potential teachers a relaxed set up to practice many teaching techniques without taking burden of real class room settings. According to Allama Iqbal University in 1990, simulation involves in the exploration of many curriculum concepts. It is considered that through this method basic principle and concepts can be strengthened. In this mode students are engaged in real life situations and teachers are mainly the facilitators. These modes are developed to interpret feelings, emotions, attitudes, values and insights near to reality. Although it is assumed that it is one of the strong teaching technique but careful measures should be taken. The time should not be wasted by students. The teachers and students should be bound to complete a task in a specific time. Role playing is also helpful to test and validate their own beliefs and values by trying out alternate beliefs and values. Moreover, a huge benefit of this technique is to prepare learners in making important decisions based on practices along with the action oriented human relation skills. The expertises are required on the part of instructor but learners may also get benefit by experiencing real life situations. In large group simulations many group members participate but those members who could not practically involve in simulation also get their involvement in question-answers session. The researcher concludes that simulation techniques can be applied in teachers training programs to strengthen the concepts of trainee teachers. Although it is time taking and require careful examination but teachers who trained by using these techniques can be effective in motivating their students in future to serve for the purpose in a right direction.

### 2.39.6 Discussion Method: A traditional approach to upgrade learners’ skills

This method is very popular in present era particularly at higher educational level. It is considered as potent source of strengthening concepts and developing learning skills among participants. According to Brown and some other educationists in 1982, this method is very popular to enhance knowledge of learners in social
sciences, literature and history. But its importance can’t be denied in many applications of natural sciences and mathematics. It can be utilized in many ways for effective dissemination of knowledge. This method is effective when a panel of discussion should have five to ten members to participate. Further this method is very useful for higher education where learners can have abilities necessary for intelligent discussions. The learners may have been able to deliver critical and evaluative thinking at this level. Moreover, they have ability to argue with supportive evidence. Here the researcher believes those panel discussions are very useful to launch debate on environmental issues. It is considered as an excellent mechanism for students to highlight conflicting view points and to bring out the merits and demerits of different beliefs and value systems. A panel of five to ten students sits together to participates in the discussion. As a result a huge number of ideas are pooled this is an advantage of discussion. At the end the participants may be able to gather a bulk of information on the discussion topic. The teacher may act as a facilitator. But some considerations are very important. The participants should be bound to remain within the limits of a topic to achieve the desired results at the end of a discussion. The teacher should participate as an active evaluator during the whole phase of discussion. The researcher concludes that this method is very useful in teachers training programs because it is very helpful in building knowledge on specific topics. The teacher can utilize this knowledge in future. The concepts of environmental education can be delivered effectively and at large scale.

2.40 Working locally for environmental protection:

Diversity and complexity of environmental systems are very complex and difficult to comprehend at the level of common man. But people can contribute to such complex resilient but interesting ecosystem by providing them awareness and training. The training should be given on a pattern whether individuals live in city, a suburb, or in a rural area. For this purpose the training should be designed in a manner that butterfly gardens should be planted. Native trees carrying fruits and berries should be planted because they provide support to birds. The local organization for environmental protection should be developed on firm basis to support local community. It would be potent source to maintain health of local ecosystem. Grasslands and forests shouldn't be replaced by lawns and streets because it is the faster way to eliminate natural ecosystems. The best way to learn local environment is
to develop a habit of daily walk around an area. By observing the surroundings the relationships of many species in an ecosystem can be observed. These observations are very helpful for maintaining long term health of local environment. The environmentalists believe that local schools are powerful source to deliver the concepts of protection of local ecosystems. In Pakistan there are still no such patterns which are to be followed because locally communities are not aware of the organizations to be working for protection of environment. The concept "working locally for environmental protection" is needed urgently to be practiced in Pakistani local communities. This concept can be strengthened by introducing ecological concepts in education system."

2.41 Environmental Policy:

Environmental Policy is given by the government in any country all over the world. The environmental policies should possess the steps for health of an ecosystem. The policies should be made purely for human needs and for this human health is most important. Sustainable economies should be essential part of environmental policy. The government agencies are powerful source of implementing policies at local, national or international level. Basically the power is hidden in politics so environmental policies need a political thirst for its implementation at community level. The laws and rules based on environmental issues should be enforced by government forces. The American government has practiced many environmental policies in 1960s and 1970s but they were mostly based on civil rights. Later on many developed countries like Canada, Australia, UK, Japan, and Germany followed the American Governmental public policies. The conditions are not good in developing countries. The concepts are borrowed from developed countries but there is no real spirit is seen for solving environmental issues in developing countries. Pakistan is also facing same problems. There are no concrete policies on environmental issues. Many environmental issues are being ignored although they need urgent attentions like sanitation, population growth and urbanization etc. there is strong need to develop environmental policies at public level and its implementation in public life.

2.41.1 The policy cycle:

The policy cycle is a research oriented process. At start the problem or issue is identified in the local community. First of all the government officials should be
responsible to identify environmental problems at local level because it is observed many times that people generally don't have vision to point out such issues or raise their voice. Then agenda is set for the solution of the problems. Here the faith of government officials is most important because they are responsible to organize all facilities for the public. The government officials build a bridge between public and bureaucracy by providing quality services. Moreover, they enforce rules and laws in the society. After setting agenda in which goals are established then proposal are build. In next step, a legislative process is executed to make rules and laws. Finally the policy is implemented but results should be evaluated. On the basis of evaluation changes are suggested and policy cycle is practiced again and again. The policy cycle is a detailed frame work for laws to be executed.

2.41.2 Environmental Rights:

The 1982 world charter for nature asserts that “man’s need can be met only by ensuring the proper functioning of natural system” and that is “an essential human right to means of redress when the human environment has suffered damage or degradation”.

It was clearly presented in world charter for nature in 1982 that environmental protection and restoration is a basic and essential human right. Environmental damage or degradation should be stopped and neat and clean environment is the responsibilities of those have power and vision globally. So it was accepted that environmental protection is one of the core issues in the world. The world attention was demanded towards damages of environment and its protection should be given due heed.

The American convention on human rights in 1988 declared expressively that everyone in the earth has the right to live in healthy environment. Moreover, it was expressed that every individual should have access to basic public services which are recommended worldwide. Further, it was emphasized that all signatory parties present in convention on human rights should promote preservation, protection and improvement of the environment.

The voice for environmental protection has been rising from many decades and almost in all important international forums. The environmentalists have been struggling from a last century to provide awareness generally to public. It is believed that environmental laws are potent source of providing protection and preservation to
the environment. To get this goal in true spirit, the legislative members of any particular community can play a significant role. This significant role can be played in formulating policies on environment and then enforcing such policies in the society. The true spirit can be achieved only when members should be fully aware of the problems and issues. For this purpose education is a potent source of learning and understanding environmental issues from early ages. Environmental issues should be made part of curriculum from early childhood education. The students who will get ecology as compulsory part of education should have sound ecological approach towards the solutions of problems. So it may be expected that environmental policies and laws can be enforced in their real spirit at community, local, national and international level.

The cleaning efforts were done in the Santa Barbara oil spill in 1969 and a huge material was provided by the media by taking footage of cleaning of beach. By showing cleaning of beach by participation of young people was a big international factor towards environmental protection in 1970s. Consequently, in 1972 US clean water act was developed. Moreover, in United States in 1970’s hundred of administrative regulations and more than 27 major federal laws were established. The 1970’s is called environmental decade in America and most of environmental protection is based on the efforts in 1970’s in US. The media played a key role in highlighting environmental issues in 1970’s. A short media report of 30 seconds to one minute presented the issue in an effective manner. As a result, the public attention was caught by launching media efforts in the west in 1970’s. Further the ideas were transformed to developing countries onward with a mediocre pace. In Pakistan media is very strong now a days. A rapid progress has been observing in media production since 2002. Environmental awareness campaigns have been reporting in electronic and print media at public and private sector from last decade but still due heed is not being paid by government sector and social media. As a result the desired achievements are still far ahead of Pakistani community. The legislative institutions are not mature up to the extents that ecological concerns can be redressed. Although media reports are big source of projection of environmental protection but actual task is to flourish world class curriculum and syllabus to replenish the goals. The world class curriculum is only possible by participation of renowned subject specialists.

2.41.3 American environmental policy:
Former American president Bill Clinton issued an executive order 12898 to order federal agencies to collect data to reduce pollution effects on minorities. Further, environmental justice must be protected. The new act was established for twenty two new monuments in America during the two terms of Bill Clinton. US Virgin Islands Coral Reef monument is a prominent example of that new act. Unfortunately former president Bush ordered to suspend sixty rules of former President Bill Clinton. Further, President Bush ordered to ease rules on environment. As a result, many developmental projects were allowed without taking into considerations environmental justice. It was continuity of American arrogant attitude in 1988 when American delegation refused to sign treaty in human rights convention. The critics believe that such acts of world leading super power may be responsible for roll back of all environmental protection efforts during the last century. Further, the policies framed by one government should not be undone by next government. It demoralizes the efforts of public and mindset of people generally. On the other hand there is a council of environmental quality in the subsidiary of presidential office of America. The council is responsible to regulate environmental protection agency under which all major environmental issues are looked after. The council given top priority in the presidential hierarchy but there is need to produce practical steps on ground. There must be restoring balance by promoting radical ideology but this is only possible by concrete educational system. For the questionnaire the subsequent question is tied up to determine the environmental comprehensions in the local settings.

| 50. | The monuments and wildlife areas shouldn’t be developed on the cost of interests of industrial lands. |

### 2.42 Collective action for environmentalism:

When people intend to do collective action for any purpose then their powers are multiplied. Useful information is exchanged as a result of meetings with each at other at local community level. Consequently, groups are formulated and people having common interests come close to each other for collective actions. Worldwide we look at different groups working together for the environmental awareness in the communities.

#### 2.42.1 Student environmental groups:
There are many organizations working on the students group to develop environmental awareness. The elementary and secondary level students are taken to teach environmental education. “Eco kids corps” or “Kids saving the earth” are prominent groups who are providing education and training to school students in America. The important thing is a recent survey of world wildlife fund that 63% of American young people lobby their parents to purchase environmentally responsible products. Moreover, the organizations having volunteers from college students are considered as potent source for positive actions in favor of environment. Student environmental action coalition (SAEC) in North America is the largest environmental group. The students of north Caroline university of chapel hills formed this group in 1988. Recently the group is being grown rapidly having more than thirty thousand members and some 500 campus environmental groups. SAEC is also serving the purpose to provide training to student to serve as leaders of the future. National conferences are also held by this group at different occasions to undertake a diverse spectrum of activities. Another influential student group in United States is the network of public interest research group (PIRGs). PIRGs are mostly focusing on research work on environmental issues from awareness perspectives. These groups are doing the task of organizing people in a local community to address environmental awareness issues and heir handling. As Margaret Mead once said “Never doubt that a small, highly group of individuals can change the world, indeed, it is only thing that ever has”. It is clear from statement that a group of some people may never change the world entirely but a continuous process for change is started forever.

“I pledge to explore and take into account the social and environmental consequences of any job I consider and will try to improve these aspects of any organization for which I work”.

In more than 100 colleges and universities across America the graduating students take pledge at the time of admission and read it. After entering the college or university the students are being provided research facilities on sustainability and its lifelong effects. There is no such existence of groups in Pakistan even in most modern cities like Islamabad, Lahore, and Karachi etc. Moreover, the progressive institutions in a private sector are not working on such lines which are a matter of worry still. As the world is far ahead of us and there is lack of such progressive activities in Pakistan.
CHAPTER 3

RESEARCH METHODOLOGY

3.1 METHODOLOGY

3.1.1 This chapter describes the methodology adopted by the researcher. This research is qualitative descriptive in its approach. The teaching of contents, largely in the domain of environmental science, awareness among the student community, relevant legislation, operating procedures, decisions of UN bodies and the criticism thereof by subject specialists largely eluded quantitative treatment. However, quantitative tools were employed to the extent of establishing the reliability of the questionnaires aimed at assessing the level of awareness of the participants before and after teaching of environment related curriculum. Hence, pilot test, pre-test and post test were accordingly administered.

3.1.2 The research was undertaken by the researcher in cognizance of the fact that awareness on environmental issues is lagging behind the rest of the civilized world. The researcher believed that the best way to redress the situation and bring Pakistan at the level of developed nations in this regard was to first make teachers aware of the environmental concerns and then allow that knowledge to spread through them to the students. Since under-18s comprise some 40% of our population, the strategy is bound to bring success. The effort demanded developing a customized curriculum to be taught to under-training teachers with a view to prepare them to transfer environmental knowledge to, and, create awareness amongst the students.
The review of literature constituted the basis of curriculum development, pre-
test, post test and analysis/ treatment of research data acquired through
questionnaires. The review had to be accordingly extensive and probed into
scientific knowledge at the base of environmental concerns and efforts to
redress the damage already done. It has been organized as Chapter II in the
following parts which are indicative of the scope of the thesis:

Part 2.1: Introduction
Part 2.2: Environment
Part 2.3: Environmental Science
Part 2.4: Environmentalism
Part 2.5: Environmentalism as social movement

This chapter comments on the methodology of this research. Research data has
then been analysed in Chapter IV. Finally, the inferences have been
summarized in Chapter V and recommendations drawn from inferences have
been listed towards its end. The researcher is confident that if the
recommendations are taken up by Pakistani universities, they would help
overcome most of the challenges faced by environment in Pakistan today. The
researcher is cognizant of the impediments and practical difficulties in
adoption of some of these recommendations. However, it was considered vital
to record the recommendations for posterity. The researcher expects that the
same may be found useful as the basis of further research and deliberations by
other researchers.

The researcher recognized universities and schools as the potential key actors/
contributors to the efforts required to reverse environmental damage and
sincerely hopes that their contribution will bear fruit and that troubled regions
such as depleting forests in northern Pakistan and in Salman Range will find
peace, re-growth and prosperity in future. At the same time, researcher
indicates the need for government to allow greater role to be played by
potential major actors/ contributors to this effort through swift decision
making and funds allocation at concerned ministries so that environmental
agencies may be able to deploy their plans earliest.
3.1.6 The study undertook development of teachers training curricula to promote environmental awareness at tertiary level of education, and to assess the impact of teaching of the said curriculum in promoting the awareness level of ‘would be teachers’ or ‘potential teachers’ or ‘students’ teachers.’ The awareness level was assessed initially as pre-test; and later as post test after providing them the training through teaching of the curriculum designed by the researcher. The experimental part of research work was carried out for a period of fifteen weeks from March 2013 to May 2013, in the M.Ed. level (teachers’ trainee classroom) in the Federal College of Education, H-9 sector, Islamabad. The procedure of the study is explained hereunder.

3.2 The Research Model and Approach

The researcher retained focus on the local situations and practices while constructing the model of the educational research. The researcher accordingly developed the teachers training curricula designed to promote environmental awareness at tertiary level of education keeping in view the current level of understanding of participants in respect of environmental issues. If this curriculum is used in similar experiment(s) in other institutions in Pakistan, it may be enhanced in contents and approach commensurate with the level of initial awareness and the background scientific knowledge of participants.

3.2.1 Qualitative-Descriptive Research

The research predominantly followed qualitative-descriptive mode of research as teachers training curriculum developed by the researcher is a non numeric entity that is non quantifiable as a variable. The qualitative research proved to be potent tool in developing an insight into environmental issues, and ethical and aesthetic values relating to the cause amongst the participants. The research thus fully realized the objectives of environmental education the curriculum was designed to deliver.

3.2.2 Quantitative Descriptive Research

The research, however, used quantitative techniques with a view to assure the reliability of the tools i.e. the questionnaires that were administered to assess the impact of teaching of the curriculum designed by the researcher, aimed at promoting
awareness of environmental issues amongst the participants. In this case, the relationship between dependent and independent variables was numeric and quantifiable. The quantitative treatment of data assured the researcher that these questionnaires, if used under similar circumstance, and administered to a sample of populations having similar educational background and level of understanding of environmental issues, in the same geographic area, will not result in significantly higher rates of error in assessment results. However, if used outside the geographic area of this research, or, if administered to subjects having dissimilar background knowledge/ awareness levels, the questionnaires may result in higher rates of assessment errors and therefore must be treated with caution/ adjusted as required during interpretation.

3.2.3 Experimental Research

This research was developmental/ experimental to the extent that a curriculum was developed and then experimented in the classroom through teaching. In this form of research the final product i.e. the curriculum can be adjusted through repeated assessment after manipulating variables carefully. Such manipulation of variables can only be done reliable through a well planned teaching practice process only. The curriculum was therefore taught in a classroom of M.Ed. level of education and the resultant level of environmental awareness of participants carefully assessed and used to make such adjustments to curriculum as considered desirable.

The research followed the following steps systematically:

1. The decision had been taken after mutual consentation of the supervisor and the researcher that the research was to be undertaken as a developmental activity i.e. curriculum development activity aimed at enhancing environmental awareness for teaching at the tertiary level of education.

2. The decision had been taken that the curricular contents should be selected/ developed on the basis of current environmental issues globally and locally.

3. The researcher decided that the curriculum of environmental awareness shall be taught in a regular class to under-training teachers and that the questionnaires needed to assess the level of awareness pre and post
treatment shall be designed keeping in view the level of knowledge and their familiarity with environmental issues.

4. The curriculum of environmental awareness was to be designed to provide built in learning opportunities through practical activity.

5. The validity and reliability of the curriculum aimed at enhancing environmental awareness had to be proved through referral to specialists and through class trials respectively.

The researcher followed the ‘action research method’ to improve the curricular contents through pilot class trials. Step-by-step development took place as under;

1. The general and specific objectives of the research were defined.

2. The body of knowledge of environmental awareness was established by reviewing the latest available literature on the subject.

3. The initial syllabus of Environmental Awareness was drawn prior to conduct of pilot teaching/class trial.

4. The pilot study was planned and conducted which was equal to one semester.

5. The curricular contents were enriched in the light of pilot teaching through value addition and reorganization on the basis of feedback.

6. The upgraded curricular contents were tested again in the second teaching phase which was equivalent to one semester.

7. The lecture method, concept teaching, group discussion and assignment method were implemented during the class trials.

8. The pre test and post test were conducted in two groups i.e. the control group and the experimental group.

9. The pre test and post test were administered (Appendix A). Data generated was subjected to statistical treatment to assure reliability of questionnaires use in class trials.

10. The curriculum finalized in the light of teaching and class trials was referred to specialists for their opinion on validity of curriculum contents. A positive report was received from them (Appendix C).

11. The awareness level of potential teachers in the pre test and post test was analyzed to draw inferences and generalizations. Recommendations were drawn accordingly (Chapter V).
12. The curriculum of Environmental Awareness was finalized and recommended to be made a compulsory part of curriculum of tertiary level of education.

3.2.4 Applied Research

James V Kahn and John W Best classified most of the educational researches as applied researches because they attempt to produce generalizations about instructional materials and teaching-learning processes. The relationship between research and scientific method is described by Kahn and Best (1999):

“Research is considered to be more formal, systematic and intensive process ... involving application of problem identification, hypothesis formulation, observation, analysis and conclusion ... directed towards discovery and development of an organized body of knowledge. Research ... may lead to the development of generalizations, principles or theories, resulting in prediction and possibly ultimate control of events.”

While the basic research is distinct in its goals as its objective is to develop theories by discovering broad generalizations, the research presently undertaken focused on designing curriculum to generate environmental awareness at the tertiary level of education. In this sense the present research is an applied research. The action research followed the path of scientific method i.e. preparation of initial draft of curriculum, pilot study through class trial, improvement in contents, experimental teaching, pre-test and post-test, analysis and finalization of enhanced curriculum. This led to inferences and generalizations which formed the basis of recommendations.

3.2.5 Action Research based on Systems Approach

Due to developmental/ experimental nature of research, Action research was chosen as the mode which meant researching through regular academic schedules without disturbing ongoing teaching activities. Curriculum development followed “Systems Approach” involving the following action steps:

1. Initial Planning and designing the curriculum of environmental Awareness
2. Development of modules that would enable the researcher to deliver concepts in the classroom effectively
3. Pilot trial curriculum in a regular class, and evaluation
4. Value addition of latest information in the modules to enhance the interest of the participants during the class trials
5. Developing appropriate teaching strategies to assess the transformation of concepts by conducting different activities during and after teaching of each module in the class
6. Re-planning and Re-trial through implementation of curriculum in a regular class
7. Evaluation through pre and post testing
8. Evaluating the attainment of objectives of the experiment
9. Finalization of curriculum as the final product
10. Formulation of recommendations

The pattern of Action Research was non-intrusive which facilitated obtaining cooperation of staff and under-training teachers.

3.2.6 Feasibility of Action Research in Tertiary Education

The experience showed that Action Research is feasible and may well be the preferred option in existing system of tertiary education in Pakistan because such research does not interfere vigorously with existing academic patterns, extends over a longer period of time and seeks gradual changes in the system rather than aiming to produce dramatic results in a short span of time. It is considered that recommendations made at the end of Chapter V based on Action Research would be acceptable to a large proportion of teachers’ and administrators’ community. By seeking gradual but persistent changes in the system, the element of resistance from teachers and administrators may be minimized improving the chances of longer lasting impact.

3.2.7 The attitude of Learners towards present Research

Whole-hearted participation of learners was very important for the success of this Action Research project. They responded warmly and showed achievement-oriented approach in studies, managed class time effectively and exhibited keenness for integration of this new kind of knowledge in existing scheme of instruction. Students assumed a deep and inquisitive approach to learning being intrinsically
motivated, and readily integrated environmental information into their existing knowledge.

The researcher found that learners approached the subject differently coming from diverse learning backgrounds. The modules were augmented with innovative and thought provoking items to maintain the interest of learners during the experiment.

3.2.8 Assessment of prevailing situations regarding teaching of Environmental Awareness at Tertiary Level of Education

The researcher found that there is no vogue of teaching concepts pertaining to Environmental Awareness at tertiary level of education in most learning institutions. Although a syllabus for environmental education has been designed by Higher Education Commission, but the same has not been made regular part of course work at any level of tertiary education. The researcher analyzed the existing syllabus of environmental education and then re-engineered the same by adding items representing latest trends and issues concerning environment. There being no precedent of teaching Environmental Awareness as a proper regular discipline, it turned out to be a novel experience for the learners. The researcher was encouraged by the warmth of the participants who were trainee teachers to enhance the range of learning activities and add value to the contents with thought-provoking facts and scientific information. Thus enriched contents were taught through effective pedagogical strategies to ensure maximum involvement of learners in the teaching/learning process.

3.2.9 Approaching the contents through Global/Local setting

National and local environmental hazards/ issues were highlighted as examples to lend weight to base discussion on existing ground realities. The following constituted points of emphasis/areas of interest in contents and class discussions:

1. Understanding our environment: A brief history of conservation and environmentalism, Environmental Philosophy and ethics, environmental justice.
2. Population biology: Dynamics of population growth and factors that regulate population growth.
3. Demography: demographic transitions, family planning and fertility control.
5. Pest control: Pests and pesticides, pesticides benefits and problems, alternatives to current pesticide uses, reducing pesticide exposure.
7. Preserving and restoring nature: Parks and nature reserves, wilderness and wild life refuges, world parks and preserves.
8. Ecosystem management: Preserving ecosystem services, preserving functional ecosystem and landscapes, restoration of ecosystem.
9. The Atmosphere and climate: Seasonal winds and monsoons, frontal weather, driving forces and patterns in climate changes.
10. Air pollution: Natural sources of air pollution, human-caused air pollution, effects of air pollution, air pollution control, clean air legislation.
11. Water use and management: Water availability and use, fresh water shortages, increasing water supplies, water management and conservation.
12. Water pollution: Types and effects of water pollution, water quality today, water pollution control, clean water legislation.
15. Environmental policy, law and planning: International treaties and conventions, dispute, resolution and planning.

3.3. Academic Interventions

The prime environmental concerns are deforestation, water pollution, air pollution, land degradation, preservation of culture, ethics and aesthetic sense, water scarcity, its use and management, human population, climate change and global warming, waste management and environmental policy. These are topmost concerns as mentioned in print and electronic media, seminars and conferences etc. These
inputs were used to decide upon curricular interventions meant to provide in depth awareness to the learners. Assignments were planned and group discussions arranged during the teaching phases.

The incorporation of these interventions followed the learning theory as brought forth by a revolution in the process of curriculum development and educational management witnessed during the last century. Educationists and psychologists Pavlov, John Dewey, Vygotsky, Jean Piaget and Carl Rogers contributed to this revolution in a big way while curriculum specialists *viz.* George A. Beauchamp, Hilda Taba and Robert S. Zais brought education theory closer to life by investigating these learning theories through research in schools using scientific methods. Action research that followed in schools extended our understanding of students’ classroom behaviour. Consequently, new curriculums were formulated which had relevance to the needs of the versatile societies. Environmental knowledge also received attention worldwide. A complete framework is available in developed societies to train the learners and activists keeping in view the contemporary life-related requirements of a progressive society. This action research followed the models available in leading countries in designing a curriculum for teachers training in delimited area.

### 3.4 Designing Environmental Awareness Curriculum:

The present curriculum of Environmental awareness available on HEC website does not cover tertiary level of education. The scholar found that the departments of tertiary education were not familiar with the subject at all. The department of Environmental Education in ARID University, Rawalpindi was consulted for proper designing and shaping of a curriculum aimed at creating awareness of environmental concerns. Their advice was valuable in deciding upon its contents. The contents were further enriched by adding local issues. The syllabus was formulated to support teaching of social sciences and enhance the capacity of trainee teachers, and through them, the higher secondary students in terms of social-service skills. Further, a mechanism was developed to make students aware of some vital
aspects of healthy life style. There were challenges posed to this research project by diversity among students hailing from various segments of Pakistani society as well as diverse climate in various parts of the country at a given time.

3.5 Development of modules

After reviewing the literature in detail, the researcher stood apprised on opinions and advice of the renowned curriculum specialists viz. Rice, Becker, Taba, Zais, Best and Kahn. The Researcher consulted the research supervisor, the head of department of Environmental Education in ARID University and the head of department of Education in ARID University and established the following pattern for layout of modules.

1. The curricular contents must be converted into individualized concepts and groups of related concepts to be delivered as a unit,
2. The transmission of concepts must be confirmed by asking verbal questions at the end of each module,
3. The opportunities for effective learning and desired skills must be created,
4. The layout of modules must allow floor discussions,
5. The curriculum needed to be balanced in terms of input from rational, intuitive, philosophical and religious sources,
6. The curriculum needed to be strongly with society.

A systematic review of literature of environmental awareness was drawn to establish the “body of knowledge of environmental awareness” and for determining the outline of curricular contents the international research papers and articles was analyzed. Moreover, electronic and print media reports alongwith authentic internet resources were covered to set a broad based body of knowledge.

3.6 Action Research Tasks

The following action tasks were accomplished by the researcher to fulfill the above-cited considerations:

Task1: The modules were drafted to conduct the initial trial as the pilot study which was conducted from March 2013 to May 2013 to assess needs and interests of the learners towards the environmental awareness. The task was
very helpful in setting final curriculum of environmental awareness for tertiary level of education.

Task2: In the light of the pilot study the curricular contents were reviewed to make up shortcomings to prepare the curriculum for final test.

Task3: Advance organizers, floor discussions, case studies, communication and revision questions were added during the re-drafting of modules. Some valuable knowledge items were added from philosophical and theological.

Task4: Model of floor discussions was developed and assignments were added to evaluate the mechanism for effectiveness of modules.

Task5: The second and final trial was conducted from December 2013 to February 2014 using the upgraded and enriched modules. The effectiveness of the product was tested through conduction of pre-test and post-test after validation by subject specialists.

Task6: Findings were drawn and statistical treatment applied on the test results to reassure reliability. Specific inferences were extracted to support/ negate the theses. Recommendations were concluded on the basis of inferences.

Task7: The follow up action researches were recommended to strengthen the proposed curriculum of Environmental Awareness at Tertiary Level of education.

### 3.7 Challenges in controlling the variables:

During the conduct of the experiment, the following challenges were encountered and resolved at the M.Ed. class in Federal College of Education, Islamabad:

1. The traditional teaching practices were being followed at tertiary level of education in the said institution. Rote learning being the normal mode of teaching, students were not inclined to accept new knowledge and methods. The subject was not part of their regular courses.

2. The learning background of the students varied in teachers’ training programs. The challenge was accepted by the researcher and modules were designed in such a way as to address ‘average-students’.

3. The students joined M.Ed. class from diverse social and demographic backgrounds. The researcher resolved the problem by relating the concepts of Environmental Awareness with real life situations. The
researcher attempted to deliver teaching sessions by putting examples in their local settings to strengthen the concepts of local environment. The students developed interest in the subject and keenly learned about their environmental issues in the local settings.

4. Interest was created in the learners by giving them assignments to research their respective local environmental issues and then suggesting solutions for its improvements.

5. Group discussions provided opportunities to point out environmental problems and propose their solutions. Inductive reasoning was encouraged during group discussions. Discussions were effective in promoting communications skills. The sessions were organized in IT lab in the college to get familiar students with modern educational and communicational skills. These activities were helpful in producing in-depth knowledge and life-skills among learners.

3.8 Organizing Knowledge for Teaching in the Classroom

The modules developed for testing in classroom comprised contents to teach Environmental Awareness, two assignments with group discussions, one project, Question-Answer sessions and power point presentation on environmental issues. In expositions, current environmental issues were included. Latest research articles were distributed. The students were encouraged to ask questions frequently to resolve queries. Students’ contribution towards knowledge was appreciated. The concepts were reinforced by involving students in discussions and written assignments. The organization of knowledge was as under:

1. The course curriculum was organized into thirteen modules and each module was planned to complete within one week duration in sessions totaling three contact hours.

2. The ‘Environmental issues at national level’ were given top priority in each module.
3. Each module was comprised of expositions to present one main concept of environmental awareness and its allied issues at national level. The concepts were transmitted through different teaching strategies like lecture method, group discussions, assignments etc. The activities contained in modules motivated students to engage in practical work towards betterment of their surroundings.

4. The success of the transmitted knowledge was tested by revision questions at the end of each teaching session. Questions preceded the start of the next teaching session as well.

### 3.9 Developing Analytical Skills among learners

The following considerations/ activities were included in the developed modules by the researcher to focus learners’ thinking on environmental issues and develop their analytical skills from the point of view of environmental awareness.

1. What questions should be asked from people who claim that they live in the world full of bounty?

2. Pointing out preconceptions, values, beliefs and contextual perspective that should be asked from majority of people about environmental ethics;

3. Enlisting to improve physical and biological conditions in your own community that are important for shaping local biological community;

4. Some people believe that environmental problems can be resolved through technology while some others argue that technological fix is making environment worse;

5. Unhealthy lifestyle and less nutrition in developing countries put accountability on developed countries to bear responsibility;

6. Debate on the critical elements that claim most famines that are caused by human actions or inactions rather than by ecological forces;

7. Wildlife populations could never receive lasting impacts affected by human actions as nature is vast and fertile. False beliefs held by people a century ago still create misjudgments.

The discussions brought these questions amongst others:

1. Put yourself as decision maker to evaluate data about destruction of tropical rainforests and extent of desertification of grazing lands;
2. Comment on an arrogant attitude of restoration ecologists *viz.* ‘the environmental damage can be repaired later but we should do we want now.’

3. Do you believe the stories that elders tell about the weather when they were young?

4. There is conflict between richer and poor nations on global warming issue as poor nations blame richer. What is your point of view?

5. Underground water should be used regularly or should it be saved for future time?

6. Is water quality in your area getting better or worse? Do you try to make a judgement on water resources in your local area?

7. Do you think about alternative energy resources which are more useful in your region or climate?

8. Present a number of proposals for urban redesign which are appropriate and useful for your community.

9. As a community leader or political leader, what steps would take to establish environmental policy and enforce environmental laws?

### 3.10 Conduct of Experiment

The systems approach was evaluated by conducting an experiment i.e. a class trial in which pre-test and post-test cycle was implemented. The M.Ed. class in Federal College of Education, H-9, Islamabad was selected for the conduct of experiment. The modules of Environmental Awareness developed by the researcher were taught in the classroom for a duration equivalent to one semester. The class was divided into a control group and an experimental group comprising 31 students in each group. The control group was identical in learning background and other entry conditions, and it was not given the treatment i.e. teaching that was given to the experimental group. Both the groups were pre-tested before the start of the experiment and, after completing the treatment, both groups were post tested using the questionnaire. The presence of full strength in both groups was made sure as best as possible. Prior to the experiment, pilot testing was carried out which provided necessary feedback which helped improve the teaching contents as well the questionnaires.
3.11 Population of the Study

The 14 public sector and 4 private sector universities have been working in Islamabad Capital Territory (ICT) under the charter of Higher Education Commission (HEC). Three public sector universities and one private sector university have been offering Tertiary Level Education (Teachers’ Training programs). The names of the universities offering Tertiary Level of education are as follows:

<table>
<thead>
<tr>
<th>Name of the University</th>
<th>Charter</th>
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<tbody>
<tr>
<td>Allama Iqbal Open University</td>
<td>Public</td>
</tr>
<tr>
<td>International Islamic University</td>
<td>Public</td>
</tr>
<tr>
<td>National University of Modern Languages</td>
<td>Public</td>
</tr>
<tr>
<td>Foundation University</td>
<td>Private</td>
</tr>
</tbody>
</table>

The Federal College of Education, H-9 sector, Islamabad offers tertiary level of education (M.Ed., B.Ed., B.S.Ed. and B.A.Ed.). It is the only institution solely is responsible for the provision of Tertiary Level of Education within Federal Area.

3.12 Sample of the Study

National University of Modern Languages, Islamabad and the Federal College of Education, H-9 sector, Islamabad provide tertiary level of education (M.Ed., B.Ed., B.S.Ed. and B.A.Ed.). The department of Education, NUML and Federal College of Education were selected as sample of the study to conduct experiment. The combined strength of the two institutions was considered sufficient for the purpose of the study. The College facilitated constitution of experimental and control groups according to the needs of the study. The researcher intended to constitute both groups of 31 students each to fulfill the requirement of reliable data generation. Students of the session December 2013 to February 2014 were designated as the sample for this study. For the construction and validation of the instrument to measure the environmental awareness of the student teachers, all the teachers training programs (M.Ed., B.Ed., B.S.Ed. and B.A.Ed.) of Federal College of Education were designated the sample of the study. In session December 2013 to February 2014 there were above 400 trainee teachers who were getting their tertiary education in four different programs (M.Ed., B.Ed., B.S.Ed. and B.A.Ed.). The M.Ed. class in the
The aforementioned college was split into an experimental and a control group for pilot study during March 2013 to May 2013.

Out of four teachers’ training programs being taught at Federal College of Education, M.Ed. program was randomly selected as sample of the study. There were 62 students in M.Ed. program in Federal College of Education, Islamabad during the session December 2013 to February 2014. All Sixty one students were taken as a sample for this study. The sample was then divided into two equivalent groups i.e. 31 students in each group. One group was declared experimental group. It comprised 31 students and it was given environmental education to develop awareness in this field during a fifteen weeks session. The control group was not given any such treatment but their awareness was tested prior to and again at the end of the session through post test. The post test was given to both groups at the completion of session at the end of February 2014. The instrument was by researcher and designed to measure the environmental awareness level of the participants.

3.13 Contents of the Study

Environmental Science: A Global Concern by William P Cunningham, University of Minnesota was selected as the source of contents to develop the modules for this study. The selection was guided by the outline curriculum developed by Higher Education Commission of Pakistan.

The selection covered twenty most important topics considered adequate for the purpose of developing awareness among the trainee teachers in M.Ed. class. The environmental problems of Pakistan especially were made part of the teaching to develop the conceptual understanding of the learners relevant to local perspective. The twenty selected topics were arranged into sixteen chapters as listed below:

1. Understanding our environment: A brief history of conservation and environmentalism, Environmental Philosophy and ethics, environmental justice.
2. Population biology: Dynamics of population growth and factors that regulate population growth.
3. Human populations: Human demography, demographic transitions, family planning and fertility control.
5. Pest control: Pests and pesticides, pesticides benefits and problems, alternatives to current pesticide uses, reducing pesticide exposure.


7. Preserving and restoring nature: Parks and nature reserves, wilderness and wild life refuges, world parks and preserves.

8. Ecosystem management: Preserving ecosystem services, preserving functional ecosystem and landscapes, restoration of ecosystem.

9. The Atmosphere and climate: Seasonal winds and monsoons: Frontal weather, driving forces and patterns in climate changes.

10. Air pollution: Natural sources of air pollution, human caused air pollution, effects of air pollution, air pollution control, clean air legislation.

11. Water use and management: Water availability and use, fresh water shortages, increasing water supplies, water management and conservation.

12. Water pollution: Types and effects of water pollution, water quality today, water pollution control, clean water legislation.


15. Environmental policy, law and planning: International treaties and conventions, dispute, resolution and planning.


### 3.14 Conduct of the Treatment

The experimental group was provided a treatment (environmental education to enhance the awareness of the potential teachers) for a period of fifteen weeks in the Federal College of Education, Islamabad in M.Ed. program. The exposition of contents of the modules was carried out two days (Wednesday and Thursday) per week in the M.Ed. classroom. The teaching was organized in periods of duration of ninety minutes each i.e. one hundred eighty minutes (three contact hours) per week entitling the trainees to three credit hours towards their degree programs.

### 3.15 Research Design
The pre test and post test design was used for this study. The students were divided into one experimental and one control group of 31 students each. The students were selected randomly. As the basic qualification for admission in M.Ed. is the qualification of B.Ed., the experimental and control groups were considered well-equated, all possessing B.Ed. qualification. The experimental group received a treatment, that is, teaching through modern teaching techniques for the purpose of affective learning. Audiovisual teaching technique was practiced through the use of multimedia for delivery of the contents. Teaching was coupled with group discussions, students’ projects and assignments. The experimental and control groups were subjected to pre and post tests. The mean raw test scores of the experimental and control groups were used to determine respective means for each group. The means were subjected to Gusset test of statistical significance (t-test). Once the means were considered statistically reliable, assuring no greater than 5% error in re-use, the means of pre test and post test were compared to assess the gain attributable to learning in case of the experimental group.

The gain was considered a reliable indicator of the effectiveness of the treatment. The design of the research was as under:

<table>
<thead>
<tr>
<th>Group</th>
<th>Pre test</th>
<th>Treatment</th>
<th>Post test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>O(^1)</td>
<td>T</td>
<td>O(^2)</td>
</tr>
<tr>
<td>Control</td>
<td>O(^1)</td>
<td>-</td>
<td>O(^2)</td>
</tr>
</tbody>
</table>

O\(^1\) = observation (pre test)
O\(^2\) = observation (post test)
T = treatment

**Population:**

**Sample:** 31 students of M.Ed. programme of Federal College of Education, Sector H-9, Islamabad, were selected as experimental group and 31 students of the same class as the control group.

**3.16 The Instrument:**
The instrument (Appendix ‘A’) was developed to test the awareness level of the learners through test-retest procedure. The difference between means of the
experimental and the control group before and after administration of treatment would indicate the gain in case of respective groups and a significant increase in the mean of raw score would indicate the increase in level of awareness attributable to learning. The test-re-test procedure would, with repeated use, assure reliability over time in terms of robustness of the questionnaire.

The pre test was conducted before the start of the class trial. The instrument comprised of the following fields of environmental information: (1) Philosophy of environment (2) Human population (3) Biodiversity (4) Ecological health (5) Water use and management (6) Water pollution (7) Air pollution (8) Climate change (9) Waste disposal methods (10) Preservation and restoration of environment (11) Ecological pyramid (12) Land degradation (13) Food shortage and hunger (14) Alternate energy resources (15) Environmental policy. The instrument was designed to test awareness on a five point Likert scale (Strongly Agree, Agree, Un-decided, Disagree, Strongly Disagree) and the marks were allocated respectively as 5, 4, 3, 2, 1 for positive statements while reverse order was adopted for negative statements without disclosure to the respondent. The positive and negative statements were mingled at random to assure avoidance of repeated patterns that may be recognized by the respondents and taken advantage of. The statements further provided an insight of the interest of the learners along with intellectual position adopted by them in the debate regarding environmental issues. The Awareness scale was maintained at the same level in pre test and post test to assess the ‘gain’ or ‘decline’ in the level of awareness after the conduction of treatment through class experiment.

### 3.17 Approach to the Conduct of Experiment

The request was forwarded by the researcher to Secretary CAD (Capital Administrative Deptt, Education, then supervising higher education) for the conduct of experiment in Federal College of Education, H-9, Islamabad. The researcher was advised by the research supervisor to conduct experiment in this particular college as the respective educational institute specifically cater for teachers’ training at tertiary level education of all types. Moreover, the enrolment was sufficient in the college to obtain statistically robust outcomes.

The college head and faculty was given a detailed briefing about the purpose of the study and request was made on the respective head of the said institute to allow the proposed class trial in M.Ed. class as per the intended schedule. Further, the
respective class of M.Ed. was also briefed at length about the objectives and the manner of conduct of the proposed research undertaking.

3.18 Controlled Variables

3.18.1 Independent variables

The treatment given to the experimental group i.e. teaching of concepts related to environmental awareness in the classroom, through the modules especially prepared by the researcher for this purpose, was considered as the Independent Variable. Modification of behaviour through enhanced awareness and heightened sensitivity towards environmental issues was regarded as being contingent upon this independent variable.

3.18.2 Dependent Variables:

The Dependent Variables constituted the products of the treatment. The teaching of contents related to environmental awareness resulted in new cognition of knowledge and attendant behaviour modification. The transformation was the direct result of, and directly attributable to teaching of modules in the class aimed at enhancing the level of environmental awareness. Modification of behaviour through enhanced awareness and heightened sensitivity towards environmental issues was regarded as being contingent upon this independent variable and was therefore treated as the principal dependent variable. The dependent variable had the following facets that were used as indicators in the experiment:

1. Enhanced awareness and heightened sensitivity towards national and global environmental concerns;
2. Motivation to take practical steps for betterment of community by working for better environment in the surrounding;
3. Promote the attitude of caring for environmental concerns through advocacy.

The independent variable “Consciousness” or “Awareness” defined the principal domain of above mentioned indicators. Changes in indicators were measured quantitatively through purpose designed questionnaires. It was assessed through indicators that ‘Dependent Variable’ varied in proportion to changes in the ‘Independent Variable.’ This was attributable only to the treatment i.e. invoking
interest of the students through the newly developed curricular contents relevant to environmental awareness.

Other independent and dependent variables were painstakingly eliminated. The class attendance and attentiveness of students was made sure by setting discipline in classroom, moreover, active participation of students was made ensured. A mechanism was built to motivate class through reinforcement, promoting self regulation and giving home assignments at regular basis. A keen sense of ‘presentism’ was maintained during teaching phase to relate the effective relationship of subject with real life settings of the students. Multiple activities were practised in the classroom to develop ‘sense of ownership’ regarding environmental concerns among the students as it was the ‘essence’ of the research project. The floor discussions and home assignments were found to be highly helpful in assimilation of concepts and enhancing intellectual capacity of students. The combined effect of all these activities supported efforts to invoke ownership role among students towards ecological issues.

3.19 Uncontrolled Variables

3.19.1 Uneven Educational Background

The students of M.Ed. class had diverse educational backgrounds. As per policy of the college, the criterion for getting admission into M.Ed. programme was a B.Ed. degree which condition was not met by all, as majority of students possessed a general degree in social sciences at the graduation level. Some students had science background. The subject of Environmental Education consisted of complex concepts of Science which was grasped with ease by these students but the same cannot be said of the social sciences students. Hence, the variance in background knowledge may have caused variance in learning and attitudinal change attributable to treatment. Due to the constraints of the college administration, it was not possible to overcome this difference, for instance, through extra coaching. The interest of the non-science learners was, however, maintained by developing the modules in as simple and comprehensible form as consistent with the nature of the contents.
3.19.2 Concept of Self efficacy of Individual Students

The individual’s concept of his or her own efficacy in undertaking a challenge or in encountering and overcoming a predicament is paramount in deciding the outcomes of non-conventional learning such as administered in this experiment, and influencing the results of a research outcome. Every individual accepts the challenge of assimilating new knowledge in a different way. Some students are sharp in accommodating new knowledge while some others are relatively slower and may tend to hold back the pace of learning in a group. Every individual responds to new concepts according to his or her concept of self-efficacy. The impact of such motivational triggers may have influenced the response of individual participants and, given the short time allocated to this experiment precluding any remedial measures, the impact of the phenomenon of self-efficacy was beyond the control of the researcher.

3.19.3 Intensity of exposure:

The seven subjects that were being taught in college in part as part of their regular semester activity continued to be taught in parallel with Environmental Awareness. The attention of the students was, therefore, divided among all these subjects. The importance of these courses could not be de-emphasized as these were compulsory subjects that the students had to qualify for completion of their requirements towards the degree through regular examinations. As a result the variable remained beyond the control of researcher and may have influenced the outcome of the research.

3.19.4 Associational Learning:

Clinical conditions for the experiment are desired but seldom achieved. Theoretically, the experimental and the control group members should be totally isolated and not allowed to mix, a condition that can only be met in a psychiatric ward. Such total isolation couldn’t be forced by the researcher in given college atmosphere. Communication between ‘control group’ and ‘experimental group’ on the activities of the experiment could not be excluded. Informal discussions, exchange of ideas pertaining to the contents of the modules may have taken place in friendly discourse. It is thinkable that some of the control group members may even have attempted the exercises forming part of the modules. The influence of such informal
activities could not be monitored systematically nor filtered from the results obtained. The impact of these factors upon the experiment thus remains largely undetermined.

### 3.19.5 Exposure to Media and Internet

While nearly 100% students stand exposed to media and internet, the degree of individual exposure cannot be reliably measured and discounted from the results of the experiment. It is conceivable that significant difference existed between individual in the extent to which media and internet supported their learning. Control group though not formally tutored had equal access to media and internet. It is apprehended that a significant variation may have crept into the results of experiment modifying the impact of designed learning. It was beyond the control of the researcher to eliminate this variable.

### 3.20 Statistical Treatment

The difference in means of raw scores from pre and post tests conducted on the control and experimental groups were compared to mark the difference between the pre and post test status within each group and to mark the difference between the two groups at pre and post test levels. The difference being in favour of the experimental group indicated a positive gain that was distinctly attributable to the treatment extended to experimental group and not to the control group. The Researcher thus concluded that the results obtained from pre and post tests suggested rejection of null hypothesis substantiating the opposite or positive statements.

#### 3.20.1 Comparison of Means of Raw Scores

Comparison of the means of raw scores indicated that the two groups had near identical level of awareness of environmental issues at the pre test level. Hence, it is concluded that the two groups matched entry gate conditions.

<table>
<thead>
<tr>
<th>Group / Test</th>
<th>Pre-Test</th>
<th>Post-Test</th>
<th>Gain</th>
<th>Achievement</th>
<th>Intra-Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>H₁:H₂:H₃:H</td>
<td>317.15</td>
<td>447.7</td>
<td>130.5</td>
<td>26.11</td>
<td>H₁:H₂=</td>
</tr>
<tr>
<td>Awareness on a Scale of 31 (X₁)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On a Scale of 31 (X₂)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Comparison of means of differences \((D_i)\) of experimental group between the pre test and post test stages showed 26.11\% gain which is remarkable given the circumstances under which the tutoring was carried out. This gain is beyond all doubt attributable to the treatment extended to the experimental group under controlled conditions.

Comparison of means of differences \((D_i)\) of control group between the pre test and post test stages showed a meager 1.37\% gain which is attributable to the fact that no treatment was extended to the control group under conditions of isolation.

Comparison of means of raw scores of experimental group and control group at the post test stage showed 25.08\% advantage in favour of experimental group which is remarkable given the circumstances under which the tutoring was carried out. This advantage is beyond all doubt attributable to the treatment extended to the experimental group under controlled conditions which was not extended to the control group.

The Researcher thus inferred, in the light of the analysis that the results obtained from pre and post tests suggested rejection of null hypothesis substantiating the opposite or positive statements.

### 3.21 Analysis of Responsible Environmental Behaviour
### Hungerford and Volk’s Model (1990)

<table>
<thead>
<tr>
<th>Entry-Level Variables</th>
<th>Ownership Variables</th>
<th>Empowerment Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental sensitivity *</td>
<td>In-depth knowledge about issues.*</td>
<td>Knowledge of and skill in using environmental action strategies*</td>
</tr>
<tr>
<td>Knowledge of ecology</td>
<td>Personal investment in issues and the environment.*</td>
<td>Locus of control*</td>
</tr>
<tr>
<td>Androgyny (Non-violent Resistance)</td>
<td>Knowledge of the consequences of behaviour – both negative and positive</td>
<td>Intention to act*</td>
</tr>
<tr>
<td>Attitude toward pollution, technology, and economics</td>
<td>A personal commitment to issue resolution</td>
<td>In-depth knowledge about issues</td>
</tr>
</tbody>
</table>

Table: Hungerford and Volk’s (1990) model of Responsible Environmental Behaviour

The researcher selected the aforementioned model to generate Environmental Awareness through Teachers’ Training Programs. In the model the step by step involvement of the participants is determined.

1. The first step is ‘Entry Level Variable’. At this stage the participants are given orientation about the environmental issues. The basic information is delivered and minds of participants are started to develop environmental sensitivity.

   The researcher followed the same line of action and provided awareness about modern environmental issues at local, national and international level. The
students of M.Ed. class in Federal College of Education were given ‘Entry’ to develop environmental sensitivity. The basic environmental issues were discussed in the class by having diverse backgrounds of students. Naturally, due to individual differences every student grasped the knowledge regarding environmental awareness in their own way. Some participants showed high level of interest while some medium anyhow interest of few students was at low level. The water pollution, air pollution, agriculture, urbanization, population and waste management were very interesting subjects for the learners during teaching phase.

2. The second step is ‘Ownership Variable’. At this stage the participants started to develop interest in environmental issues. The in depth knowledge was delivered through a well planned and regular teaching process. Consequently, the learners started thinking on comparison between positive and negative aspects.

The researcher observed during class trial that ‘potential teachers’ participated actively throughout teaching phase. The interest of the learners was observed during question answer sessions, assignments and group discussion. The ‘would b teachers’ were assigned issues to resolve at their local level and national level vice versa. A variety of ideas were launched in the assignments. Naturally every individual participated according to their potential and level of interest. But the majority of learners presented the solution of issues in comprehensive manners by showing their involvement in the subject. The 100% involvement of participants is not possible in any natural setting.

3. The third step is ‘Empowerment Variable’. At this stage the participants developed skills to resolve environmental issues. The participants were motivated to influence the society by using skills to maintain Ecological Sustainability.

The researcher observed that, by making the syllabus of Environmental Education as regular part of Teachers’ Training Programs, the skills of ‘would be teachers’ would be refine to such extent that Ecological Sustainability would be maintained in its natural spirit. The duration of experiment was equivalent to a single semester only so the exposure to the students was confined to limits but due to interest of learners the results was satisfactory. It was observed that regular teaching phases could be a potent source of
generation of environmental awareness in the society. The learners might develop intentions to act for the preservation and conservation of respective ecology at their local settings.

The Data Tables would be presented in chapter four in detail and in-depth discussions would be launched based on data crunching.

3.22 Reliability Test

The Researcher was naturally interested in obtaining an assurance that the pre and post test questionnaires prepared and used by him would, if reused later, not generate an unduly high rate of error originating from the internal factors. The t-test is a dependable statistical tool frequently employed to seek this assurance. The Researcher used this test and found that an error of more than 5% shall not be generated if the test were used in identical testing conditions. The Researcher is thus in a position to recommend the tests for reuse within the delimitations stated in the study with 95% figure of merit on the reliability index.

In 1993 John W Best and James V Kahn in educational research enunciate the point as: The characterization of a group is determined by satisfactory measurement between means of samples as significant. The Best and Kahn described the use of t-test as significant in terms of statistics when raw data considered being not as large in quantitative study. The determination of significant difference between means of samples is the result of ultimate achievement statistically in the study.

The T-Test was used by the researcher in the study to determine whether there is probably a significant difference for independent samples (at level of significance, 0.05, 0.01 and 0.001) that is between the means of two samples (control group and experimental group).

The data was analysed by the application of SPSS Version 15. The two forms of t-test were observed in a joint research by Cohen, Manion and Morrison in 2000. The first one is t-test for correlated means in which some sort of treatment is given to same group and means scores are compared to observe if gain is significant or here is possibility of research design also to be having involvement of two matched groups. The second one is t-test for independent means in which mean scores of two independent or different samples are compared. The independent samples are formed randomly and without any type of matching. The two groups, comprised of randomly, are expected to be same fundamentally at the beginning of the study performance.
wise on the dependent variable. The two possibilities are expected at the end of the study also. In first one if the mean scores of independent samples are different then difference is due to treatment which ultimately indicates that null hypothesis is false. The two groups are not expected to be identical at the end of the study but they are bound to be different. Here it is analyzed whether the difference is significant or not. The conclusion is that the t test for independent samples is applied to drive out a significant difference probably between the means. In second one if the mean scores of independent samples are same then treatment doesn’t create any difference which indicates ultimately that null hypothesis is true.

The Gay in 2005 stated that the t test is a parametric statistical test which is used to check the difference is significant between means of two trials at a chosen probability level. The parametric tests are used on the basis of the assumptions that the distribution of population should be normal to draw the samples for trials, the selection of subjects should be independent and the collection of data should be based on ratio or interval scale. Mostly in educational researches the achievement tests stand for interval scale. The main concept of t test is to derive the standard error of difference between means that is to compare the actual mean difference of observations with the by chance expected difference. By explaining the formula of t test, the two values is the ratio in which the difference between sample means is taken as numerator while the values of expected chance difference is placed in the denominator to generate date for proofing the null hypothesis in educational researches.

Further Koul in 2007 explained the t test in educational researches. The data is generated to obtain a value of “t” which is further compared against critical value of “t” in the statistical table but with the stipulation it is checked at a particular degree of freedom to determine the significance level that is gained. The two important conditions are implied here: In first one the null hypothesis is rejected if obtained value of “t” is greater than the critical value of “t” while in second one the null hypothesis is accepted if obtained value of “t” is smaller than the critical value of “t”.

For attitude questionnaire, the Likert scale and T-test were used for the creation and validation of an instrument to quantify the environmental awareness of the students. After completing the experiment the awareness scale was distributed to both the experimental and control groups, and subsequently tabulated. The scores attained by both the groups were tested by the T-test to determine the attitude gain in
the favour of environmental awareness. To find the reliability of the attitude scale, it was divided into two halves that are negative statements and positive statements in the questionnaire, then the reliability coefficient between the two halves was calculated. The formula was mentioned by Fisher in 1935 to calculate a difference means from two independent samples.

\[ t = \frac{(M_1 - M_2) \div [(\sum X_1^2 + \sum X_2^2 \div N_1 + N_2 - 2)] \{(N_1 + N_2) \div (N_1 N_2)\}}{\frac{1}{2}} \]

In the above mentioned formula:
\( \sum X_1^2 \) and \( \sum X_2^2 \) = sum of the squares between means of two samples
\( M_1 \) and \( M_2 \) = means of two samples
\( N_1 \) and \( N_2 \) = number of cases in two samples

The T-Test was used by the researcher in the study to determine whether there is probably a significant difference for independent samples (at level of significance, 0.05, 0.01 and 0.001) that is between the means of two samples (control group and experimental group).

The Data Tables would be created in chapter four carrying detailed data and discussions cum inferences would be determined on data crunching.

### 3.23 Inferences from Data

As evident from the data shown in Table 1, while the two groups entered at compatible levels, the Experimental Group performed better than the Control Group vis-à-vis both the indicators. The following is observed from the statistics:

1. Experimental Group and Control Group comprised 31 members each that had identical and comparable background as evident from Pre-Test scores.

2. Experimental Group’s Mean Post-Test score on ‘Awareness’ Scale (447.7) was higher than its Pre-Test score (317.15) by a factor of 2.88 on a scale of 60 representing a gain of 26.11% over its Pre-Test score. The gain was considered attributable to generate environmental awareness.

3. Experimental Group’s Mean Post-Test score on ‘Awareness’ Scale (447.7) was higher than Control Group Post-Test score (322.3) by a factor of 2.92 on a scale of 60 representing a nominal superiority of 25.08% over Control Group’s Post-Test score.

4. The Experimental Group thus showed a 25.08% higher concentration of Environmental Awareness than the Control Group attributable to teaching Environmental Awareness.
3.24 Developed Modules Taught in Class Trial

FIRST MODULE:

ENVIRONMENTAL UNDERSTANDING AND PHILOSOPHICAL

1.1 Objectives of the Module:
1.1.1 To define the basic concepts, terminologies of environment and its relation with the daily life of people.
1.1.2 To highlight the historical background of environmental conservation and its movements all over the world.
1.1.3 To identify the factors of environmental degradation by pointing out difference of rich and poor on the planet.
1.1.4 To understand environmental philosophy, ethics and values and their relationship with environmental plan of actions.
1.1.5 To point out religious and cultural aspects of environmental protection and their impacts on the lives of individuals.
1.1.6 To explain relationship between human actions and due to activities the impacts on natural ecological assets.

1.2 Learning Outcomes:
1.2.1 The student will be able to understand the need of subject of environmental awareness in their lives.
1.2.2 The learners will be able to study the history of environmental conservation and efforts of the people in past for preservation.
1.2.3 The students will be able to comprehend environmental philosophy and ethical values to follow in lives.
1.2.4 The learners will be able to study the support of Environmental Awareness from religious and cultural perspectives.
1.2.5 The learners will be able to develop concepts of environmental justice and its essential aspects in life.
1.2.6 The students will be able to comprehend the responsibility as a human being to relate with the nature

1.3 ASPCTS OF AWARENESS
1.3.1 History of Environmental Preservation and conservation

Environmental protection in Tanzania began during the German occupation of East Africa (1884-1919) — colonial conservation laws for the protection of game and forests were enacted, whereby restrictions were placed upon traditional indigenous activities such as hunting, firewood collecting and cattle grazing. In year 1948, Serengeti was officially established as the first national park for wild cats in East Africa. Since 1983, there has been a more broad-reaching effort to manage environmental issues at a national level, through the establishment of the National Environment Management Council (NEMC) and the development of an environmental act.

1.3.2 Earth as Amazing Planet in the Solar System

Earth is considered as unique planet in the universe due to moderate temperatures in different regions across world. A rich diversity of life exists on earth to help sustain a habitable environment. Earth is composed of variety of forests, deserts and hilly areas alongwith presence of fresh air and water as precious gifts by nature. Moreover, thousands of species are surviving globally due to which earth as planet consider as beautiful for spending life.

1.3.3 Preservation of Nature from Moral and Aesthetic Aspects

Core philosophy of nature protection is based fully on moral and aesthetic aspects. As a superior creation of Allah almighty it is considered the prime responsibility of human beings to care the right of life of all other living things on earth. In 1916, the National Park Service was established by Muir (geologist, author and first president of Sierra Club) and Stephen Mether in America was considered as first step towards nature preservation in its purest state.

1.3.4 The Division of People between Rich and Poor Globally

We live in a world of haves and haves not: Some people are enjoying luxuries of life but on other hand some people are lacking basic necessities of life. President of South Africa, Thabo Mbeki said in opening speech of World Summit on Sustainable Development in 2002, “A global human society based on poverty for many and
prosperity for few, characterized by islands of wealth, surrounded by sea of poverty is unsustainable.” The poverty is considered as a big agent for environmental degradation.

1.3.5 Is Sustainable Development Truly Possible on Earth?

Mega-hydropower projects generate valuable electricity which provides huge economical benefits to societies but on other hand indigenous people are disturbed along with destruction of wildlife cum poisoning of local ecosystems due to such prosecutions. So sustainable development is a complex phenomenon at large and it requires research oriented debates at great scale all over the world.

1.3.6 Principles for Universal Ethics Rights, Values and Obligations

Plato and Kant assert that fundamental principles of ethics are universal, unchanging and eternal. The great Greek philosopher Socrates said around 2500 years back “What is the good life? How ought we, as moral beings, behave?” It is base of environmentalists because they believe that human beings should care the world around them and it is possible only through great moral values.

1.3.7 Environmental Protection on the Basis of Religious and Cultural Values

Dr Abubakar Ahmed Bagader, a famous Islamic scholar said, everything in the universe has value and purpose. “God’s wisdom grants human beings stewardship (khilafah) on the earth ... As such man is only a manager of the earth and not a proprietor; a beneficiary and not a disposer or ordainer ... He is thus entrusted with its maintenance and care, and must use it as a trustee.”

The Biblical injunction, “Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth” (Genisis 1:28).

1.3.8 Environmental Justice: Racism and Across Boarders dumping

Environmental justice means the combination of civil rights with protection of environment to create safe, healthy and rich of life atmosphere for all living things globally. Racism is difference in behaviours between ‘white and black’ on earth due
to which environmental hazardous are emerged at local, national and international levels. The Environmental Justice Act was established in 1992 in the United States of America to protect communities from dangerous effects of chemicals and toxins.

1.3.9 Conservation of Pragmatic Resources

Earth is enriched by pragmatic resources which are precious to utilize by human beings for various purposes. But conservation of pragmatic resources is very challenging for engineers and scientists. The national and international politics is also involved in this sensitive issue but still living things are not in a position to get benefits without violating environmental protection laws.

1.3.10 Global Concerns for Modern Environmentalism

The environmentalists believe that roots of modern environmentalism are very deep by relating it in history. King Edward I of England warned to hang anyone found burning coal in London due to which acrid smoke was produced in 1273. The plantation of sweet smelling trees in London was suggested by English diarist John Evelyn to minimize effects of noxious air pollution caused due to coal fires and factories in 1661. The national fog and smoke committee was formed in Britain in 1880 to counter dangerous smog attacks. In 1962, Rachel Carson wrote *Silent Spring* to aware people regarding air pollution and toxic chemicals.

1.3.11 Why Study Environmental Science?

Environment is being degraded at fast rates and resources are being consumed at unsustainable rates which is highly alarming situation. Biodiversity is disappearing at fast pace during the last few centuries and many species have extinct. The destruction of ancient forests to utilize wood for furniture, tissues & paper and pollution in rivers & lakes due to wastage of factories & untreated sewage is being done sharply without taking safety measurements. The global climate observes to be changing to a new system that could have catastrophic consequences.

1.3.12 Critical Thinking: Act as a Catalyst for Studying Environmental Science
Critical thinking may lead towards methodical approaches of formal logic and systematic sharing of senses. Critical thinking also invokes characters like courage, sensitivity, humility and empathy. Intelligent opinions may be developed apropos of complex issues of environmental dilemmas. So by following the patterns of continuous training of sportsmen, the ecological problems can be handled at local, national and international levels.

1.4 Model Questions

Q. 1 What is preservation and conservation from moral and aesthetic aspects?
Q. 2 How is sustainable development possible on earth in true sense?
Q. 3 Why is critical thinking important to study environmental science?

1.5 Assignments

1.5.1 The Environmental issues are becoming very popular in discussions of intellectuals in present era and numerous researches are being done to fetch some solutions for such dilemmas which are national cum international. Bring into light some emerging environmental dilemmas in Pakistan to shape sharply current environmental agenda.

1.5.2 The Environmental Science is a vast subject by having huge depth in its understanding; moreover, the Environmentalists believe that it is combination of all basic sciences like Physics, Chemistry, Biology, Geology, Statistics etc. It is very important to differentiate anthropocentrism, utilitarianism, biocentrism and eco-feminism at level of local settings.

1.6 Recommended Books/Materials

1.7 Advance Organizer

The Unit 2 consists of concepts of Fundamental Elements of Life and Inter-relationship of different species with ecosystem. Moreover, survival of different species on earth is going to be studied alongwith lifestyle of different species. Further the central concept of Ecological Niche is going to be discussed. The learners are going to be given orientation regarding properties of communities also.

SECOND MODULE:

LIFE PROCESSES AND INTERACTIONS OF SPECIES

2.1 Objectives of the Module:

2.1.1 To identify the fundamental elements of life on earth and their relation in terms of energy for the survival on planet.

2.1.2 To highlight the importance of ecosystems and its association with other parts for maintaining balance on earth.

2.1.3 To bring into light the most important phenomenon of material cycles and their impacts on life processes.

2.1.4 To study species interaction with biological communities and relevant concepts of productivity alongwith diversity.

2.1.5 To point out properties of community at different levels from the perspective of environmental awareness.

2.1.6 To realize the significance of success of Ecological conservation for the bright future of coming generations.

2.2 Learning Outcomes:

2.2.1 The students will be able to identify fundamental elements of life on the earth and their relation with energy to survive.

2.2.2 The learners will be able to understand ecological pyramids by identifying relation of energy process with life globally.

2.2.3 The students will be able to comprehend the most important role of material cycles with life cycles.
2.2.4 The learners will be able to relate connectedness of species with each other and their relation with diversity and production.

2.2.5 The learners will be able to comprehend the complex concepts of community properties and their impacts on environment.

2.2.6 The students will be able to study phenomenon of ecological niche and its succession with passage of time.

2.3 ASPECTS OF AWARENESS:

2.3.1 Identification of Fundamental Elements of Life

The fundamental properties of matter and energy are essential to understand for studying the complex phenomenon of life on earth. Everything on earth that occupies space has mass and is defined as matter. Generally, matter is divided into three states that are solid, liquid and gas. The best example is water to explain this concept. As water is liquid but when solidifies as ice it becomes in solid state and when water boils then vapours are gaseous form. Matter never disappears but it can be transformed from one state to another.

2.3.2 Important Types of Energy and their Qualities

Energy is defined as ability to do work such as movement of matter from one place to another. Energy is of many types in organisms like kinetic energy, potential energy, chemical energy, solar energy etc. Energy is described by heat formation also in different objects as heat flows from high temperature body to low temperature body. The concept of heat is very interesting such as an area having very low temperature below freezing point but keeping a high heat content.

2.3.3 Relation of Energy with Life: Solar Energy and Photosynthesis

The life process of all organisms on earth depends upon solar energy. The temperature of earth is reasonably moderate as compared to temperature of other planets in a solar system either some are very hot while some are very cool so survival of species is impossible. Photosynthesis is a process in which chlorophyll captures sunlight to transform into high energy form for food production of plants. On other hand animals have components for cellular respiration to get energy for their life processes.
2.3.4 Relation of Species with Ecosystems: Ecological Pyramids, Trophic Levels, Food Webs and Food Chains

Food chain is an interesting phenomenon but its concept is very important for explaining the principle of conservation of Ecology globally. Herbivores eat plants only, carnivores eat flesh while omnivores eat both plants and flesh. Ecological pyramid is explained as arrangement of organisms in a food chain to create a food web which is broad based representation of producers and consumers in a trophic level.

2.3.5 Relation of material cycles with life processes:

The Hydrological cycle, the Carbon cycle, the Nitrogen cycle, the Sulphur cycle and the Phosphorus cycle The continuous cycling process between abiotic (non living) and biotic (living) organisms is maintained by regulating the material cycles. The circulation of water through our environment is regulated by hydrological cycle. The carbon cycle is highly important because release of carbon through biological accumulation is a primary factor in climate regulation. The importance of Nitrogen cycle is related with enrichment of soil and fertilizing process across the globe. The Phosphorus cycle is responsible to control algae growth and population of photosynthetic bacteria which is essential for ecosystem stability. The Sulphur cycle is important to maintain atmosphere visibility, vegetation and reduction in damaging buildings.

2.3.6 Identification of species on the planet: Where they live? How species survive? Why to understand the living style of species?

The environmentalists believe that environment has both limits that is maximum and minimum conditions to flourish survival for species. It is called Tolerance Limits for species. Beyond this limits the life is not possible on earth.

The multiple species survive according to natural environment. The ecosystem as a Whole is composition of different species in a particular area to set the natural
environment of a particular region.

2.3.7 The Ecological Niche is the backbone to study survival of species:
Exploitation, Predation and Parasitism: Symbiosis
The particular role of species in a biological community or distribution of
species according to set of environmental factors is called Ecological Niche.
Every organism needs feed to survive. Producers make their own food as they take help
through photosynthesis process but consumers fulfil their food requirements from
producers. Symbiosis is the concept of living of two or more species together in a
particular environment by giving apparent benefits to one specie.

2.3.8 Properties of Communities: Productivity and Diversity cum Abundance
Primary Productivity is known as property of community which is defined as the amount of energy left in the system after respiration. Abundance is the total number of a single specie in a particular biological community while diversity is the total number of species present specific ecosystem. The abundance and diversity are related strongly to climate and history of a particular region. Further reliability of resources also play important role in productivity of species.

2.3.9 Concepts of Connectedness and complexity: Stability and Resilience with Boundaries and Edges
The number of species survive in each trophic level is called Complexity
while dependence of species upon each other in a specific ecosystem is termed as
Connectedness. The Stability is the tendency of a particular ecosystem to remain in
A natural state for a long time while Resilience is the tendency to repair the
Ecosystem after damage by external factors. The boundaries are divisions among
multiple ecosystems across the globe.

2.3.10 Ecological Succession as Transition of Communities

Ecological Succession is divided into two types that is Primary and Secondary Succession. Primary Succession is the development of biological community new site like an island or a body of water on a place which was unoccupied previously. On the other hand Secondary Succession is the growth of biological community after disruption of previous community in a particular site. The process of environmental modification within ecosystem by biological communities is termed as Ecological Development.

2.4 Model Questions

Q. 1 What are fundamental elements of life on earth and their inter-relationship with energy?

Q. 2 How many material cycles exist on earth and their importance for maintaining life cycle?

Q. 3 Why Ecological Niche is called backbone to study for the survival of species globally?

2.5 Assignments:

2.5.1 The material cycles are five in number and having the key position in maintaining the regulatory process of the climate but due to human activities during the last three centuries the material cycles are under destruction in majority parts of the world especially in developing areas. Highlight the ways to safe material cycles from destruction in Pakistan.

2.5.2 The successful maintenance of Ecology is a great challenge as a human being right from beginning of life on earth and still the struggle is underway as complete victory is far ahead but a huge difference is observed for conserving Ecology in numerous areas globally. Point out connectedness and complexity of properties of community at local settings.

2.6 Recommended Books/Materials:


2.7 **Advance Organizer:**

The Unit 3 consists of concepts of ecosystems of fresh water, lakes and wetlands along with their natural tendency to sustain for long time. Moreover, disturbance of natural sustainability by human activities is going to be highlighted. Further the central concept of population growth dynamics is going to be discussed. The learners are going to be given analysis of population differences.

**THIRD MODULE:**

**GLOBAL PATTERNS OF LIFE AND POPULATION GROWTH DYNAMICS**

**3.1 Objectives of the Module:**

3.1.1 To study the ecosystems of fresh water forests and marine and their natural tendency to sustain for long time.

3.1.2 To highlight interrelationship of main streams of ecosystem and escalation of different types of forests.

3.1.3 To study the sort of human activities which cause disturbance in natural sustainability at domestic levels.

3.1.4 To comprehend the main concepts of factors of population growth which are responsible for population measurement.

3.1.5 To summarize the population growth dynamics and the population increase and decrease factors.

3.1.6 To investigate the analysis of population differences that is meta populations and local level conservation genetics.

**3.2 Learning Outcomes:**

3.2.1 The learners will be able to develop concepts regarding ecosystems of fresh water, forests and deserts.

3.2.2 The students will be able to learn the development of forests in main streams of different ecosystems.

3.2.3 The students will be able to investigate human activities which cause disturbance to local ecosystems.
3.2.4 The students will be able to comprehend the factors of population growth in their locality or community.

3.2.5 The learners will be able to find out the dynamics of population growth and factors due to which population increases or decreases in a particular region.

3.2.6 The learners will be able to analyze population differences and comprehending the dimensions of regulatory factors of population growth.

3.3 ASPECTS OF AWARENESS:

3.3.1 Ecosystems of Fresh Water: Lakes and wetlands: Natural Tendency to Sustain

Local environments are considered unique but they are discussed under umbrella of general groups according to growth patterns. The environmental patterns are divided into grasslands, wetlands, fresh water, deserts, tundra and forests etc. The growth patterns of diverse biological communities in a specific ecosystem are called Biomes. Each environmental pattern has natural tendency to sustain.

3.3.2 Terrestrial Biomes: Tropical Moist Forests: Tropical Seasonal Forests: Desert

Tropical Moist Forests: Tropical Seasonal Forests: Desert

Conifer Forests: Rich Fruits Forests in Majority Areas of Pakistan

To understand the concept of environmental patterns it is important to know the growth types of forests on the earth. Tropical moist forests are found in warm regions where average rainfall per year is recorded around 80 inches. The conifer forests can grow in highly cool regions around the world. Tropical seasonal forests are found in areas where heavy rainfall is recorded throughout the year. A rich quantity of fruit trees are grown in Pakistan so a variety of fruits are available throughout country during the year.

3.3.3 Ecosystems of Marine: The Natural Sustainability of Oceans and Shallow Coasts

The diversity is present in biological communities of seas and oceans. The deserts are named in open oceans where productivity level of biological communities is considered low. Islands are pieces of lands surrounded within water of seas and oceans. The environments of islands have a big impact on the marine life. The coastal regions on the bench of seas and oceans also have rich diversity of biological communities.

3.3.4 The Disturbance of Natural Sustainability by Human Activities
Natural sustainability is being disturbed day by day by human activities all over the world. Human beings are most dominated elements of ecosystems and due to their actions the stability of ecosystems are being damaged. Natural habitat is being converted to human utilizations which is biggest cause of loss of biodiversity. Temperate and tropical rainforests, temperate grasslands and many islands are being ecologically destroyed due to careless and ignorant attitude of human beings.

3.3.5 Population Growth Dynamics: Exponential Growth, Biotic Potential, Irruptive Growth and Population Oscillations

Constant rate of increase in growth of species per unit of time is called Exponential Growth. Its mean the increase in population of any specific specie increases the net population with the passage of time. The maximum reproductive rate of individual organisms is termed as Biotic Potential. The explosion in population followed by crash in population is called Irruptive Growth. The rapid increase in population of any specie in a particular time followed by rapid fall due to catastrophe is termed as Population Oscillation.

3.3.6 Discuss factors due to which populations increase or decrease: Fertility, Natality, Fecundity: Immigration and Emigration: Mortality and Survivorship

Fertility is a measure of the actual number of offspring produced. Natality is the production of new individuals by birth, germination, hatching and cloning, moreover, it is main source to increase biological populations. Fecundity is the physical ability to reproduce. Emigration is the movement of members out of population and it is one of major factor of reducing population in a particular region. Mortality is the death rate of a specific region and it is determined by dividing the number of people die in a certain time period by the number of alive people.

3.3.7 Population Growth is Regulated by Factors: Density Dependent and Density Independent Factors

Density Dependent factors tend to reduce population size by increasing mortality or decreasing natality. Factors that affect natality or mortality independently of population density tend to be abiotic components of the ecosystem.
3.3.8 Analysis of Population Differences: Metapopulations: Conservation Genetics

Long term survival of endangered and rare species is discussed under the headings of analysis of population differences. For example, the survival of lions and elephants across the world is a great challenge for environmentalists. Metapopulation is a gathering of population that have habitual or intermittent gene surge between geographically separate units. The recovery of endangered species from extinction is possibly by using the concepts of Conservation Genetics.

3.3.9 The Ground Realities in Population Growth in Pakistan: Overview upon both sides of the Picture

The human population growth is fast in Pakistan which is declared as one of top Ten countries in the world. Due to rapid population growth during the last four decades,

The Pakistan is under a big threat of environmental degradation especially threatening survival of many species. Mortality rate is high as many external factors are responsible due to density dependent and independent factors. The rate of emigration is recorded as to consider one of the major factors of population difference in the country.

3.4 Model Questions

Q. 1 What are ecosystems of freshwater, lakes and wetlands alongwith their tendency to sustain?

Q. 2 How is natural sustainability disturbed by human activities globally?

Q. 3 Why dynamics of population growth are considered to regulate on prior basis?

3.5 Assignments:

3.5.1 Diversity in ecology is very vast subject and its identification is challenging at local level settings, moreover, the sustainability of ecological diversity is very sensitive in domestic settings. The environmentalists consider it a momentous task but as a potential teacher elaborate your steps in detail to mobilize working locality for sustaining ecological diversity.

3.5.2 The population growth is big issue in the world and particularly for the developing countries; moreover, the environmentalists believe that numerous ecological issues are the result of over population in poor regions. As the
population is being tried to control globally, explore the strategies of a stable population growth by identifying factors in local community.

3.6 **Recommended Books/Materials:**


3.7 **Advance Organizer:**

The Unit 4 consists of concepts of demography of population growth and in comparison its opposing factors. Moreover, future of human population is going to be studied along with family planning and family control phenomenon. Further the central concept of Environmental Healthy is going to be discussed. The learners are going to be given awareness regarding hazardous effects of toxins globally.

**FOURTH MODULE:**

**Relationship of Human Populations with Environmental Health**

4.1 **Objectives of the Module:**

4.1.1 To recall the history of growth of human population and find out demographic factors at domestic levels.

4.1.2 To understand important concepts of life expectancy, women’s literacy, infant mortality and standards of living globally.

4.1.3 To draw comparisons between old and modern social approaches towards population regulatory methods.

4.1.4 To identify causes of major environmental diseases and routine activities of public responsible for such diseases.

4.1.5 To quote valid examples to highlight harmful effects on human health due to damage environment.
4.1.6 To determine the comparison between risk assessment and risk acceptability of environment.

4.2 Learning Outcomes:

4.2.1 The learner will be able to trace the growth rate of human population historically and demographic factors in local area.

4.2.2 The students will be able to interrelate the concepts of life expectancy, rights of women, infant mortality and living standards of people globally.

4.2.3 The learners will be able to compare between family planning and control rates between traditional and modern societies.

4.2.4 The students will be able to identify cause of environmental diseases due to infectious organisms.

4.2.5 The learners will be able to assess the harmful effects on human heath due to environmental hazardous globally.

4.2.6 The students will be able to evaluate major environmental risks by determining risk assessment and risk acceptability.

4.3 ASPECTS OF AWARENESS:

4.3.1 History of growth of Human Population

It was guess that human population were 50 million around 5000 B.C. The human population were started to record after 1600 A.D. Moreover, a rapid growth was recorded all over the world due to which a billion people were counted in 1804. In a span of 150 years, the population were figured out 3 billion in 1960. Astonishingly, from 1960 to 1972 the population reached 5 to 6 billion. At the start of 21st century the human population have been counted nearly to 7 billion.

4.3.2 Demography of Human Population:

4.3.2.1 Fertility and Birth Rates
The fertility rate is known as the average number of babies born by women in a particular region during total reproductive life.

4.3.2.2 Mortality and Death Rates
Mortality rate is termed as number of deaths per thousand persons in a specific region during any given year.

4.3.2.3 Life Span and Life Expectancy
Life expectancy is expressed as the average age of an individual at death time in a specific society or it is average age of a person to spend time after born in the world.
4.3.2.4 Emigration and Immigration
The 800,000 people immigrate every year to America from many countries in the world. The developed European countries receive around 200,000 applications for immigration per year from poor countries.

4.3.3 Opposing factors in population growth:
4.3.3.1 Pressures of reduction in birth
It is phenomenon in which pressures to reduce birth rate is analysed. The pressures in developed countries are observed more than developing countries because parents wish to take responsibility to every child for quality life.

4.3.3.2 Ratio of Birth and Death
The birth rate is being observed well below two babies per couple in developed countries due to which population level is falling from last few decades.

4.3.3.3 Pronatalist Pressures
It is desires of people to have many children in the family. The concept of big family is very popular wish in large part of the world especially in poor countries.

4.3.4 Demographic Transition:
4.3.4.1 Population and Development in a Society
Food shortage, lack of sanitation, malnutrition, air pollution, water contamination and road accidents increase rate of deaths and decrease rate of birth in a society.

4.3.4.2 A Comparison between Optimistic view and Pessimistic view
Some experts argue that population control is essential to provide quality of life all over the world but on other hand it is expressed that use of advance technologies is a big source to handle misery in life.

4.3.4.3 A Comparison between Social Justice and an EcoJustice
Social justice means the provision of fair share of facilities to everyone in the world but on the other hand Ecojustice means the care of other creatures also while facilitating human population.

4.3.4.4 Fertility Rate and Rights of Women
The care of women should be at prior during the pregnancy phases. For this purpose medical care and healthy nutrition should be provided to every woman in the world.
4.3.5 Family Planning and Family Control:

4.3.5.1 Traditional Ways of Fertility Control
Women breast feed children for three to four years which is one of the methods for birth control. Abortion, folk medicine and infanticide are also in practice.

4.3.5.2 Present Methods for Birth Control
The present methods are easier and safer for birth control. The current methods of abortion are also having fewer side effects.

4.3.5.3 Advance Methods in Birth Control
The five new products have been introduced in the market to control birth rates and they all are useful in terms of health of individuals.

4.3.6 Human Population Future
The professionals estimate that world population can reach to nine billion in 2050. Further it can exceed to 25 billion in 2150 but important thing is to control the birth rate by using effective methods globally.

4.3.7 Considerations of Environmental Health

4.3.7.1 Diseases Burden on Earth
The major diseases in the world are cardiovascular, liver failures, renal failures, breast cancer etc. due to which millions of people die each year.

4.3.7.2 Emergent and Infectious Diseases
Measles, malaria, tetanus, respiratory illness, diarrhea etc. are major infectious diseases which cost life of above 10 million children each year.

4.3.7.3 Funding for Health Caring
Huge funds have been donated for the purpose of health care by developed countries to spend in poor countries. The leading donor is United States of America.

4.3.7.4 Ecological Diseases
The evidences have been noticed that animals and trees suffer in dangerous diseases due to environmental degradation across the globe which is serious threat to planet survival in coming decades.

4.3.7.5 Antibiotic and Pesticide Resistance
Antibiotics are considered as strong agents to resist against serious illnesses. The use of antibiotics should be completed according to doctor advice.
4.3.8 Presence of Toxins (Hazardous Chemicals) in the Environment: The Movement and distribution of Toxins in the Environment and Living Organisms

It should be kept in mind that all toxins are hazardous to health but all hazardous materials are not toxic. These chemicals must be handled very carefully to avoid harmful effects in daily activities. Toxins play an important role in the diet also as amount of toxins in crops is very much related with health factor of humans alongwith other living things.

4.3.9 Methods to Minimize the Effects of Toxins: Metabolic Degradation and Excretion

The effects of toxins can be minimized by reducing sprays on crops. The intake of toxins should be reduced to minimize their harmful effects in the body. The liver, stomach, intestine or kidneys often suffer damage due to presence of toxins in the digestive system. The presence of toxins in the body is a big reason of suffering in cancer diseases so awareness is foremost to keep society healthy and safer.

4.3.10 Toxins Measurement:

4.3.10.1 Animal Testing

Animal testing is a process which is based on environmental health hazards and public policies about pollution.

4.3.10.2 Toxicity Ratings

It is dose of toxins at single time to be taken by any individual which should be controlled according to nature of chemical.

4.3.10.3 Acute Versus Chronic Doses and Effects

Toxins effect in acute manners in some cases which causes immediate health crises. When the effects are expected to be permanent then chronic effects can be seen which are permanent.

4.3.11 Understanding Risks Involvement and Risks Acceptance

The scientific process through which hazardous pose to people health are estimated is called risk assessment. The nature of risks varies depending on the ground realities so its process to handle is different in different situations.

4.3.12 The Presence of Hazardous Chemicals in the Environment in different parts of Pakistan: A Serious Concern to be addressed soon

Pakistan is one of the countries globally in which use of toxins is high while the level of awareness is very popular to care regarding toxicity. The
understanding of risk involvement is very important but still no heed is being given to such sensitive issues. The campaigns should be launched to aware people at doorsteps in the country to keep Pakistani society vigour.

4.4 Model Questions

Q. 1 What is demography of human population and its relationship with developments in the society?

Q. 2 How is environmental health effected by different malpractices across the globe?

Q. 3 Why animal testing and toxins are considered poison for quality of life?

4.5 Assignments:

4.5.1 Achievements in modern life with the help of technological advancement in the fields of agriculture, medicine, industry, engineering, sanitation, have made it possible to support people thousand times which was not possible 50 decades ago. Do you agree that present technological development is possible to carry on with same momentum without violating Ecological sustainability?

4.5.2 Healthy life style is a burning issue which is undergoing now days in the electronic media and debates are being done to suggest strong tips for healthy life style which is broad subject from the perspective of Environmentalists. Do you believe that by making habits of healthy eating is beneficial in dual manners as it is possible to save kitchen expenses also?

4.6 Recommended Books/Materials:


4.7 Advance Organizer:

The Unit 5 consists of concepts of hunger, food security, mal-nutrition and need of balance diet in the life of individuals. Moreover, major sources of food are going to be studied alongwith agriculture resources around globe. Further the central concept of Genetic Engineering is going to be discussed. The learners are going to be given understanding regarding use of pesticides and its harmful effects on human health.
**FIFTH MODULE:**

**FOOD, NUTRITION, AGRICULTURE AND GENETIC ENGINEERING**

5.1 Objectives of the Module:

5.1.1 To indicate major nutritional requirements for humans globally and its match up under local settings.

5.1.2 To point out the danger effects of land degradation and its strong link with water logging, nutrition depletion and Salinization.

5.1.3 To highlight the advantages and disadvantages of modern concept of genetic engineering and its application in Pakistan.

5.1.4 To outline the methods of using pesticides and their benefits cum harmful effects in production of crops.

5.1.5 To investigate the alternate ways of pest control all over the world in the light of modern researches.

5.1.6 To throw light into options of developing organic farming in Pakistan by pointing out its gigantic benefits for humanity.

5.2 Learning Outcomes:

5.2.1 The learners will be able to understand the need of healthy food and important nutrients which are essential for human in the diet.

5.2.2 The students will be able to search the factors of shortage of food globally due to land degradation and Salinization.

5.2.3 The learners will be able to explore the emerging concept of genetic engineering by drawing a comparison between its advantages and disadvantages.

5.2.4 The learners will be able to draw inferences regarding using of pesticides to control pests in crops production.

5.2.5 The learners will be able to learn the methods to reduce use of pesticides to save the crops from hazardous agents.

5.2.6 The student will be able to gain knowledge of the prosperous effects of organic farming in local settings.

5.3 **ASPECTS OF AWARENESS:**

5.3.1 Food and Nutrition
5.3.1.1 Chronic Hunger Globally and Food Security
5.3.1.2 Acute Food Shortages in the World
5.3.1.3 Mal nutrition and Obesity
5.3.1.4 Need to Eat a Balanced Diet

5.3.2 Major Sources of Food
5.3.2.1 Major and Minor Crops
5.3.2.2 Meat and Dairy Products
5.3.2.3 Sea Food Availability

5.3.3 A renewable resource is soil: Composition, Organisms in soil, its types and profiles
5.3.4 Water, Fertilizers and Energy are Major Agricultural Resources
5.3.5 Emerging New Crops with the Help of Genetic Engineering
5.3.6 Methods to Control Pests and Use of Pesticides
5.3.7 Analyses of Benefits of Using Pesticides but Harmful Effects of Pesticides also by Spraying on crops
5.3.8 Alternative Ways to Delete Pesticides Use Presently and Need to Reduce Exposure of Pesticides in Crops
5.3.9 Latest Picture in Pakistan regarding Use of Pesticides and Availability of Alternates to Reduce Use of Pesticides:

5.4 Model Questions
Q. 1 What is food and nutrition: A relationship between hunger and malnutrition?
Q. 2 How major agriculture resources are essential to maintain in a natural way?
Q. 3 Why use of pesticides is advised to remove urgently from crops?

5.5 Assignments:
5.5.1 Genetic Engineering is very popular in developed countries from the last four decades and getting transformation to developing countries rapidly alongwith benefits and its harmful effects. Under such circumstances discuss the role of genetic engineering in green revolution globally. Further launch a debate on topic either genetic engineering is safe or not.
5.5.2 Human health is most sensitive aspect for nutritionists and it is linked with agricultural health also globally. The Environmentalists believe that healthy nations are possible only by cultivating crops free of toxic agents. Sustainable agriculture with low input is dynamic concept globally. Discuss its
possibilities in Pakistan further tell the prospect of organic farming in Pakistan.

5.6 Recommended Books/Materials:


5.7 Advance Organizer:

The Unit 6 consists of concepts of formation of Biodiversity and its ecological cum cultural benefits. Moreover, threats to damage Biodiversity globally is going to be studied alongwith options to protect it. Further the central concept of “Earth as amazing planet having rich resources” is going to be discussed. The learners are going to be given knowledge regarding geological hazardous like volcanoes and earthquakes.

SIXTH MODULE:

BIODIVERSITY AND GEOLOGY

6.1 Objectives of the Module:

6.1.1 To report on the total number of living species globally and their relative distribution on different parts of earth.
6.1.2 To summarize the benefits of diversity for humans and causes of loss of biodiversity due to human actions.
6.1.3 To propose ways to protect endangered species through long term comprehensive planning of preserving biological recourses.
6.1.4 To understand basic geological principles and subsequently their effecting conditions for life on earth.
6.1.5 To investigate about mineral process and consequently the harmful effects of mining on environment.
6.1.6 To recognize hazardous of earthquakes, volcanoes and tsunamis during the last few decades due to human actions.

6.2 Learning Outcomes:

6.2.1 The learners will be able to develop insight about distribution of species and their roles on the earth.
6.2.2 The students will be able to understand the ways of preserving biodiversity during daily life activities.
6.2.3 The learners will be able to follow steps in their daily life routines to preserve biological resources.
6.2.4 The students will be able to understand formation of rocks and minerals along with changes geologically.
6.2.5 The learner will be able to understand concepts of mining processes and their harmful effects on environment.
6.2.6 The students will be able to know about natural catastrophes on the earth during the last century due to environmental degradation.

6.3 ASPECTS OF AWARENESS:

6.3.1 The Concepts of Biodiversity and the Species: The Basic Concept of Biodiversity:
What Type of and How many Species are?

6.3.2 The Biodiversity is Beneficial from Multiple Dimensions:
6.3.2.1 Ecological Benefits of Biodiversity
6.3.2.2 Cultural and Aesthetic Benefits of Biodiversity
6.3.2.3 Rich Sources of Foods, Drugs and Medicines

6.3.3 The Factors that Create Threats to Damage Biodiversity

6.3.4 The Protection of Diversity and Steps to Save Endangered Species:
6.3.4.1 The Laws for Hunting, Fishing and Protection of Endangered Species
6.3.4.2 International Wildlife Treaties
6.3.4.3 The Acts for Private Land and Critical Habitat Protection

6.3.5 Plans for Survival of Species to Save Rare Species in the World

6.3.6 Earth: A dynamic planet:
6.3.6.1 Formation of Rocks and Minerals
6.3.6.2 Availability of Metals, Non-Metal Resources and Mineralogy

6.3.7 The Processes of Extraction of Recourses from Earth’s Surface and its Environmental Effects like Mining Process

6.3.8 Conservation of Geological Resources: Recycling of Steel and Iron and Substituting New Materials for Old

6.3.9 Geological Hazards: Volcanoes and Earthquakes

6.3.10 The Threats to Biodiversity in Pakistan: Need Urgent Concentration

6.4 Model Questions

Q. 1 What are ecological benefits of diversity and their effects on culture?
Q. 2 How local biodiversity can be protected to save rare species in a region?
Q. 3 Why conservation of geological resources is related strongly with environmental health all over the world?

6.5 Assignments:

6.5.1 The Biodiversity is a very sensitive aspect from the conservation and preservation point of view of Ecological assets globally but it is considered a hard-hitting challenge to maintain Biodiversity at its natural trend. Explore the concepts of biodiversity and steps towards ecological stability and the products of endangered species should be boycotted globally.

6.5.2 The extraction of minerals from rocks is a famous engineering from last century and huge amount is being invested globally in it, further it is a source of creation of big labour market. Highlight the harmful effects of mining and give opinion regarding the mining laws that should be implemented under the treaties of environmental protection in Pakistan.

6.6 Recommended Books/Materials:


6.7 Advance Organizer:
The Unit 7 consists of concepts of fundamental themes of forests and their management regarding preservation cum conservation. Moreover, dangerous aspect of land degradation is going to be studied along with need of land reforms at local settings. Further the central concept of Preservation of Nature and Development of Parks is going to be discussed. The learners are going to be given information regarding management of ecosystems at local cum national settings.

SEVENTH MODULE:

PRESERVATION AND CONSERVATION OF NATURE:
FORESTS AND LAND USE

7.1 Objectives of the Module:

7.1.1 To discuss the impacts of human activities on forests and grasslands and requirement of administrative steps for protection.

7.1.2 To highlight the importance of forests in different ecosystems from the historical perspective in the world.

7.1.3 To explain harmful effects of overgrazing and recognize the rights of indigenous people for the protection of ecology.

7.1.4 To study the importance of management of ecosystems within the jurisdiction of their originality.

7.1.5 To recognize the need of parks in the modern societies and also save wildlife in the broader sense also.

7.1.6 To evaluate the need of resources to restore ecosystems according to their natural mode in respective ecological pyramid.

7.2 Learning Outcomes:

7.2.1 The learners will be able to understand the importance of forests in the country and their impacts in respective societies.

7.2.2 The students will be able to learn the management policy of forests for sustainability in the country.

7.2.3 The learners will be able to recognize the rights of indigenous people in the respective communities.
7.2.4 The students will be able to identify the elements of existing ecosystems in their respective surroundings.

7.2.5 The learners will be able to realize the importance of building and maintaining parks in the colonies.

7.2.6 The students will be able to know the ways of restoring damage ecosystems according to their natural potential.

7.3 ASPECTS OF AWARENESS:

7.3.1 Forests Theme Globally:

7.3.1.1 Covering Land Area of Forests in the World

7.3.1.2 Benefits of Forests

7.3.1.3 Management of Forests: An Overview in the Developed Countries

7.3.1.4 Tropical Forests: The Concepts of Diminishing and their Protection: Logging and Land Invasions


7.3.2 Forests Sustainability:

7.3.2.1 Administrative Steps for Protection of Forests: An International Overview under Charter of United Nations

7.3.2.2 Fire Management Policy for protection of Forests

7.3.3 Grasslands: Land degradation and Overgrazing, Forage Conversion by Domestic Animals, Harvesting Wild Animals and Rotational Grazing

7.3.4 Land Reforms in a State and Ownership Rights on Lands

7.3.5 Preservation of Nature and Importance of Parks

7.3.5.1 History of Parks and their Need in Communities

7.3.5.2 Hindrances in Building new Parks and Maintaining Existing Parks

7.3.5.3 Importance of Wildlife in Parks

7.3.6 Preservation of Functioning of Ecosystems, Landscapes and Wilderness: Preserving Wildlife Internationally and Fundamental Rights of Indigenous Communities

7.3.7 Ecological Restoration by Preservation of Services of Ecosystems:
7.3.7.1 Does Nature Heal itself?
7.3.7.2 Tools of Ecosystems Restoration
7.3.7.3 Creating Artificial Ecosystems
7.3.7.4 Wetlands and Food Plains
7.3.8 Management of Ecosystems: History, Principles and Goals of Ecosystems Management: Conflicting Views on Restoration of Ecology and ecosystems Management
7.3.9 Reduction of Forests and Land Use: An Alarming Situation in Pakistan

7.4 Model Questions

Q. 1 What are different types of forests and their respective sustainability?
Q. 2 How parks contribute towards healthy life style in towns and cities?
Q. 3 Why reduction of forests globally is a serious threat to many environmental hazardous?

7.5 Assignments:

7.5.1 It has been observing throughout the world from the last few decades that the extensive uses of lands for agriculture have changed the scenario. Due to reduction of forests, regulating climate, providing food and shelter for wildlife purifying air and controlling water is disturbed globally. Launch an extensive discussion upon such sensitive issue.

7.5.2 The Real Estate business is most popular now a day in the world and accommodating huge manpower. New colonies and industrial states are being built on the cost of loss of beautiful and remarkable ecological areas. Should they continue? Is it possible any solution feasible for both sides that is builders and ecologists keeping in view the national interests?

7.6 Recommended Books/Materials:


7.7 Advance Organizer:

The Unit 8 consists of concepts of climate formation, weather changes, movements of wind across various regions and phenomenon of raining. Moreover, a
trend of global climate change is going to be studied due to various human activities. Further the central concept of Air Pollution is going to be discussed. The learners are going to be presented orientation apropos of poisonous effects of Air Pollution.

EIGHTH MODULE:

THE CLIMATE: WEATHER, AIR AND POLLUTION:

8.1 Objectives of the Module:

8.1.1 To understand the composition of the atmosphere and determine weather system in local settings.

8.1.2 To describe the cause of rains and storms and natural temperatures at different parts of the earth.

8.1.3 To comprehend the causes of rapid climate changes across the globe and massive blow is only due to human activities.

8.1.4 To highlight the major sources of air pollution and differentiate between conventional and unconventional air pollutants.

8.1.5 To understand the harmful effects of air pollution on human health, life of plants and building materials.

8.1.6 To discuss the methods for controlling air pollution to create “Free of Air pollution Areas” in local settings by studying reports and legislations.

8.2 Learning Outcomes:

8.2.1 The learners will be able to understand the concepts of formation of atmosphere and local weather settings in different types of areas across the world.

8.2.2 The students will be able to know the concepts of natural phenomenon of rains and storms according to natural environment across the globe.

8.2.3 The students will be able to convince society to overcome the factors of causing rapid climate changes.

8.2.4 The learners will be able to comprehend the factors of air pollution and to remove such hazardous activities from their routines.

8.2.5 The learners will be able to develop consensus to save society from health issues and vegetation.
8.2.6 The students will be able to take practical steps to make their respective locality as free of pollution to meet international standards.

8.3 **ASPECTS OF AWARENESS:**

8.3.1 The Study of Climate and Atmosphere: Moisture Conditions in a Place and Daily Temperatures: Long Term Weather Patterns

8.3.2 The phenomenon of “Green House Effect”

8.3.3 Atmospheric Pressure and Reason of Raining on the Earth

8.3.4 The Wind Movements Across the Globe: Influence on Climate Conditions by Warm and Cold Ocean Currents

8.3.5 Monsoon Weather Across the Globe

8.3.6 Frontal Weather and Cyclonic Storms (Hurricanes, Cyclones and Typhoons)

8.3.7 Changes in Weather in Present Era

8.3.8 Global Climate Changes: Catastrophes and Cyclones

8.3.9 Change in Climate Globally due to Human Activities

8.3.10 Evidences of Climate Changes in Current Period: Local, National and International overview

8.3.11 Natural Sources of Air Pollution

8.3.12 Air Pollution due to Human Activities

8.3.12.1 Primary and Secondary Factors

8.3.12.2 Conventional and Unconventional Factors

8.3.13 Effects of Air Pollution on Human Health, Plants Life and Acid Rain

8.3.14 The Methods to Control Air Pollution: Legislations and Negotiations

8.3.15 Comparison of Air Pollution Between Developing and Developed Parts of the World

8.4 **Model Questions**

**Q. 1** What is climate and weather: Movements of wind across the globe?

**Q. 2** How human actions are responsible for polluting air at local, national and international level?

**Q. 3** Why air pollution is worse in poor regions of the world in comparison to rich regions?

8.5 **Assignments:**
Climate change is a burning issue all over the world and uncertainty in climate change is a huge source of human disturbance globally. Moreover, the environmentalists are focusing to develop mechanisms for the reduction of air pollution at local levels. Suggest valid and reliable suggestions to overcome this issue in the light of international negotiations.

Air pollution is a threatening issue all over the world but still some cities in developed countries are considered as “Air pollution free”. Is there any possibility in near future to develop a plan of action for establishing capital city ISLAMABAD as “Free of Air pollution” like Auckland in New Zealand by taking key steps towards this goal.

### Recommended Books/Materials:


### Advance Organizer:

The Unit 9 consists of concepts of major sources of water on earth and need to maintain a balance in use of water budget during daily usage. Moreover, conservation of water management on earth is going to be studied along with depletion of ground water regionally. Further the central concept of Water Pollution is going to be discussed. The learners are going to be given awareness regarding importance of quality of water in human life.

**NINTH MODULE:**

**WATER: ITS USE, MANAGEMENT, SOURCES AND WATER POLLUTION:**
9.1 Objectives of the Module:

9.1.1 To understand the delivery of fresh water to terrestrial ecosystems and its balance overtime.
9.1.2 To describe the various important ways which are used for water consumption, withdrawal and its degradation.
9.1.3 To learn the methods to conserve water at local cum domestic level in the cities, towns or villages.
9.1.4 To define water pollution and appreciate the importance of clean water in the lives of people especially developing countries like Pakistan.
9.1.5 To delve into sources of ground water and highlight the methods to protect this precious asset all over the country.
9.1.6 To point out methods to reduce water pollution and its root causes at domestic level to improve quality of life.

9.2 Learning Outcomes:

9.2.1 The learners will be able to understand the importance of fresh water in their lives and its transfer to whole society.
9.2.2 The students will be able to know the methods of water consumption at domestic level and its proper management to withdraw.
9.2.3 The learners will be able to apply effective water conservation methods at their community level.
9.2.4 The students will be able to comprehend the presence of water pollution in their respective surroundings to handle it at their own level.
9.2.5 The learners will be able to launch efforts to convince local communities for protecting precious source of groundwater.
9.2.6 The students will be able to opt practically in their lives the steps towards use of pollution free society in their respective homes and colonies.

9.3 ASPECTS OF AWARENESS:

9.3.1 Major Sources of Water Across the Globe:

9.3.1.1 Oceans, Snow, Ice, and Glaciers:
9.3.1.2 Rivers and Streams: Ground Water
9.3.1.3 Ponds, Lakes and Wetlands: The Hydrologic Cycle

9.3.2 Need to Maintain Balance in Water Budget:
9.3.2.1 Regions of Availability of Plenty of Water
9.3.2.2 Regions Having Deficit of Water

9.3.3 The Use of Water According to Availability:
9.3.3.1 Types of Water Use: Domestic, Agriculture and Industrial Water Use
9.3.3.2 Types and Quantities of Use of Water
9.3.3.3 Difference in Level of Water Quantity Available among Countries all over the World

9.3.4 Fresh Water is a Precious Natural Source: Its Use and Management

9.3.5 Conservation of Water and Management:
9.3.5.1 Domestic Conservation and Watershed
9.3.5.2 Dams, Canals, Aqueducts and Reservoirs
9.3.5.3 Water Conservation through Recycling

9.3.6 Ground Water Depletion and Cost of Environment on Conservation of Water

9.3.7 Water Pollution and its Types:
9.3.7.1 What is Water Pollution?
9.3.7.2 Presence of Infectious Agents in Water
9.3.7.3 Organic and Inorganic chemicals in Fresh Water
9.3.7.4 Pollution in Sea Water

9.3.8 Quality of Water in Present Era: Comparison of Surface water between developed and Developing Countries: An Analysis of Ground Water Availability and supply of Drinking Water

9.3.9 Efforts to Control Over Water Pollution:
9.3.9.1 Reduction in Sources and Land Management
9.3.9.2 Human Waste Disposal

9.3.10 Legislations for Water Quality: The Clean Water Act

9.3.11 The Quality of Usable Water in Pakistan at Domestic Level: A Worrying Situation in most parts of Country

9.4 Model Questions

Q. 1 What are major sources of fresh water and availability level in different areas nationally cum internationally?
Q. 2 How quality of water is determined in local settings to develop healthy community?
Q. 3 Why usage of water at domestic level is called a big reason of its wastage?

9.5 Assignments:

9.5.1 Pakistan is one of country having reasonable availability of water due to monsoon season but due to lack of policies the management of water is poor all over the country. Discuss in a broad spectrum need of water conservation efficiently in cities, towns and villages and use of water effectively in houses to preserve it for future needs.

9.5.2 Pakistan is supposed to be one of the countries at international levels facing issue of water pollution due to which quality of domestic and drinking water is very low in majority areas of country. Mention the steps through which quality of water can be improved by consuming very low cost in cities, towns and especially villages by improving hygiene.

9.6 Recommended Books/Materials:


9.7 Advance Organizer:

The Unit 10 consists of concepts of methods to dispose of waste and reduce quantity of waste in household activities. Moreover, dumping of chemical wastes is going to be studied alongwith its harmful effects at domestic activities of public. Further the central concept of Urbanization is going to be discussed. The learners are going to be given understanding of issues in megacities.

TENTH MODULE:

WASTE DISPOSAL MANAGEMENT

10.1 Objectives of the Module:

10.1.1 To explain the different ways out for dumping around the world like ordinary landfills, advance secured landfills and sewage methods.
To summarize the emerging concept of recycling and reusing waste materials: Its benefits, potential and constraints.

To evaluate the importance of hazardous waste management and alternatives to reduce use of toxic material in household activities.

To recognize the factors those lead towards urban growth and differentiate among megacity, city, town and village.

To compare the advantages and disadvantages of urban life and its effects in reference to quality of life in urban areas.

To assess the sustainability of megacities with reference to ecological aspects, social features and economic forces.

**Learning Outcomes:**

10.2.1 The learners will be able to observe the process of dumping in their surroundings and launch an awareness campaign in their respective communities for proper disposal of wastes especially toxins.

10.2.2 The students will be able to communicate effectively the benefits and potential of recycling and reusing of wastes in the society alongwith constraints in its execution.

10.2.3 The learners will be able to search out alternatives of hazardous chemicals to use in household activities to reduce the dangerous effects of hazardous waste materials.

10.2.4 The students will be able to differentiate the needs and demands between rural life and urban life and understand the factors due to which people prefer the urban life.

10.2.5 The learners will be able to identify the factors that are essential for maintaining quality of life in urban areas and follow parameters of quality of life in daily life routines individually and collectively.

10.2.6 The students will be able to draw comparisons among ecological, social and economic factors for maintaining sustainability of megacities of Pakistan.

**ASPECTS OF AWARENESS:**

10.3.1 Methods for waste disposal:

10.3.1.1 Open Dumping

10.3.1.2 Dumping in Seas

10.3.1.3 Developing Sanitary Landfills

10.3.1.4 Exporting waste
10.3.1.5 Generate electricity from waste disposal methods

10.3.2 Reducing the quantity of waste: An alternate method
   10.3.2.1 Recycling process: Benefits cost and market
   10.3.2.2 Produce energy from waste and Remanufacturing from waste
   10.3.2.3 Controlling waste production at local levels

10.3.3 Waste of Toxic and Hazardous materials: A dangerous aspect
   10.3.3.1 Identification of Hazardous waste
   10.3.3.2 Legal methods to dispose Hazardous waste
   10.3.3.4 Provide alternatives to hazardous materials: An approach to minimize
       the production of Hazardous waste and chemicals

10.3.5 The rapid growth process of Urbanization across the globe: An overview
   regarding the advantages and disadvantages of Urbanization

10.3.6 Causes of Urban growth in the world: Immigration push factors and
   Immigration pull factors influenced by government policies

10.3.7 The Problems of Urbanization in the developing and developed countries:
   10.3.7.1 Population congestion, traffic load and sewerage system issues
   10.3.7.2 The gigantic issues of Air pollution and Water pollution
   10.3.7.3 The issue of Housing requirements in various megacities
       around the world

10.3.8 New Movements in Urban areas for better planning

10.3.9 Waste Disposal Management in Megacities like Islamabad, Lahore, Karachi,
       Peshawar, Quetta, Multan, Gujranwala, Sukkur and Hyderabad

10.4 Model Questions

Q. 1 What steps are essential to keep colony safe from hazardous of waste disposal?
Q. 2 How waste is being disposed properly and utilized in many developed parts
    of the world?
Q. 3 Why urban growth is not friendly phenomenon for environmentalists?

10.5 Assignments:

10.5.1 Waste disposal management is critical in developing countries. The level of
    awareness is very low in such societies while workers are not trained to
    dispose of garbage properly. How steps can be taken to launch an awareness
    movement in Islamabad city to use alternatives to reduce hazardous chemicals
    in household activities and disposal of garbage effectively.
10.5.2 Megacities are being flourished rapidly all over the world but this phenomenon creates many issues in the life of a common man. At one side it provides opportunities for society to progress but there are many hindrances in quality life also. Suggest steps due to which Capital area Islamabad can be able to compete world top level metropolitan cities.

10.6 **Recommended Books/Materials:**


10.7 **Advance Organizer:**

The Unit 11 consists of concepts of conventional and sustainable sources of energy and difference between them. Moreover, pollution factors are going to be studied along with destruction of lands and oceans due to pollution. Further the central concept of working of Nuclear Reactors is going to be discussed. The learners are going to be given orientation regarding need of skill manpowers.

**ELEVENTH MODULE:**

**SOURCES OF ENERGY**

11.1 **Objectives of the Module:**

11.1.1 To compare the available conventional resources of energy and their uses with other parts of the world.

11.1.2 To assess the benefits and cost of natural resources of energy that is coal, oil and natural gas.

11.1.3 To summarize the controversies regarding nuclear reactors their use production of energy and dangerous effects of radioactive wastes.

11.1.4 To comprehend the availability of sustainable sources of energy across the world and in Pakistan.

11.1.5 To understand the concept of generating electricity from solar energy and use of residues of crops as sources of potential energy.
11.1.6 To identify the resources of earth’s forces for production of electrical energy and describe their tendency in Pakistan.

11.2 Learning Outcomes:

11.2.1 The learners will be able to understand the availability of resources of conventional energy in their respective surrounding and convince the people in their respective locality for its judicious use.

11.2.2 The students will be able to compare the benefits and costs of oil, gas and natural gas and their appropriate use accordingly at homes.

11.2.3 The learners will be able to search out the use of nuclear reactors around the world and their damaging effects on environmental health alongwith human health.

11.2.4 The students will be able to work out on availability of renewable energy sources in their surroundings and explore options regarding their effective use at domestic level.

11.2.5 The learners will be able to comparisons about use of emerging source of solar energy and utilize the ground realities regarding energy production such as ancient concept of crop residues or peat etc.

11.2.6 The students will be able to know the supremacy of Nature regarding production of electricity through earth’s forces and launch a campaign to make sure such possibilities in their society.

11.3 ASPECTS OF AWARENESS:

11.3.1 Conventional Sources of Energy:

11.3.1.1 Resources and Reserves of Coal
11.3.1.2 Resources and Reserves of Oil
11.3.1.3 Resources and Reserves of Natural Gas
11.3.1.4 Generating Nuclear Power
11.3.1.5 Management of Radioactive Wastes

11.3.2 Sustainable Sources of Energy:

11.3.2.1 Conservation: Efficient Conservation of Energy
11.3.2.2 Rapid Growth of Concept of Solar Energy
11.3.2.3 Promotion of Sources of Renewable Energy
11.3.2.4 Production of Energy from Biomass
11.3.2.5 Production of Energy from Natural Forces of Earth

11.3.3 Air Pollution due to Burning of Coal and Oil
11.3.4 Nuclear Activities in Developed Countries: A Sensitive issue
   11.3.4.1 Disposal of Nuclear Wastes in Land
   11.3.4.2 Dumping of Radioactive Wastes in Oceans
11.3.5 The Working Pattern of Nuclear Reactors and different designs of Nuclear Reactors: How energy is produced by Nuclear Reactors?
11.3.6 Crises of Fuel in Developing countries: A serious issue threatening the cleanliness of the atmosphere globally
11.3.7 Optimum Utilization of Earth’s Forces for Fulfilling Energy Requirements Globally and Locally: A Valuable Contribution
11.3.8 Residues of crops and Peat: A good domestic source of energy
11.3.9 Need of Land and Skilled Manpower for Benefiting Large Segment of Population from Renewable Energy Sources
11.3.10 The Future of Renewable Energy Sources across the Globe and in Pakistan: A Comparative Analysis

11.4 Model Questions
   Q. 1 What is difference between conventional and sustainable sources of energy?
   Q. 2 How lands and oceans are being polluted globally by super powers?
   Q. 3 Why skilled manpower is most urgent need to transmit efficient energy utilization in the society?

11.5 Assignments:
11.5.1 Conventional energy sources are backbone of the country. Pakistan is one of the countries in the world having reasonable energy reservoirs and resources. Do you think that energy resources are being utilized effectively in majority of areas in Pakistan? Pen down the strategy if you are given the responsibility to aware people regarding reasonable use of energy at domestic level and for commercial purposes.
11.5.2 Sustainable energy resources are becoming very popular all over the world. A huge amount is being invested globally to search out options to explore advancements. Do you observe that sustainable energy resources are being utilized efficiently in domestic use and for commercial purposes? Do you agree that a huge manpower can be accommodated under the charter of development of Sustainable Energy?

11.6 Recommended Books/Materials:


11.7 Advance Organizer:

The Unit 12 consists of concepts of Environmental Policy and Laws for Environmental Protection globally. Moreover, the learners are going to be aware of the international treaties and negotiations regarding preservation and conservation of Ecology all over the world. Further the central concept of Real Progress (Cost Benefit Analysis) is going to be discussed. The learners are going to be given orientation regarding protection of wildlife.

**TWELFTH MODULE:**

**ENVIRONMENTAL POLICY, LAWS AND ECONOMICS**

12.1 Objectives of the Module:

12.1.1 To study the Environmental treaties and conventions at international level and importantly their effectiveness all over the world.

12.1.2 To learn the legislations and litigations regarding environment and their implementation in the world and in Pakistan.

12.1.3 To summarize the ways out of community based planning patterns for effective sustainability of Ecology.

12.1.4 To understand the relationship of development of modern technology with ecological sustainability globally.

12.1.5 To analyze the relationship of cost benefit analysis at domestic settings with destruction of environmental assets.

12.1.6 To promote some patterns for giving awareness to produce items by taking careful steps regarding environmental degradation.

12.2 Learning Outcomes:

12.2.1 The learners will be able to get knowledge regarding international treaties and conventions and analyze the effectiveness of such actions in the societies of developed countries.
12.2.2 The students will be able to assess the sensitivity level of volunteers working for the cause of environmental protection and mobilization of societies at grass root level to sustain ecology.

12.2.3 The learners will be able to study the process of law making and legislations in environment friendly societies and compare the spirit of same process in different regions of Pakistan.

12.2.4 The students will be able to comprehend the involvement of modern technologies in the life of every individual and its relation with damage of environment during process of production.

12.2.5 The learners will be able to realize the factors due to which environment is destroyed by functioning of various factories without opting precautionary measures in rural and urban areas.

12.2.6 The students will be able to take practical steps for developing mechanisms of community based working patterns and try level best to keep environment clean in their respective surroundings by using legal steps.

12.3 ASPECTS OF AWARENESS:

12.3.1 Environmental Policy:
  12.3.1.1 Political Turbulences in Environmental Policies
  12.3.1.2 Environmental Rights Globally
  12.3.1.3 Environmental Policies in Developed Countries
  12.3.1.4 Environmental Policies in Pakistan

12.3.2 Laws for Environmental Protection:
  12.3.2.1 Struggle for Environmental Protection
  12.3.2.2 Statutory Law: The Legislative Branch
  12.3.2.3 Case Law: The Judicial Branch
  12.3.2.4 Administrative Law: The Executive Branch

12.3.3 International Conventions and Treaties: Environmental Governance and Globalization

12.3.4 Policies for Environmental Dispute Resolution:
  12.3.4.1 Immoral problems and Management for Adaptation
  12.3.4.2 The Precautionary principle: arbitrary and Mediation
  12.3.4.3 Resilience in Ecosystems and Institutions
  12.3.4.4 Collaborative approaches to Community Based planning and Actions for green Areas
12.3.5 Relation of Economy with Environmental Sustainability: Classical, neoclassical and Ecological economics

12.3.6 Types of Resources and Capital: Categories of Economic Resources and Property resources of Community

12.3.7 Relation of Environmental Sustainability with Technological Advancements Globally and protection of Environment in Markets

12.3.8 International Trade and International development should not be on the cost of Environmental Protection

12.3.9 Analysis of Real progress: Relating Cost-Benefit Analysis with Environmental Degradation

12.3.10 Production cost at National and International Level without the violation of Environmental Protection

12.3.11 Legislation and its Implementation for the Protection of Wildlife in Pakistan

12.4 Model Questions

Q. 1 What is Environmental policy and laws for protection of environment at national and international level?

Q. 2 How economy of any region is is linked with environmental sustainability?

Q. 3 Why environmentalists resist against international development and trade on the cost of environmental protection?

12.5 Assignments:

12.5.1 Every country in the world is bound to follow Environmental Laws and Policies. Do you think Pakistan is Environmental friendly country in terms of laws and policies? Is there possibility to promote radical ideology in Pakistan by developing a mechanism of strict environmental protection laws? Do you satisfy about Pakistan Government policies for restoring Environmental balance?

12.5.2 Ecological sustainability is a very complex concept because it is related with all dimensions of life such as Theologically, Socially and Economically. Economy of every home is very important and simply people shouldn’t be stopped to fulfil bread and butter. In such scenario the question is very important that there should be created another earth for spending life without destroying Ecology.

12.6 Recommended Books/Materials:


**12.7 Advance Organizer:**

The Unit 13 consists of concepts of preparing environmental friendly citizens and environmental educators and professionals. Moreover, motivation for individuals towards sustainability is going to be studied alongwith creation of organizations at government and non-governmental levels. Further the central concept of Broadening Environmental Agenda is going to be discussed. The learners are going to be given awareness apropos of green politics and principle of charter for sustainability.

**THIRTEENTH MODULE:**

**ENVIRONMENTAL EDUCATION AND ADVOCACY**

**13.1 Objectives of the Module:**

13.1.1 To realize the importance of Environmental Education on regular basis and utilize it for effective citizenship concept.

13.1.2 To point out necessary steps in daily life routines for sustainability and develop habits for simple lifestyle.

13.1.3 To summarize the ways out for building momentum in the society for collective actions towards Ecological sustainability at domestic level.

13.1.4 To highlight the role of governmental and nongovernmental organizations (Nationally and internationally) for protecting green environment.
13.1.5 To analyze the role of green movements globally and efforts of individuals for the cause of safe environment.
13.1.6 To conclude the motivation for safe and healthy climate by adopting principles for the earth charter to make it conserve beautifully for humanity.

13.2 Learning Outcomes:
13.2.1 The learners will be able to realize the importance of Environmental Education on regular basis at primary and secondary level for developing the mind set at grass root level to safe Ecology.
13.2.2 The students will be able to develop habits to identify Environmental friendly products in the local markets and convince family members to avoid unnecessary shopping in daily routines.
13.2.3 The learners will be able to constitute students action groups at domestic level for stepping ahead collective reforms and motivate themselves to build a platform in local settings for volunteer actions.
13.2.4 The students will be able to comprehend the working pattern of government agencies and nongovernmental organizations for protection of green climate and understand the results of such efforts.
13.2.5 The learners will be able to realize the effectiveness of an individual for the protection of local ecology and develop a mechanism of interests at personal level for enhancing environmental standards.
13.2.6 The students will be able to familiar with the principles of earth charter by adopting in personal lives and constructing a chain process of struggle for the revitalization of wonderful planet.

13.3 ASPECTS OF AWARENESS:
13.3.1 Environmental Education:
   13.3.1.1 Environmental Literacy and Curricula
   13.3.1.2 Preparing Environmental Friendly Citizens
   13.3.1.3 Need of Environmental Educators in all tiers of Education
   13.3.1.4 Need of Environmental Professionals in Industries
13.3.2 Actions for Environmental Protection at Individual Level:
   13.3.2.1 Unnecessary Shopping Habits of People
   13.3.2.2 Create Culture for Simple Lifestyle Globally
   13.3.2.3 Selection of Environmental Friendly Products in Daily Life
   13.3.2.4 Limitations in Availability of Green Products
13.3.3 Collaborative Efforts in the Society to Protect Environment:
   13.3.3.1 Organizing Students Environmental Groups
   13.3.3.2 Motivate Society for Doing Volunteer Tasks
   13.3.3.3 Creating Organization for Actions at Domestic Level
   13.3.3.4 Promoting Cooperation and Compromise among Stakeholders

13.3.4 Broadening Environmental Agenda: Role of Government and at National and International level (Non Governmental Organizations)

13.3.5 Green Politics: What an Individual can do? An Essence of Global Struggle in the Present Century

13.3.6 The Principles of Earth Charter: Respect of Life alongwith Earth Congruently in Multiple Dimensions

13.3.7 Environmental Awareness Campaign in Pakistan through a Well Planned Educational cum Literacy Programs

13.4 Model Questions
Q. 1 What is scope of environmental education in formal settings of education?
Q. 2 How environmental agenda is possible to spread with uniform pace by involving every individual in its prosecution?
Q. 3 Why principles of earth charter is considered as comprehensive document to create earth as ideal planet for quality life?

13.5 Assignments:
13.5.1 Environmental literacy is a potent source in the society to protect green charter in the world. The critics of environmental movement claim that we are living in an uncertain world and life would be impossible by accepting logics of environmentalists in their true spirit. Poll your vote in favour of environmentalists or critics by taking examples from your daily consumptions.
13.5.2 Environmentalists have launched a variety of products in the markets to provide alternates for public against such products violating environmental laws. Do you feel those products are enough to fulfil daily consumptions? Do you find such green products in the markets of capital city Islamabad? If products are available then they are under purchasing capacity of buyers?

13.6 Recommended Books/Materials:
CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

In the present research, the experiment was conducted to evaluate the Environmental Awareness of the ‘would be’ teachers in a teachers training program. The subject of Environmental Awareness was taught at Federal College of Education, Islamabad. Out of four teachers’ training programs (B.Ed., M.Ed., B.S.Ed., and B.A.Ed.), the M.Ed. program of teachers training was selected for the conduct of experiment. The total strength of sixty two students enrolled in M.Ed. teaching program was divided into two groups randomly, comprising of thirty one students in each group. The control group and experimental group were constituted in equal strength within the system and no demarcation was applied while constituting both groups.

Entry gate conditions were identical. There was a single criterion for admission at M.Ed. level and that was holding B.Ed. degree at the time of admission. The syllabus of Environmental Education, recommended by Higher Education Commission, was reviewed and updated accordingly from the perspective of teachers’ training program. The new outline of the syllabus of the subject “Environmental Awareness” was formulated especially for the purpose of teachers training programs. The syllabus was designed keeping in view the basic potential of students having social sciences background.

The pilot study was planned at the start of 2013 to teach Environmental Awareness to M.Ed. students. The pre test and post were conducted. The data was generated and analysed and observations were taken. In the light of experiences gained,
the syllabus was updated and errors were removed. The task was challenging as Environmental Education draws upon several basic sciences like Physics, Chemistry, Botany, Zoology, Geology, Agriculture, Medical, Mathematics and statistics. The task was accomplished smartly including its conversion for teaching from general awareness point of view rather than treating it as deep scientific knowledge. Consequently, the final teaching phase was carried out at the end of 2013 to generate the data for the validation of research venture.

As stated, the two groups were purposefully identical in terms of class strength and basic abilities of students. The students showing good performance and showing active class participation were distributed almost equally in both groups. The pre test comprising of 100 questions was conducted in both groups. The questionnaire was upgraded on the basis of feedback obtained during the phase of pilot study. Three months treatment i.e. teaching was delivered to experimental group of M.Ed. class. The control group underwent routine teaching process that did not include the ‘treatment’ contents. Every effort was made to ‘insulate’ the two groups. The containment effort was, however, limited to the extent that was allowed by informal socialization that had to be accepted as a fact of college life. The researcher is not in a position to hazard a guess regarding its effect on the experiment.

The teaching phase was equivalent to a single semester course work. Subsequently, the post test was conducted at the completion of teaching phase. Importantly, the whole phase of teaching was conducted by the researcher himself in person. The conduct of pre and post both tests were administered by the researcher likewise. The mean of difference in raw scores was regarded as the ‘gain’ attributable to treatment which was found to be significant as shown by statistical treatment presented further below in this chapter.

It was considered important to develop a comment on the suitability of the questionnaires administered for reuse later. For this purpose, the data was subjected to ‘t’ test. The SPSS 16 version was used to calculate the tabulated ‘t’ value. The calculated ‘t’ value of mean of difference of raw scores was compared with the tabulated value of ‘t’ to check the reliability of the questionnaires for subsequent reuse. The level of significance was sought at 0.05 level for this purpose which is an appropriate level for an experimental group of this size. For the purpose of the ‘t’ test,
the questionnaire was divided into 11 segments according to different aspects of Environmental Awareness. A comment was thus developed on all essential 11 features of Environmental Awareness which is reported below.

The researcher had formulated four null hypotheses that were prosecuted through the analysis of the comparison of mean difference of raw scores.

4.2 Quantitative Data Analysis

The quantitative data obtained from the pre test and post tests was analysed to compare the gain in awareness attributable to treatment. For this purpose data was subdivided into various aspects and each aspect was treated separately. Data in each table presented was separately subjected to ‘t’ test to develop a comment on the reliability of each set of questions for subsequent reuse.

The quantitative data analysis is presented as under:

**Bench: 4.2.1: Raw Scores (Pre Test) Control Group & Experimental Group**

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Pre Test (X₁): Out of 500</th>
<th>Score: Experimental Group: Pre Test (X₂): Out of 500</th>
<th>Gain in Score: Dᵢ = (X₂-X₁)</th>
</tr>
</thead>
<tbody>
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<td>322</td>
<td>+3</td>
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<tr>
<td>12</td>
<td>315</td>
<td>317</td>
<td>+2</td>
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</tbody>
</table>
The data shown in Bench 4.2.1 indicated that Experimental Group and Control Group both performed almost equal by a factor of 1.7 to the base of 500 in Pre Test results, in that, Experimental Group obtained 0.34% better when group means were compared.

**Table 4.2.1: Comparison of performance of Experimental Group and Control Group in Pre Test before treatment**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain (X₂ - X₁)</th>
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</thead>
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<td></td>
<td>9778</td>
<td>317</td>
<td>9778/31 A.M. = 9832 A.M. = X₂ - X₁ = 1.7 to the base of 500</td>
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<td></td>
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<td>315</td>
<td>315.45 X₁</td>
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<td>316</td>
<td>316</td>
<td>320 X₂</td>
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<td></td>
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<td>317</td>
<td>316 X₁</td>
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<tr>
<td></td>
<td>305</td>
<td>305</td>
<td>310 X₁</td>
</tr>
</tbody>
</table>

The data shown in Bench 4.2.1 indicated that Experimental Group and Control Group both performed almost equal by a factor of 1.7 to the base of 500 in Pre Test results, in that, Experimental Group obtained 0.34% better when group means were compared.
Control Group: 31 students with a mean of 315.45.
Experimental Group: 31 students with a mean of 317.15.

Discussion:

1. Experimental Group comprised 31 members each in Pre Test that had identical and comparable background.
2. The pre test data of experimental group and control group of M.Ed. class were evaluated to draw comparisons to measure the awareness level before the conduct of teaching phase. The indication in the result was that mean score for pre test of experimental group (317.15) was congruent to arithmetic mean for pre test of control group (315.45). The difference between Experimental Group and control Group Pre Test score (1.7−0.34%) was almost negligible.
3. It is inferred that both groups were at same level of awareness before the commencement of teaching process.

Bench 4.2.2: Raw Scores (Post Test) Control Group and Experimental Group

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Post Test (X1): Out of 500</th>
<th>Score: Experimental Group: Post Test (X2): Out of 500</th>
<th>Gain in Score: ( D_f = (X_2 - X_1) )</th>
</tr>
</thead>
<tbody>
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<td>327</td>
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<td>139</td>
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<td>3</td>
<td>326</td>
<td>445</td>
<td>119</td>
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<td>4</td>
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<td>326</td>
<td>454</td>
<td>128</td>
</tr>
</tbody>
</table>
The data shown in Bench 4.2.2 indicated that Experimental Group performed better by a factor of 125.4 to the base of 500 in Post Test results as compared to Post Test results of Control Group, in that, Experimental Group were 25.08 % better when group means were compared. It is inferred that the gain made by the experimental
group is solely attributable to the treatment given to that group and not to the control group viz. the teaching of modules.

### Table 4.2.2: Overall performance in the Post Test

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain</th>
<th>t-value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>31</td>
<td>322.3</td>
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<tr>
<td>Experimental group</td>
<td>31</td>
<td>447.7</td>
<td>125.4</td>
<td>2.88</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

**P = significance value  
**df = degree of freedom  
**t-value = calculated *t* value**

**Discussion:**

1. Experimental Group and Control Group both comprised of 31 members each that had identical and comparable background.

2. The post test data of experimental group and control group of M.Ed. class were evaluated to draw comparisons to measure the terminal ambient awareness level. The indication in the result was that arithmetic mean for experimental group (447.7) was greater than arithmetic mean for control group (322.3) by **25.08%**.

3. The gain in Experimental Group Mean Post Test score (125.4) was significantly higher (25.08% increase) as compared to Control Group Mean Post Test score. It is inferred that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group and not to the Control Group.

4. The subset of data was subjected to ‘t’ test to develop a re-assurance that the questionnaire would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.88) was greater than tabulated ‘t’ value (2.0) from *t* table at df(60). It is, therefore, inferred that the questionnaire is reliable for re-use in identical conditions.

The graphic below clearly depicts the picture of generated data which reveals the reliability of research project.
### Bench: 4.2.3: Raw Scores (Pre Test and Post Test) Experimental Group

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Experimental Group: Pre Test($X_1$): Out of 500</th>
<th>Score: Experimental Group: Post Test($X_2$): Out of 500</th>
<th>Gain in Score: $D_f = (X_2 - X_1)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>322</td>
<td>466</td>
<td>144</td>
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<td>2</td>
<td>319</td>
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<td>Post Test</td>
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<td>310</td>
<td>425</td>
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</table>

The data shown in Bench 4.2.3 indicated that Experimental Group performed better by a factor of 130.55 to the base of 500 raw score in Post Test results as

\[ X_2 - X_1 = 130.55 \]
compared to Pre Test results, in that, Experimental Group obtained 26.11% improvement when group means were compared.

**Table 4.2.3: Comparison of performance of Experimental Group between Pre Test and Post Test**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain $(X_2 - X_1)$</th>
<th>t-value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Test</td>
<td>31</td>
<td>317.15</td>
<td>-</td>
<td>60</td>
<td></td>
<td>&lt;0.05</td>
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<tr>
<td>Post Test</td>
<td>31</td>
<td>447.70</td>
<td>130.55</td>
<td>2.92</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

$P = \text{significance value}$  $df = \text{degree of freedom}$  $t-value = \text{calculated } t$ value

**Discussion:**

1. Experimental Group comprised of 31 members that had identical and comparable background.

2. The pre test and post test data of experimental group of M.Ed. class were evaluated to draw comparisons to measure the terminal ambient awareness level. The indication in the result was that mean score for post test (447.70) was greater than arithmetic mean for pre test (317.15) by 26.11%. It is considered that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group by drawing comparison between Pre Test and Post Test.

3. The gain in Experimental Group Post Test score (130.55) was significantly higher (26.11% increase) as compared to Experimental Group Mean Pre Test score.

4. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value in the post test (2.92) was greater than calculated ‘t’ value (2.0) in the pre test at $df(60)$. It is, therefore, inferred that questionnaire is reliable for re-use in identical conditions.

The graphic below clearly portrays the picture of generated data which outlines the strength of research project.
### Bench: 4.2.4: Raw Scores (Pre Test and Post Test) Control Group

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Pre Test (X₁): Out of 500</th>
<th>Score: Control Group: Post Test (X₂): Out of 500</th>
<th>Gain in Score: ( D_f = (X₂ - X₁) )</th>
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<td>9778</td>
<td>9992</td>
<td>(X_2 - X_1) = 6.85 to the base of 500</td>
</tr>
<tr>
<td></td>
<td>A.M.= 9778/31</td>
<td>A.M.= 9992/31</td>
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</tr>
<tr>
<td></td>
<td>(X_i= 315.45)</td>
<td>(X_i= 322.3)</td>
<td></td>
</tr>
</tbody>
</table>

The data shown in Bench 4.2.4 indicated that Control Group performed congruent by a factor of 6.85 to the base of 500 in Post Test results as compared to Pre Test results, in that, Control Group obtained 1.37 % improvement when group means were compared.
Table 4.2.4: Comparison of performance of Control Group in Pre Test and in Post Test after trial

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain $(X_2 - X_1)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Test</td>
<td>31</td>
<td>315.45</td>
<td></td>
</tr>
<tr>
<td>Post Test</td>
<td>31</td>
<td>322.3</td>
<td>6.85</td>
</tr>
</tbody>
</table>

Discussion:
1. Control Group comprised of 31 members each in Pre Test and Post Test that had identical and comparable background.
2. The pre test and Post test data of control group of M.Ed. class were evaluated to draw comparisons to measure the awareness level before and after the conduct of teaching phase. The indication in the result was that arithmetic mean score for pre test of control group (315.55) was congruent to arithmetic mean for post test of control group (322.3). It is considered that Control group was at same level of awareness before and after the commencement of teaching process.
3. The difference between Pre Test and Post Test score (6.85) was very minor and no awareness was recorded.

The Eleven Benches delineated below (4.2.5 to 4.2.15) would represent the data to show the performance of ‘Would be teachers’ in the Post Test towards essential features of Environmental Education. The questionnaire was bifurcated into eleven sections carrying vital environmental topics to assess the awareness level of ‘potential teachers’ after completing the trial.

Bench 4.2.5: Raw Scores(Post Test) Control Group & Experimental Group:
Fundamental Concepts & Definitions of Ecological Terms

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group Post Test$(X_1)$:</th>
<th>Score: Experimental Group Post Test$(X_2)$:</th>
<th>Gain in Score: $D_f = (X_2-X_1)$</th>
</tr>
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<tbody>
<tr>
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<tr>
<td>31</td>
<td>33</td>
<td>44</td>
<td>11</td>
</tr>
</tbody>
</table>
The data shown in Bench 4.2.5 indicated that Experimental Group performed better by a factor of 12.4 to the base of 50 in Post Test results as compared to Post Test results of Control Group apropos of Fundamental Ecological Concepts and Definitions, in that, Experimental Group obtained 24.8 % better when group means were compared.

**Table 4.2.5:** Performance of ‘would be teachers’ in the Post Test towards “basic concepts and definitions”

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain ($X_2 - X_1$)</th>
<th>t-value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>31</td>
<td>31.45</td>
<td>12.4</td>
<td>2.75</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Experimental group</td>
<td>31</td>
<td>43.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Where: $P = significance value$, $df = degree of freedom$, $t-value = calculated t value$

**Discussion:**

1. Experimental Group and Control Group comprised of 31 members each that had identical and comparable background.

2. The ten questions were added in the questionnaire to measure the terminal ambient awareness of ‘potential teachers’ towards ‘fundamental concepts and definitions of Ecological terms’. The questions numbers 1, 11, 19, 37, 43, 58, 64, 82, 90 and 100 were included in the questionnaire to calculate awareness apropos of ‘fundamental concepts and definitions of Ecological terms’. The indication in the result was that arithmetic mean for experimental group (43.85) was greater than arithmetic mean for control group (31.45) by **24.8%**. It is considered that gain is significant and attributable directly and solely to
the treatment extended to the Experimental Group and not to the Control Group.

3. The gain in Ten questions regarding Basic Ecological concepts and definitions of Experimental Group Mean Post Test score (12.4) was significantly higher (24.8% increase) as compared to Control Group Mean Post Test score.

4. The reliability of above mentioned ten questions carrying ‘fundamental concepts and definitions of Ecological terms’ were tested by applying Cronbach’s alpha coefficient. Out of 10 questions, 5 questions were written as positive statements while other 5 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was ‘0.824’ which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.

5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated t value (2.75) was greater than tabulated t value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions.

The graphic below clearly depicts the picture of generated data which reveals the reliability of research project.
### Bench 4.2.6: Raw Scores (Post Test) Control Group & Experimental Group:

**Water Pollution**

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group Post Test (X₁): Out of 40</th>
<th>Score: Experimental Group Post Test (X₂): Out of 40</th>
<th>Gain in Score: ( D_f = (X₂ - X₁) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25</td>
<td>36</td>
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<tr>
<td>31</td>
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<td>36</td>
<td>13</td>
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</tbody>
</table>

\[
\begin{align*}
\text{A.M.} &= \frac{773}{31} = 24.9 \\
\text{A.M.} &= \frac{1082}{31} = 34.9 \\
X_2 - X_1 &= 10.0 \text{ to the base of 40}
\end{align*}
\]
The data shown in Bench 4.2.6 indicated that Experimental Group performed better by a factor of 10.0 to the base of 40 in Post Test results as compared to Post Test results of Control Group apropos of Water Pollution, in that, Experimental Group obtained 25.0% better when group means were compared.

**Table 4.2.6: Performance of ‘would be teachers’ in the Post Test towards burning Ecological issue “Water Pollution”**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain (X2 – X1)</th>
<th>t-value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>31</td>
<td>24.9</td>
<td>-</td>
<td>-</td>
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<td></td>
</tr>
<tr>
<td>Experimental group</td>
<td>31</td>
<td>34.9</td>
<td>10.0</td>
<td>2.70</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

P = significance value  
\( df = \) degree of freedom  
\( t-value = \) calculated \( t \) value

**Discussion:**

1. Experimental Group and Control Group both comprised of 31 members each that had identical and comparable background.

2. The eight questions were added in the questionnaire to measure terminal ambient awareness of ‘potential teachers’ towards burning issue “Water Pollution”. The questions numbers 12, 14, 24, 34, 67, 77, 87 and 89 were included in the questionnaire to calculate awareness a propos of ‘Water Pollution’. The indication in the result was that arithmetic mean for experimental group (34.9) was greater than arithmetic mean for control group (24.9) by **25%**. It is considered that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group and not to the Control Group.

3. The gain in Eight questions regarding concepts of Water Pollution of Experimental Group Mean Post Test score (10.0) was significantly higher (25% increase) as compared to Control Group Mean Post Test score.
4. The reliability of above mentioned eight questions carrying concepts regarding ‘Water Pollution’ were tested by applying Cronbach’s alpha coefficient. Out of 8 questions, 4 questions were written as positive statements while other 4 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was ‘0.83’ which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.

5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.70) was greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions.

The graphic below noticeably depicts the picture of generated data which reveals the reliability of research project.

Bench 4.2.7: Raw Scores(Post Test) Control Group & Experimental Group: Air Pollution
<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Post Test(X₁): Out of 40</th>
<th>Score: Experimental Group: Post Test(X₂): Out of 40</th>
<th>Gain in Score: (D_f = (X_2 - X_1))</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>26</td>
<td>35</td>
<td>09</td>
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<td>12</td>
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</tbody>
</table>
The data shown in Bench 4.2.7 indicated that Experimental Group performed better by a factor of 10.05 to the base of 40 in Post Test results as compared to Post Test results of Control Group apropos of Air Pollution, in that, Experimental Group obtained 25.13 % better when group means were compared.

Table 4.2.7: Performance of ‘would b teachers’ in the Post Test towards sensitive Ecological issue “Air Pollution”

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain</th>
<th>t-value</th>
<th>df</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>31</td>
<td>25.20</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Experimental group</td>
<td>31</td>
<td>35.25</td>
<td>10.05</td>
<td>2.76</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

$P = \text{significance value}$  \hspace{1cm} $df = \text{degree of freedom}$  \hspace{1cm} $t-value = \text{calculated \hspace{1cm} t \hspace{1cm} value}$

Discussion:

1. Experimental Group and Control Group comprised of 31 members each that had identical and comparable background.

2. The eight questions were added in the questionnaire to measure terminal ambient awareness of ‘potential teachers’ towards sensitive ecological issue “Air Pollution”. The questions numbers 5, 27, 40, 48, 61, 74, 95 and 96 were included in the questionnaire to calculate awareness apropos of ‘Air Pollution’. The indication in the result was that arithmetic mean for experimental group (35.25) was greater than arithmetic mean for control group (25.20) by 25.13%. It is considered that gain is significant and attributable
directly and solely to the treatment extended to the Experimental Group and not to the Control Group.

3. The gain in Eight questions regarding concepts of Water Pollution of Experimental Group Mean Post Test score (10.05) was significantly higher (25.13% increase) as compared to Control Group Mean Post Test score.

4. The reliability of above mentioned eight questions carrying concepts regarding ‘Air Pollution’ were tested by applying Cronbach’s alpha coefficient. Out of 8 questions, 4 questions were written as positive statements while other 4 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was ‘0.827’ which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.

5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.76) was greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions.

The graphic below clearly illustrates the picture of generated data which reveals the reliability of research project.
Bench 4.2.8: Raw Scores(Post Test) Control Group & Experimental Group:
Deforestation, Water Management and Waste Management

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Post Test(X₁): Out of 50</th>
<th>Score: Experimental Group: Post Test(X₂): Out of 50</th>
<th>Gain in Score: ( D_f = (X_2 - X_1) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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</table>

980  
A.M. =  
980/31  
X₁ = 31.55  

1369  
A.M. =  
1369/31  
X₂ = 44.15  

X₂ - X₁ = 12.6 to the base of 50
The data shown in Bench 4.2.8 indicated that Experimental Group performed better by a factor of 12.6 to the base of 50 in Post Test results as compared to Post Test results of Control Group apropos of Deforestation, Water management and Waste management, in that, Experimental Group obtained 25.2 % better when group means were compared.

Table 4.2.8: Performance of ‘would b teachers’ in the Post Test towards “Deforestation, Water management and Waste management”

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain (X₂ – X₁)</th>
<th>t-value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>31</td>
<td>31.55</td>
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<td></td>
<td>-</td>
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<tr>
<td>Experimental group</td>
<td>31</td>
<td>44.15</td>
<td>12.6</td>
<td>2.67</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

P = significance value  
df = degree of freedom  
t-value = calculated t value

Discussion:

1. Experimental Group and Control Group both comprised of 31 members each that had identical and comparable background.

2. The ten questions were added in the questionnaire to measure terminal ambient awareness of ‘potential teachers’ towards “Deforestation, Water management and Waste management”. The questions numbers 9, 18, 28, 32, 36, 65, 69, 73, 83 and 92 were added in the questionnaire to calculate awareness a propos of “Deforestation, Water management and Waste management”. The indication in the result was that arithmetic mean for experimental group (44.15) was greater than arithmetic mean for control group (31.55) by 25.2%. It is considered that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group and not to the Control Group.

3. The gain in Ten questions regarding concepts of Deforestation, Water management and Waste management of Experimental Group Mean Post Test
score (12.6) was significantly higher (25.2% increase) as compared to Control Group Mean Post Test score.

4. The reliability of above mentioned Ten questions carrying concepts regarding ‘Deforestation, Water management and Waste management’ were tested by applying Cronbach’s alpha coefficient. Out of 10 questions, 5 questions were written as positive statements while other 5 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was ‘0.805’ which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.

5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.67) was greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions.

The graphic below clearly depicts the trend of generated data which reveals the reliability of research project.
### Bench 4.2.9: Raw Scores (Post Test) Control Group & Experimental Group: Agriculture and Biodiversity

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Post Test (X₁): Out of 40</th>
<th>Score: Experimental Group: Post Test (X₂): Out of 40</th>
<th>Gain in Score: ( D_f = (X₂ - X₁) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25</td>
<td>36</td>
<td>11</td>
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<td>2</td>
<td>25</td>
<td>34</td>
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<td>22</td>
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</tbody>
</table>
The data shown in Bench 4.2.9 indicated that Experimental Group performed better by a factor of 10.2 to the base of 40 in Post Test results as compared to Post Test results of Control Group apropos of Agriculture and Biodiversity, in that, Experimental Group obtained 25.5% better when group means were compared.

**Table 4.2.9:** Performance of ‘would b teachers’ in the Post Test towards sensitive “Agriculture and Biodiversity”

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain (X_2 - X_1)</th>
<th>t-value</th>
<th>df</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>31</td>
<td>25.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental group</td>
<td>31</td>
<td>35.3</td>
<td>10.2</td>
<td>2.69</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

\(P = \) significance value \(\text{df} = \) degree of freedom \(\text{t-value} = \) calculated \(t\) value

**Discussion:**

1. Experimental Group and Control Group both comprised of 31 members each that had identical and comparable background.
2. The eight questions were added in the questionnaire to measure terminal ambient awareness of 'potential teachers’ towards “Agriculture and Biodiversity”. The questions numbers 8, 10, 16, 22, 79, 85, 91 and 93 were included in the questionnaire to calculate awareness a propos of “Agriculture and Biodiversity”. The indication in the result was that arithmetic mean for experimental group (35.3) was greater than arithmetic mean for control group (25.1) by 25.5%. It is considered that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group and not to the Control Group.

3. The gain in Eight questions regarding concepts of Agriculture and Biodiversity of Experimental Group Mean Post Test score (10.2) was significantly higher (25.5% increase) as compared to Control Group Mean Post Test score.

4. The reliability of above mentioned eight questions carrying concepts regarding ‘Agriculture and Biodiversity’ were tested by applying Cronbach’s alpha coefficient. Out of 8 questions, 4 questions were written as positive statements while other 4 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was ‘0.795’ which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.

5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.69) was greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions.

The graphic below clearly depicts the picture of generated data which reveals the reliability of research project.
### Bench 4.2.10: Raw Scores (Post Test) Control Group & Experimental Group:

**Population cum Urbanization**

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group Post Test (X1): Out of 50</th>
<th>Score: Experimental Group Post Test (X2): Out of 50</th>
<th>Gain in Score: $D_f = (X_2 - X_1)$</th>
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</thead>
<tbody>
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<td>1</td>
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</table>
The data shown in Bench 4.2.10 indicated that Experimental Group performed better by a factor of 12.3 to the base of 50 in Post Test results as compared to Post Test results of Control Group apropos of Population cum Urbanization, in that, Experimental Group obtained 24.6 % better when group means were compared.
Table 4.2.10: Performance of ‘would b teachers’ in the Post Test towards “Population cum Urbanization”

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain ($X_2 - X_1$)</th>
<th>t-value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>31</td>
<td>31.55</td>
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<tr>
<td>Experimental group</td>
<td>31</td>
<td>43.85</td>
<td>12.3</td>
<td>2.72</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

$P = \text{significance value}$  
$df = \text{degree of freedom}$  
$t-value = \text{calculated t value}$

Discussion:

1. Experimental Group and Control Group comprised of 31 members each that had identical and comparable background.

2. The ten questions were added in the questionnaire to measure terminal ambient awareness of ‘potential teachers’ towards “Population and Urbanization”. The questions numbers 2, 4, 13, 17, 49, 51, 52, 84, 88 and 97 were included in the questionnaire to calculate awareness a propos of “Population and Urbanization”. The indication in the result was that arithmetic mean for experimental group (31.55) was greater than arithmetic mean for control group (43.85) by 24.6%. It is considered that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group and not to the Control Group.

3. The gain in Ten questions regarding concepts of Population cum Urbanization of Experimental Group Mean Post Test score (12.3) was significantly higher (24.6% increase) as compared to Control Group Mean Post Test score.

4. The reliability of above mentioned ten questions carrying concepts regarding ‘Population and Urbanization’ were tested by applying Cronbach’s alpha coefficient. Out of 10 questions, 5 questions were written as positive statements while other 5 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5.
(strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was ‘0.81’ which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.

5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.72) was greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions.

The graphic below clearly shows the picture of generated data which reveals the reliability of research project.

### Bench 4.2.11: Raw Scores (Post Test) Control Group & Experimental Group:

**Ecological Cycles**

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Post Test (X₁):</th>
<th>Score: Experimental Group: Post Test (X₂):</th>
<th>Gain in Score:</th>
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<tr>
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<td>( D_{f} = (X_{2} - X_{1}) )</td>
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<td>Out of 50</td>
<td>Out of 50</td>
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<td>31</td>
<td>32</td>
<td>43</td>
<td>11</td>
</tr>
</tbody>
</table>
The data shown in Bench 4.2.11 indicated that Experimental Group performed better by a factor of 12.5 to the base of 50 in Post Test results as compared to Post Test results of Control Group apropos of Ecological Cycles, in that, Experimental Group obtained 25.0 % better when group means were compared.

Table 4.2.11: Performance of ‘would b teachers’ in the Post Test towards gigantic Ecological issue “Ecological cycles”

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain</th>
<th>t-value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>31</td>
<td>31.3</td>
<td></td>
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<tr>
<td>Experimental group</td>
<td>31</td>
<td>43.8</td>
<td>12.5</td>
<td>2.65</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

P = significance value df = degree of freedom t-value = calculated t value

Discussion:

1. Experimental Group and Control Group both comprised of 31 members each that had identical and comparable background.
2. The ten questions were added in the questionnaire to measure terminal ambient awareness of ‘potential teachers’ towards “Ecological Cycles”. The questions numbers 25, 29, 31, 38, 41, 60, 63, 70, 72 and 76 were included in the questionnaire to calculate awareness a propos of ‘Ecological Cycles’. The indication in the result was that arithmetic mean for experimental group (31.3) was greater than arithmetic mean for control group (43.8) by 25.0%. It is considered that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group and not to the Control Group.
3. The gain in Ten questions towards concepts of Ecological Cycles of Experimental Group Mean Post Test score (12.5) was significantly higher (25.0% increase) as compared to Control Group Mean Post Test score.

4. The reliability of above mentioned Ten questions carrying concepts regarding ‘Ecological Cycles’ were tested by applying Cronbach’s alpha coefficient. Out of 10 questions, 5 questions were written as positive statements while other 5 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was ‘0.80’ which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.

5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.65) was greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions.

The graphic below clearly portrays the picture of generated data which reveals the reliability of research project.
### Bench 4.2.12: Raw Scores (Post Test) Control Group & Experimental Group:

**Food Management, Hunger and Rights of Native People**

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Post Test (X₁): Out of 50</th>
<th>Score: Experimental Group: Post Test (X₂): Out of 50</th>
<th>Gain in Score: ( D_f = (X_2 - X_1) )</th>
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<td>16</td>
<td>28</td>
<td>46</td>
<td>18</td>
</tr>
</tbody>
</table>
The data shown in Bench 4.2.12 indicated that Experimental Group performed better by a factor of 12.2 to the base of 50 in Post Test results as compared to Post Test results of Control Group apropos of Food management, Hunger and Rights of Native people, in that, Experimental Group obtained 24.4 % better when group means were compared.

**Table 4.2.12: Performance of ‘would b teachers’ in the Post Test towards “Food management, Hunger and Rights of Native people”**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Gain ((X_2 – X_1))</th>
<th>t-value</th>
<th>df</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>31</td>
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<tr>
<td>Experimental</td>
<td>31</td>
<td>43.9</td>
<td>12.2</td>
<td>2.73</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
Discussion:

1. Experimental Group and Control Group both comprised of 31 members each that had identical and comparable background.

2. The ten questions were added in the questionnaire to measure terminal ambient awareness of ‘potential teachers’ towards “Food management, Hunger and Rights of Native People”. The questions numbers 15, 20, 21, 26, 44, 57, 75, 80, 81 and 86 were added in the questionnaire to calculate awareness a propos of “Food management, Hunger and Rights of Native People”. The indication in the result was that arithmetic mean for experimental group (43.9) was greater than arithmetic mean for control group (31.7) by 24.4%. It is considered that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group and not to the Control Group.

3. The gain in Ten questions towards concepts of Food management, Hunger and Rights of Native People of Experimental Group Mean Post Test score (12.2) was significantly higher (24.4% increase) as compared to Control Group Mean Post Test score.

4. The reliability of above mentioned Ten questions carrying concepts regarding ‘Food management, Hunger and Rights of Native People’ were tested by applying Cronbach’s alpha coefficient. Out of 10 questions, 5 questions were written as positive statements while other 5 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was ‘0.82’ which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.
5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.73) was greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions. The graphic below clearly represents the picture of generated data which reveals the reliability of research project.

Bench 4.2.13: Raw Scores (Post Test) Control Group & Experimental Group:

Policy Management for Environmental Protection

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Post Test (X₁): Out of 50</th>
<th>Score: Experimental Group: Post Test (X₂): Out of 50</th>
<th>Gain in Score: ( D_f = (X₂-X₁) )</th>
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\[
\text{A.M.} = \frac{989}{31} = 31.9 \\
\text{A.M.} = \frac{1380}{31} = 44.5 \\
X_2 - X_1 = 12.6 \text{ to the base of 50}
\]
The data shown in Bench 4.2.13 indicated that Experimental Group performed better by a factor of 12.6 to the base of 50 in Post Test results as compared to Post Test results of Control Group apropos of Policy management for Environmental Protection, in that, Experimental Group obtained 25.2% better when group means were compared.

**Table 4.2.13: Performance of ‘would b teachers’ in the Post Test towards “Policy Management for Environmental Protection”**

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain (X₂ – X₁)</th>
<th>t-value</th>
<th>df</th>
<th>p</th>
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<tr>
<td>Control group</td>
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<tr>
<td>Experimental group</td>
<td>31</td>
<td>44.5</td>
<td>12.6</td>
<td>2.78</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

*P = significance value, df = degree of freedom, t-value = calculated t value*

**Discussion:**

1. Experimental Group and Control Group comprised of 31 members each that had identical and comparable background.

2. The ten questions were added in the questionnaire to measure terminal ambient awareness of ‘potential teachers’ towards “Policy management for Environmental Protection”. The questions numbers 3, 33, 35, 42, 50, 59, 66, 68, 98, and 99 were included in the questionnaire to calculate awareness a propos of ‘Policy management for Environmental Protection’. The indication in the result was that arithmetic mean for experimental group (44.5) was greater than arithmetic mean for control group (31.9) by 25.2%. It is considered that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group and not to the Control Group.

3. The gain in Ten questions towards concepts of Policy management for Environmental protection of Experimental Group Mean Post Test score (12.6) was significantly higher (25.2% increase) as compared to Control Group Mean Post Test score.

4. The reliability of above mentioned Ten questions carrying concepts regarding ‘Policy management for Environmental Protection’ were tested by applying
Cronbach’s alpha coefficient. Out of 10 questions, 5 questions were written as positive statements while other 5 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was ‘0.79’ which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.

5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.78) is greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions.

The graphic below clearly represents the picture of generated data which reveals the reliability of research project.
### Bench 4.2.14: Raw Scores (Post Test) Control Group & Experimental Group: Effects of Industrialization

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Post Test (X₁): Out of 40</th>
<th>Score: Experimental Group: Post Test (X₂): Out of 40</th>
<th>Gain in Score: (D_f = (X_2 - X_1))</th>
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<tbody>
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</tbody>
</table>
The data shown in Bench 4.2.14 indicated that Experimental Group performed better by a factor of 10.3 to the base of 40 in Post Test results as compared to Post Test results of Control Group apropos of Effects of Industrialization, in that, Experimental Group obtained 25.75% better when group means were compared.

Table 4.2.14: Performance of ‘would b teachers’ in the Post Test towards gigantic Ecological issue “Effects of Industrialization”

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain (X₂ – X₁)</th>
<th>t-value</th>
<th>df</th>
<th>p</th>
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<tr>
<td>Control group</td>
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<tr>
<td>Experimental</td>
<td>31</td>
<td>35.3</td>
<td>10.3</td>
<td>2.64</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

P = significance value  
\text{df} = \text{degree of freedom}  
\text{t-value} = \text{calculated t value}

Discussion:
1. Experimental Group and Control Group both comprised of 31 members each that had identical and comparable background.
2. The eight questions were added in the questionnaire to measure terminal ambient awareness of ‘potential teachers’ towards “Effects of Industrialization”. The questions numbers 6, 7, 30, 46, 53, 55, 71 and 94 were added in the questionnaire to calculate awareness a propos of ‘Effects of Industrialization’. The indication in the result was that arithmetic mean for experimental group (35.3) was greater than arithmetic mean for control group (25.0) by 25.75%. It is considered that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group and not to the Control Group.

3. The gain in Eight questions regarding concepts of Effects of Industrialization of Experimental Group Mean Post Test score (10.3) was significantly higher (25.75% increase) as compared to Control Group Mean Post Test score.

4. The reliability of above mentioned Eight questions carrying concepts regarding ‘Effects of Industrialization’ were tested by applying Cronbach’s alpha coefficient. Out of 8 questions, 4 questions were written as positive statements while other 4 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was ‘0.811’ which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.

5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.64) was greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions.

The graphic below evidently depicts the picture of generated data which reveals the reliability of research project.
**Bench 4.2.15: Raw Scores (Post Test) Control Group & Experimental Group:**

**Wild Life Protection**

<table>
<thead>
<tr>
<th>S#</th>
<th>Score: Control Group: Post Test (X1): Out of 40</th>
<th>Score: Experimental Group: Post Test (X2): Out of 40</th>
<th>Gain in Score: $D_f = (X_2 - X_1)$</th>
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<td>31</td>
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<td>36</td>
<td>12</td>
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A.M. = 25.1

The data shown in Bench 4.2.15 indicated that Experimental Group performed better by a factor of 10.4 to the base of 40 in Post Test results as compared to Post Test results of Control Group apropos of Wild Life Protection, in that, Experimental Group obtained 26.0 % better when group means were compared.
Table 4.2.15: Performance of ‘would b teachers’ in the Post Test towards
gargantuan Environmental issue “Wild Life Protection”

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Gain (X₂ – X₁)</th>
<th>t-value</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group</td>
<td>31</td>
<td>25.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experimental group</td>
<td>31</td>
<td>35.5</td>
<td>10.4</td>
<td>2.71</td>
<td>60</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

\[ P = \text{significance value} \quad df = \text{degree of freedom} \quad t-value = \text{calculated t value} \]

Discussion:

1. Experimental Group and Control Group both comprised of 31 members each that had identical and comparable background.

2. The eight questions were added in the questionnaire to measure terminal ambient awareness of ‘potential teachers’ towards “Wild Life Protection”. The questions numbers 23, 39, 45, 47, 54, 56, 62 and 78 were included in the questionnaire to calculate awareness a propos of ‘Wild Life Protection’. The indication in the result was that arithmetic mean for experimental group (35.5) was greater than arithmetic mean for control group (25.1) by 26.0%. It is considered that gain is significant and attributable directly and solely to the treatment extended to the Experimental Group and not to the Control Group.

3. The gain in Eight questions regarding concepts of Wild Life Protection of Experimental Group Mean Post Test score (10.4) was significantly higher (26.0% increase) as compared to Control Group Mean Post Test score.

4. The reliability of above mentioned eight questions carrying concepts carrying ‘Wild Life Protection’ were tested by applying Cronbach’s alpha coefficient. Out of 10 questions, 4 questions were written as positive statements while other 4 questions were inscribed as negative statements. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The calculated value of Cronbach’s Alpha Coefficient for above mentioned ten questions was “0.834” which was near to 0.8 and it was considered as good reliability so the part of questionnaire carrying ten questions was reliable in good manners for future utilization.
5. The subset of data was further subjected to ‘t’ test to develop a re-assurance that the questions would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.71) is greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, inferred that the items in the questionnaire are reliable for re-use in identical conditions.

The graphic below visibly depicts the picture of generated data which reveals the reliability of research project.

### 4.3 Prosecution of Hypotheses in the light of Inferences from Table 4.2.1 to Table 4.2.15

#### 4.3.1 Hypothesis#1:

It had been suggested in Null Hypothesis no. 1 that:

“There is no relationship between ecological awareness amongst masses and sustainable development of Pakistani society.”
It was implied in hypothesis no. 1 that there was no relationship between ecological awareness amongst masses and sustainable development of society. The above stated hypothesis was tested through the questionnaire comprising one hundred questions pertaining to significant and burning ecological issues in detail. In statistical terms, as per the null hypothesis, we could expect no significant difference between pre test and post test of “would be teachers” after conduct of experiment through teaching of modules especially prepared by the researcher for this purpose. The scores were tabulated in Table 4.2.3 to present the status of research project. The mean score of experimental group in post test (447.7) was significantly high than mean score in pre test (317.15). The gain in Post Test raw scores (130.55) of Experimental Group was significantly higher (26.11% increase) as compared to Mean Pre Test score of Experimental Group. Further the t test value (2.92) was calculated which was greater than tabulated t value (2.0) at df (degree of freedom) 60 and significance level of 0.05. The gain of 26.11% was considered significant under prevailing conditions which in turn suggested the rejection of proposed null hypothesis. Rejection of null hypothesis suggests the positive or the alternate statement as under:

“There is strong relationship between ecological awareness amongst masses and sustainable development of Pakistani society.”

It was considered necessary to obtain a measure of reassurance that if this test is re-used, it would not generate more than 5% error due to internal factors. For this purpose, t value was calculated which turned out to be 2.92 against tabulated value of 2.0. Since calculated t value is greater than the tabulated value, it is assured that the test would not generate more than 5% error in re-use under similar conditions. However, researcher and teachers reusing this test are cautioned that they must keep the limitations of this study in view when administering these tests.

4.3.2 Hypothesis#2:

It had been proposed in Null Hypothesis no. 2 that:

“There is no relationship between the ecological awareness of trainee teachers and enhancement in the quality of life in Pakistan.”

It was implied in hypothesis no. 2 that there was no relationship between ecological awareness amongst masses and sustainable development of society. The above stated hypothesis was tested through the questionnaire comprising one hundred questions pertaining to significant and burning ecological issues in detail. In statistical
terms, as per the null hypothesis, we could expect no significant difference between post test of “would be teachers” after conduct of experiment through teaching of modules especially prepared by the researcher for this purpose. The scores were tabulated in Table 4.2.2 to present the status of research project. The mean score of experimental group in post test (447.7) was significantly high than mean score of control group in post test (322.3). The gain in Post Test raw scores (125.4) of Experimental Group was significantly higher (25.08% increase) as compared to Mean Post Test score of Control Group. Further the t test value (2.88) was calculated which was greater than tabulated t value (2.0) at df (degree of freedom) 60 and significance level of 0.05. The gain of 26.11% was considered significant under prevailing conditions which in turn suggested the rejection of proposed null hypothesis. Rejection of null hypothesis suggests the positive or the alternate statement as under: “There is strong relationship between the ecological awareness of trainee teachers and enhancement in the quality of life in Pakistan.”

4.3.3 Hypothesis#3:

It had been suggested in Null Hypothesis no. 3 that:

“Adequate curricular contents and effective teaching strategies have been developed and employed for the purpose of enhancing ecological awareness amongst trainee teachers in teachers’ training institutes in Islamabad.”

It was implied in hypothesis no. 3 that adequate curricular contents and effective teaching strategies have been developed and employed for the purpose of enhancing ecological awareness amongst trainee teachers in teachers’ training institutes in Islamabad. The above stated hypothesis was tested through the questionnaire comprising one hundred questions pertaining to significant and burning ecological issues in detail. In statistical terms, as per the null hypothesis, we could expect no significant difference between pre test and post test of “would be teachers”
after conduct of experiment through teaching of modules especially prepared by the researcher for this purpose. The scores were tabulated in Tables 4.2.1 to 4.2.15 to present the status of research project. The mean score of experimental group in post test (447.7) was significantly high than mean score in pre test (317.15) in the Table 4.2.3. The gain in Post Test raw scores (130.55) of Experimental Group was significantly higher (26.11% increase) as compared to Mean Pre Test score of Experimental Group. Further the t test value (2.92) was calculated which was greater than tabulated t value (2.0) at df (degree of freedom) 60 and significance level of 0.05. The gain of 26.11% was considered significant under prevailing conditions which in turn suggested the rejection of proposed null hypothesis. Rejection of null hypothesis suggests the positive or the alternate statement as under:

“Adequate curricular contents and effective teaching strategies should have been developed and employed for the purpose of enhancing ecological awareness amongst trainee teachers in teachers’ training institutes in Islamabad.”

4.3.4 Hypothesis#4:

It had been suggested in Null Hypothesis no. 4 that:

“Development of adequate curricular contents and adoption of effective teaching strategies will not enhance the effectiveness of trainee teachers in creating ecological awareness amongst their students.”

It was implied in hypothesis no. 4 that development of adequate curricular contents and adoption of effective teaching strategies will not enhance the effectiveness of trainee teachers in creating ecological awareness amongst their students. The above stated hypothesis was tested through the questionnaire comprising one hundred questions pertaining to significant and burning ecological issues in detail. In statistical terms, as per the null hypothesis, we could expect no significant difference between pre test and post test of “would be teachers” after conduct of experiment through teaching of modules especially prepared by the researcher for this purpose. The tabulation of data was split into eleven groups to
assess the awareness level of experimental group. The data was analyzed by making
groups of various environmental issues and as a result tables were drawn from 4.2.5 to
4.2.15. The mean scores achieved by experimental group in all tables were
significantly high than mean scores of control group (see table 4.2.2 to 4.2.15).
Further the t test value was calculated in all tables (4.2.2 to 4.2.15) and it was found
that value of t in each table was greater than tabulated t value (2.0) at \( df \) (degree of
freedom) 60 and at significance level of 0.05. The overall picture of data in each table
was clear that the proposed null hypothesis was rejected as calculated t value is
greater than 0.5 separately in each table (see table 4.2.2 to 4.2.15). The gain in post
test scores of experimental group in Tables 4.2.2 to 4.2.15 was considered significant
under prevailing conditions which in turn suggested the rejection of proposed null
hypothesis. Rejection of null hypothesis suggests the positive or the alternate
statement as under:

“Development of adequate curricular contents and adoption of effective
teaching strategies will enhance the effectiveness of trainee teachers in creating
ecological awareness amongst their students.”

4.4 Qualitative Data Analysis

4.4.1: Environmental sensitively as an agent/ method to invoke quest
for in depth knowledge relating to environmental issues

The environmental education is becoming popular day by day globally. A lot
of environmental issues have been identified globally. Further these issues are global
and in most cases regional or local. The in-depth knowledge is essential to resolve
ecological issues because in-depth knowledge provides a command over issues
towards their solution. For getting in-depth knowledge regarding any subject the
sensitivity towards that subject is essentially required. The environmental sensitively
among individuals can lead to in-depth knowledge about environmental issues. The
environmental sensitivity can also play a vital role in promoting caring attitude
towards environment. There is need to develop environmental sensitivity among
young generation at prior basis. To achieve this goal the environmental education
should be made part of curriculum right from early childhood education. It may be
estimated to enhance the sensitivity of students towards ecology. It should be remembered that student shouldn’t be over burdened. The educational system should not be extra loaded. The syllabus of environmental education should be infused in curriculum in a very light way or with subjects of languages particularly. In Pakistan English language is compulsory right from early childhood education so environmental education can be induced in this subject. Here it is very important to mention that training of teachers from this perspective is essential. A well trained teacher having good knowledge of ecology can serve the purpose in its true spirit. A teacher can build sensitivity towards environment among student easily. By doing this rehearsal regularly the minds of students may be developed to ready for actions towards environmental care. The continuous practice may enhance the quest for in-depth knowledge regarding ecological issues. Although it’s a long term process but it’s not an ending process. It is a process of welfare and quality of life which is basically the teachings of our religion Islam. Further it is not only the teachings of Islam but all religions and philosophies focus on welfare and quality of life of humanity. The researcher concludes that a continuous teaching of ecology in curriculum may create sensitivity towards environment which ultimately may lead to quest of in depth knowledge.

4.4.2: Knowledge of consequences of behaviour (both negative and positive) lead to a personal commitment to issue resolution

The Knowledge about any issue or topic is the basic thing for doing any action either in favour of it or against it. The researcher Hungerford and Volk’s presented a model in 1990 in which they were supporting the concept of environmental education. The both researchers emphasized in their model that consequence of both negative and positive behaviour effect the issue. Further it leads to personal commitment of individuals toward issue resolution. In fact the personal commitment towards any issue shows the interest of the individual. Personal commitment is always developed by building strong concepts over an issue. Then an individual starts thinking about the practical steps towards solution of his problems. Practical steps or behaviour always lead to positive or negative effects. The behaviour towards any issue may lead to either positive effects or negative. Here the awareness plays a vital role. If level of awareness is high regarding any core issue then an individual knows the consequences of its both positive and negative behaviour towards it. That’s why the researcher
supports the infusion of environmental education in a curriculum. First of all it may create sensitivity towards environment through a continuous teaching process. Secondly the students start thinking about their behaviour and its consequences towards environment. Here the quest for in-depth knowledge about environment may develop among learners. The students would be able to estimate the effect of their both negative and positive behaviour. The students may try to overcome negative steps which ultimately result in a reduction of damage to environment. This could lead to personal commitment of individuals also. The highly committed persons would not harm environment. This is the basic environmental philosophy. The student should feel environmental issues as their personal commitments. They start thinking about conservation and preservation in their behaviour. The students not only behave at their own level but they also start providing awareness to family members and other society members too. This would lead to high personal commitment of society towards environment. The researcher concludes that the minds of students must be made clear regarding the consequences of their both positive and negative behaviour towards environment. It can be done only through teachers having skill and knowledge on the subject.

4.4.3: Knowledge of and skills in using environment action strategies as essential agenda for modification of behaviour

Knowledge of and skills in using environment action strategies being an essential agenda for modification of behaviour was included in the objectives of curriculum pertaining to environmental education. This was done in the light of the Hungerford and Volk’s model which is very comprehensive and emphasize mostly in developing a link between knowledge and skills in using action strategies about environment. The model explains the step by step development of behaviour among individuals. Initially the environmental sensitivity should be injected among students right from early childhood education. Then students would be taught to develop skills regarding ecological issues. The students would be able to use skills in their action strategies for the betterment of environment. There is no doubt that behaviour can be modified through a continuous educational process. This logic supports the modification of behaviour of students toward conservation of ecology. It is crystal clear that behavioural changes in one student’s mean the creation of ideas in one family. Here the researcher suggests that environment education should be included in
the objectives of curriculum. It is a modern subject carrying ideas of new era. Further it is included in the agenda of United Nations. The researcher has followed the model presented by Hungerford and Volk in 1990 on responsible environmental behaviour. The environmental education must be made part of education in primary middle and secondary level by following the model. The environmental sensitivity is first step that must be created among students. Then skills should be developed in their behaviour. Then intentions to act to use the skill are essential. It is all possible through planned teaching programs. For achieving all these objectives the most important thing is training of teachers so environmental education must be made part of teachers training programs. The teachers must be aware of the subject in such a manner so that they can transfer true spirit of subject among students. The researcher concludes that the meaning of true spirit means the mode of behaviour through which responsible environmental behaviour may be expected by teachers and students. It may show sensitivity and intentions to act skilfully towards ecological issues individually and collectively.

4.4.4: Personal investment and sense of ownership in projects related to environmental issues increase the quality of behaviour modification?

Personal investment and sense of ownership in projects related to environmental issues increases the quality of behaviour modification. This question is linked directly with theoretical framework of research. The model of responsible environment behaviour (REB) by Hungerford and Volk in 1990 is a comprehensive tool for developing environmental awareness in a society through education. The sensitivity among students towards ecological issues is the first step for achieving sustainability in society. After creating sensitivity the students feel ownership in the issues. They urge for in depth knowledge about issues. Then a quest for in depth knowledge may lead towards skill development among students in their actions and strategies towards environment. Here they may show a sense of ownership about issues. They start thinking about effects of positive and negative behaviour towards environment. They consider the ecological issues as essential part of their life. Consequently students may pay more attention to ecological concerns. With the passage of time through a continuous educational process the ownership may be
converted to empowerment in action and strategies of students. The feeling of ownership towards ecological issues may give sensitivity to student to care for their environment. The above mentioned practices would be expected in the society if environmental education would be made part of curriculum. It is worth mentioning that the role of teachers would be considered as key to success. The skilled teachers would be able to change the overall scenario in the society by invoking awareness to a larger extent. For getting the results the programs should be started practically to provide awareness to teachers. This is a challenging task in Pakistan. Currently a lot of work has to be done by educationists. The steps should be taken urgently to introduce environmental education in B.Ed. and M.Ed. programs in practical manners. The researcher suggests that syllabus of environmental education should be loaded with projects, field trips etc. to invoke quest for knowledge. The behaviour modification would be the ultimate achievement. The personal investment would be related to quality of behaviour modification. The behaviour modification is a tough process and objectives can be achieved through a long term process. It should be kept in mind that the first steps always lead to destiny by taking thousands of steps.

4.4.5: Environmental education contributes to sustainable development of society

The sustainable development of society can be ensured at large scale through environmental education formally. The environmental education is a subject which focuses mainly on preservation and conservation of environment and its components. Land pollution, noise, deforestation, water pollution, air pollution, population growth etc. are core issues which are being discussed globally now days. Due to these issues life is becoming tough on the plant for the human beings. It is directly linked with quality of life too because its roots are interlinked with each other. Further these issues impact directly in behaviour of humans also. These basic issues are addressed on environmental education at large scale and a lot of researches have been conducted on these issues. The quality of life is becoming lower and lower day by day. As a result the revolutionary steps are being urgently required to provide awareness to general public. The campaigns have been launched during last four decades to input environmental awareness in the minds of public. The awareness have been launching
through media and informal education. In some countries the environmental education is being taught formally too. The formal mode of education is a potent source of transferring knowledge and skills. The teaching of environmental education regularly in a curriculum can contribute largely towards the sustainable development of society. The students realize the importance of subject. Further the behaviour of individuals can be developed. They start caring their atmosphere and surroundings. The whole society can be involved in a sustainable development process through environmental education because the process of sustainable development goes down to a single point i.e., at a home level in the society through the participation of students. If thousands of homes start caring environment then fruitful results can be achieved in the society. The researcher concludes that sustainable development process in the society can be accelerated by teaching environmental education action and strategies at regular basis particularly in schools and colleges.

4.4.6: Greater ecological awareness enhances quality of life in Pakistani society

The environmental issues are becoming severe in Pakistan day by day. Consequently the public is suffering from many problems but still the efforts are minor towards solving ecological issues. The reason behind it is that the main source of creating ecological awareness is media and informal education so environmental education is not getting its due status in the society. Further the print and electronic media are not focusing on it regularly. They are paying minor attention to ecological issues. Consequently, the ecological awareness is not getting popularity among masses in Pakistan. Although the quality of life can be vigorously enhanced if environmental awareness would be made part of formal education. A huge number of people would become part of movement of ecological awareness if it would be induced in formal system of education. The basic philosophy is to develop the concept of saving the resources and searching for alternates in future. Further the concept of transformation can also be developed. The proper disposal of garbage can lead to production of electricity. The saving of water can also be source of cheaper electricity. The saline in the lands can be improved by proper plantation. The drinking water can be virus free by using herbs naturally. The process is just like an output of a
computer machine. The small parts are joined systematically to get an enormous output. On the same pattern if people would be ready to add little efforts towards ecological awareness than a huge output can be observed in a society. By creating a chain of small segments of society in systematic way the quality of life can be improved without any doubt but this all would be possible through a well planned and organized environmental education programs in schools, colleges and universities. The researcher concludes that the basic concepts of environmental education can be invoked in the minds of individuals in such a way they should consider it compulsory part of their lives. They practice these ideas in their daily life settings. Consequently, the people would show a good quality of life through their actions. The people would be able to overcome hindrances in promotion of ecological awareness in the society.

**4.4.7: Identifying the agents of change in creating greater ecological awareness in society**

The scholar believes that the teachers would be the best agents of change in creating greater ecological awareness in society. A teacher may interact with huge number of people in the society. Further a teacher may have a full command over students during teaching. So a teacher can easily influence the minds of students. In fact the ecological awareness is considered as one of the essential requirements of the society at urgent bases. The teaching is assumed as a portent source of transferring ecological knowledge to the new generation. The modern teaching methodologies may play a vital role in creating a greater ecological awareness in society. For this purpose the main agent is a teacher whose role is important in all scenarios. The reason behind it is that students follow their teachers and normally believe their teachers blindly. That’s why a well trained teacher and having a good ecological knowledge may shape the minds of students to care for their environment. The main aim is to develop care among students for their environment so that the purpose of neat and clean environment may be achieved. The researcher believes that an individual can start the process in any capacity for change particularly for the ecological awareness but a lot of people are required to achieve destiny. Teachers can be the best source in this regard because they contribute largely towards nation building process. Here is the urgent need to train the teachers according to ecological awareness perspective. In this way results can be achieved in the society about
ecological awareness. Moreover, the most important thing is that a teacher can teach hundreds of students during the entire teaching career. So we may expect to develop ecological awareness among millions of society members through well planned and organized teaching phases. The philosophy behind it is that a teacher may teach fifty students in a year. So during the career of twenty five to thirty years he or she can teach 1250 to 1500 students. In this way a huge masses can be mobilized by thousand of teachers in the society. There is need to design teachers training programs in favour of ecological awareness so that huge number of society members may be able to contribute towards sustainability.

4.4.8: Formal education can be a potent source of developing ecological awareness in society

The formal education can be a potent source of developing ecological awareness in society. In formal education a direct relationship is established between teachers and students. The teachers deliver lectures in a routine through formal education. The teachers interact regularly to students through formal education because course work is always designed and organized properly in formal education. In formal education students attend classes daily and on weekly basis. Further classroom activities are done regularly. The classroom activities are planned in a variety of manners. In this way knowledge is strengthen in the minds of students in a multiple manner. If syllabus of environmental awareness is planned and organized to teach in a regular course work and then it is taught on regular basis, in this way a huge awareness can be expected among masses. The modern teaching methodologies can be implemented to develop ecological awareness like group discussion, project method, concept teaching method etc. By using these modern teaching methodologies, the knowledge can be constructed in a strong manner. The teachers regularly assign projects to students. As a result students put their efforts to complete the assigned projects. During the whole process the teachers may act as facilitator or guide. We observe a strong interaction in formal education between teachers and students. While in informal and non formal education the element of teacher student interaction is missing. As a result students are not motivated strongly for the cause. The required outputs are difficult to obtain through non-formal education because of lack of interaction between teachers and students. The ecological awareness can be developed strongly through formal education in a society. For doing this a
comprehensive plan of action must be developed and implemented in an educational system presently. The society can be made sustainable by making people aware of conservation of their natural environment.

4.4.9: Measures to enhance ecological awareness of trainee teachers will contribute to enhancement of ecological awareness amongst masses

The research maintains that a well planned and organized teaching program in schools and colleges will enhance ecological awareness amongst masses. The teachers will realize the importance of ecological awareness in the society. Further, teachers will deliver the knowledge with high spirit to the students because they realize the importance of the subject. As a result the students follow the instructions in the classroom and subsequently they practice such knowledge and information in their routines. Then actions of individuals may contribute largely to ecological awareness. The general public may start learning about the right ways of disposal of wastages around. This may enhance the aspect of cleanliness in the surroundings. As we know that cleanliness is one of the main issues in our society. Garbage is thrown without any safety measures openly. Then they create panic and smell in the atmosphere which is one of the major causes of producing germs in the environment. By raising awareness amongst masses through formal education a revolutionary tempo may be build gradually in the society about healthy environment. It is one of the issues of quality of life which is being ignored at high level in our country. Many other issues are related with it. Awareness can be raised about using clean water in the homes. As it is not essential for drinking only but clean water is very important for other household purposes too like washing cloths and cleaning of utensils etc. The second example may lead to enhancement of awareness of physical and mental health. We know that this dilemma is crucial presently in more than eighty percent part of our country. We can bring awareness to members of society by putting efforts in a right direction. The environmental education, delivering formally, is a powerful tool to enhance its awareness at large scale in the society. This mission should not be delayed further and measures should be taken at urgent basis to address issue. It is also very important for us to compete with international standards and get good position globally.
4.4.10: Enhancing ecological awareness of trainee teachers would lead to enhancement in the quality of life in Pakistan

The scholar believes that enhancing ecological awareness of trainee teachers would lead to curbing the unchecked practice malpractices such as that of making a soakage pit in one corner of the house. Although the quality of life is a broad subject but here we are discussing it in relation with ecological awareness. The motive is to enhance the quality of life of general public in Pakistan by developing ecological awareness at large in the society. Though this is a new concept for our society but through continues plan of action the targets can be achieved. The plan of action is actually setting a mechanism of enhancing ecological awareness through a process of formal education. The process is to engage the teachers and students for the preservation of environment. Firstly, the teachers should be oriented with the process of ecological awareness in their training courses. At second step, the teachers should deliver the awareness to students in affective manners. The main goal is to involve the families in the process by involving children of families. Consequently, a huge response can be built in this aspect. By developing awareness among students they start managing things properly. They care for their environment because we often observe, especially in Pakistani society, we don’t care for gardens. Gardens are reducing at high level in Pakistan and there is no concentration by government and public towards this aspect. Further the proper maintenance of things is very poor due to lack of awareness and interest. The interest building is very crucial in young generation and it can be done by adding contents of environmental education in syllabus of formal education at all levels. The addition of environmental education in syllabus will be useless if responsibility is given to untrained teaching staff. The training of staff is very important for getting desired results. The researcher believes it is a complete philosophy and can set the minds of new generation. They can start thinking about its applications in real life settings, consequently, we may expect students lead to curbing the unpacked practice of making soakage pits in one corner of the house. The philosophy of environmental education is much closed with the moral values of all religions and societies without any doubt and hesitation.
4.4.11: Participation of community be greatly enhanced by introducing ecological awareness in teacher training curricula and in school curricula

The participation of community would be greatly enhanced from researcher point of view by introducing ecological awareness in teacher training curricula and in school curricula. The main philosophy behind this purpose is to realize the importance of subject to the society. In this way the students realize that the subject is essential part of their life and whatever they study they should practically follow it in daily activities. The subjects which are combined together to make a whole set of curriculum at any level of education in any society are actually focusing on basic philosophy and need of the society. It is clear from here that by making environmental awareness as compulsory subject of curriculum participation of community would be increased largely. A large member of families will be providing environmental awareness through formal education in schools. Further students of primary level are very sensitive but have sharp minds. As a result, they can develop affiliation with the subject which means they should have respect for their environment. The reason behind it is that elements of respect and care may be developed in the society by involving environment education formally. The students may consider it as compulsory part of their life and they can involve their families as a whole in this process. The involvement of society should be made possible. Practical implementation of environmental awareness is only possible through this way. The practical application of environmental awareness can reduce damages in the environment and improve the quality of life at large in the Pakistani society. The common example is the use of pure and natural drinking water because its condition is very poor almost all over the country. By raising awareness campaign through formal educational process, quality of life can be made possible to large number of people cheaply and smoothly.
4.4.12: Inclusion of ecological agenda in teachers’ training institutes curricula

The teachers training institutes are not paying proper attention to ecological awareness agenda, although, the syllabus of environment education has been designed by ministry of education and higher education commission but is still not be implemented in its true spirit. Even it is not being taught at regular basis in teacher’s training institutes all over Pakistan. A very less number of topics are being taught in teachers training programs while these topics carry minor information too. It was strange for the researcher that in Federal area Islamabad, the focus on environmental education was very small. It is not being taught at regular basis. Further the designed syllabus has not been applied fully in most of the institutions. It is a fact that teachers always transfer knowledge to the students and students get not only information but values from their respective training institutes. If teachers are not provided ecological awareness at prior level so it’s impossible to transfer it to students at grass root level. The ecological agenda should be included in teachers’ training institutes. After getting awareness the teachers may transfer their knowledge skillfully to the students. In this way a social mobilization towards ecological awareness may be created. The ecological agenda should be activated in teachers’ training programs at urgent basis because it is not only the need of time but it is essential for updating the curriculum according to United Nations’ charter. The United Nations’ charter is the chief supporter of ecological awareness agenda in the society. For this purpose schools are potent sources to deliver by getting support from curricula. The curriculum can be made effective only when it is implemented through skillful teachers. The teachers can be skilled and informative by adding contents of ecology in their syllabus. Further these contents should be taught in well planed and organized manners. By managing these steps the results can be achieved. To make society ecologically aware is not only the purpose to enhance life quality on the planet but also it is true following of messages of Allah almighty.
4.4.13: Teacher’s training institutes must develop adequate curricular contents

Teacher’s training institutes must develop adequate curricular contents and adopt effective teaching strategies to enhance the effectiveness of trainee teachers in creating ecological awareness amongst their students. The teachers’ training institutes have not developed any syllabus of environmental education in Pakistan. Some efforts have been initiated by ministry of education of Pakistan. They have focused on the development of syllabus of environmental awareness for teachers’ training institutes. Some attention had also been paid on this emerging issue by Higher Education Commission and curriculum wing. The curriculum wing does not exist presently due to its dissolution. The problem in both cases is that after developing a syllabus for environmental awareness the due head could not be paid to the subject. The teacher training institutes or universities had not been forced to make sure the presence of syllabus of environmental awareness in the overall curriculum. Here it is very important to mention that the inclusion of syllabus of environmental awareness in teachers training curricula requires a high level of planning and expertise. The reason behind it the length and breadth of curriculum should not be disturbed. It should not be made hectic and boring for students. Further the students should not be burdened in this aspect. The technicalities should be in consideration while making syllabus of environmental education a part of curriculum. The researcher is trying to overcome the short comings which are present in the system. The teaching of environmental education is also linked with the subject specialists also. The subject specialists are urgently required for the purpose of adequate development of contents in the syllabus. The contents should be in accordance with the emerging ecological issues of Pakistani society. The identification of emerging ecological issues is very crucial and requires high level of expertise and potential. Further these expertises may result in a formation of up to date contents of syllabus.
4.4.14: Identification of emerging ecological issues in Pakistan

The most critical emerging ecological issue in Pakistan is population growth from researcher point of view. The population growth is a vast subject and its impacts are multi dimensional in the society. If population is not controlled at prior basis the quality of life falls rapidly. As the population growth increases the cutting of trees also increases due to fulfil the public demand. The deforestation is a dangerous process because it affects the climate directly. There was 6% forest area in Pakistan around thirty years back while this area is reduced to less than 3% presently. The forests are also helpful in breaking the momentum of floods. That’s why floods couldn’t be controlled during last 20 years in Pakistan. The requirement of water is also enhanced due to population growth. The water is not only used for drinking purpose but also for bath taking, washing cloths and utensils. Water preservation is a challenging issue for Pakistan while numbers of dams are very less. Dams could not be built during last forty years and it is a disaster for Pakistan. Further India has built many dams on Pakistani strategic positions to stop water which is also another alarming factor for Pakistan government and society. The shortage of electricity is another challenging issue in Pakistan. There is an urgent need to develop awareness regarding conservation of water. If we mobilize the nation in this regard we may be able to get cheaper electricity. Further dumping of wastage in a proper manner is also very useful. Electricity can be produced in a cheaper way by using wastage. A huge number of factors are working near to main cities and towns. Their wastage is continuously a source of water contamination and air contamination. The steps should be taken quickly to stop such environmental violations. The efforts should be started to save society from such hazards. The preservation of atmosphere is very important for Pakistani society. Another emerging ecological issue is preservation of wildlife. The chicken is not being breaded on international standards here while steroids are being used to take excess quantity of milk from buffalos. This is extremely harmful for human health. The researcher concludes that the above mentioned ecological issues should be addressed openly in public for awareness and improvement.
4.4.15: Contents required to be developed towards ecological awareness in Pakistan

The contents which have been designed by ministry of education are not comprehensive but require more research and investigations. The civic responsibilities of individuals must be highlighted and given priority in the syllabus. Moreover, the present ecological issues is Pakistani society must be given weight age while developing contents for environmental education for teachers’ training programs. The main target is to add the contents through which living standard should be increased in society. For this purpose the concept of savings in daily life settings should be promoted. The water should be preserved and not wasted without purpose. The garbage should be dumped properly. It is also important to mention here that contents should be updated with passage of time and in accordance with emerging ecological issues of Pakistan. In Pakistan it is essential to focus on urbanization process in education because manpower is transferring from villages to cities. The result is decrease in cultivation process. Presently, the concept of growth of crops without using pesticides and urea is very important. The crops should be grown naturally because it is directly related with human health. The researches have proved that crops grown by using artificial methods and contaminated water is harmful to human health. The contents should be included in syllabus to teach students about the importance of naturally grown fruits, vegetables, wheat etc. The gender equity should be promoted in this regard. This concept may also be helpful in increasing manpower. Further women are driving force in homes and are called first university of children. If minds of women are convinced regarding practicality in society about environmental education then a huge success can be expected in few years of educational process. This concept can also be strongly linked with social change in behaviour patterns with respect to environment. The researcher concludes that addition of contents should be relevant to societal needs. Further the practical involvement of public should be possibly made in a larger context. This can be possible only by continuous and vigilant research process.
4.4.16: Contents and strategies required to be developed towards ecological awareness of trainee teachers as part of B.Ed. and M.Ed. level of education

The teachers training programs are one of the driving forces to bring potential in the society. The trainee teachers can put their efforts in the classrooms to strengthen the concepts of the students. The teachers can make strong concepts among students by creating a revolutionary mode in the society. So the training of teachers must be planned in such a manner that the required outputs can be seen in the field. A plan of activities must be organized in such a way so that concepts of trainee teacher should be clear. The strategies should be developed by the subject experts. The most important thing is the initiative of teachers towards restoration of environment. The teacher should have interest in the subject and understand the depth of the subject. The teachers should be able to deliver clear concepts about ecology. The field trips and surveys are most important. The observation of trainee teachers should be made strong by organizing a set of questions and activities on the spot. The main strategy is to train teachers following the process of practical teaching. The students should be able to develop a garden in the home and then must be conscious about its protection. The group discussion should be managed routinely in which students must be given topics and their practical implication in the society. The group discussions are great source of sharing knowledge and its mode of application in a society. A very important thing is to study the root causes of any issue in the society. If the root causes are addressed properly then issues can be minimized with the passage of time. The curiosity should be developed among student about environment so that students raise questions and should be thinking about new environmental developments. Another important strategy is to develop sensitivity regarding the impact of environmental hazards in the minds of students. The researcher concludes that the environmental issues should be addressed in personal, social and professional lives of the individuals. They can draw a clear line between these and can act accordingly. The most importantly the participation of individuals objectively and enthusiastically can create an ecological revolution in the society ultimately.

4.4.17: Need to design separate courses to develop ecological awareness among students of various levels
There is a strong need to design separate courses to develop ecological awareness among students of various levels. It is strongly related with the cognitive development of the students. As cognitive development of students is a gradual process and is linked with age of students. The students acquire knowledge and information according to their age and cognitive development. It is strongly required the courses of ecological awareness as per their age group. It is basic educational philosophy that students are classified according to their age group. The basic classification is primary level, middle level, secondary level and higher education. Each tiers of education has its own parameters. So environmental education should also be handled keeping in mind the basic philosophy of education. The main purpose of classification of students according to their age is to make concepts convenient for them. The students can grasp knowledge and information easily if it is developed at the level of their cognitive growth. Further the concepts of students can be built strongly if contents of syllabus should be designed accordingly. The same requirements should be needed for developing the syllabus of environmental education. The syllabus of environmental education should be different for primary level, middle level, secondary level and higher education. The most important thing is to develop awareness among students right from their early days of education. Further the concepts should be made clear in an easy way so that students should feel interest and involvement in the environmental issues. The involvement of students should be at top priority in the whole system. For getting this objective the syllabus should be constituted according to age group and cognitive growth of the students. Further it should be most relevant to the society needs. The syllabus should depict the ecological issues of respective society and local needs of public in a certain geographical limits. The development of separate courses of environmental awareness would make it popular and easy to learn for the students of different levels of education.

4.4.18: Availability of subject specialists/ instructors to teach
ecological-awareness-related courses to students at various levels

The availability of instructors or subject specialists to teach ecological awareness in Pakistan is itself an issue. Government has created ministry for environmental awareness from last fifteen years. Many private and nongovernmental organizations are also working on environmental issues. The important thing is that they all are focusing on the scientific aspects of environmental issues. The researches are being done to create knowledge and information about the subject at scientific basis. On the other hand the provision of awareness regarding environmental concerns to general public in our society is very low. For this purpose the teachers training programs can be considered as potent source to deliver awareness to society at broad level. Here the availability of subject specialists and instructors is compulsory so that instructions can be delivered effectively. The potential teachers can be trained for various levels of education through training programs. For this purpose the subject specialists should be required in teachers training institutes. Unfortunately, in Pakistan the availability of subject specialists in teachers training institutes regarding environmental education is almost zero. The availability of subject specialists can enhance the efficiency of programs. A plan of action can be set to arrange subject specialists or instructors in teachers training institutes. For this purpose a concept of public private partnership can be helpful. The subject specialists can be hired initially in teachers training institutes to train potential teachers about subject. These specialists can be taken from organizations which are conducting researchers on environmental issues. Further efforts may be launched to hire specialists from abroad wherever possible keeping in view the financial aspects of the country. It is concluded that hiring of subject specialists and environmentalists in teachers training institutes is very important especially from training point of view of potential teachers. Through this way a quality teaching approach can be expected. Then quality teachers may put high quality in classrooms which may ultimately result a revolution in environmental awareness in the society.

4.4.19: Workshops/ seminars/ conferences to provide awareness on ecological issues at schools, colleges and university levels
Workshops, conferences and seminars play a vital role in promoting awareness on any issue or topic. Through this way the importance of issue to a general public can be injected in the society. The conduction of seminars, conferences and workshops are very effective in mobilizing the society on any issue. For this purpose, the awareness regarding environmental issues can be enhanced by routinely conduction of workshops, seminars or conferences. In this way the society pays heed and realize the positive and negative aspects of the issue. Unfortunately, the case is reverse in Pakistani society. The conduction of workshops or seminars or conferences are very less in number as compared to societies of developed countries. The university education is the highest level of education, even at that level awareness is very less and awareness building measures are not being taken yet. The universities are considered as strong platform to organize workshops or seminars to raise environmental awareness. Through universities the colleges can be mobilized and through colleges the concepts can be transferred to schools. In Pakistan the concept is still to build at university levels. There is still no urge in universities to address the environmental issues at prior level by routinely conduction of workshops seminars and conferences. If the momentum can be build at universities and teachers training institutes regarding environmental awareness then it can be transferred down to colleges and schools. The researcher concludes that workshops or seminars or conferences are not being routinely held in universities, colleges or schools. There is still no attention being shown to the ecological issues. For this purpose, the momentum should be started from universities at urgent basis. By building the concepts of university students the colleges and schools can be mobilized. In this way a huge mob can be made aware at high level about ecological issues. This may result the improvement in the environment by making it more green, neat and clean. It is earnestly required to manage workshops, seminars and conferences on environmental issues routinely in educational institutions in Pakistan.

4.4.20: Effectiveness of awareness development programs

The awareness development programs always play a key role in concept building process. Basically these are organized to mobilize the society on a particular subject or issue. The awareness development programs have shown positive results in
developed countries. The developed countries have given weight age to environmental issues through legislation process in their respective constitutions. Then society realizes the importance of issue and subsequently ready to address it at prior basis. For doing this the awareness programs on ecological issues are being launched continuously. Researchers have shown huge interest in ecological issues. Many issues have been investigated globally on ecological concerns. Green peace is a very famous organization around the world. They raise voice peacefully in the world in favour of natural climate. They have launched worldwide ecological awareness programs. As a result of struggle of many organizations globally like Wildlife Conservation International and Green Peace, they have got the intentions of world leaders towards ecology. Further ecology has been added in United Nations charter from last forty years. Now the debate is open all over the world regarding conservation of ecology. It is expected around the globe through all nations on the earth to follow international rules and regulations about environment and its issues. Although it’s a pain taking process and requires consistency and fluency in targets. But time has proved that continues efforts have shown their results and improvement is expected in future. The researcher concludes that if momentum is build up in a serious way in Pakistan with same spirit as being done internationally, then fruitful results may be expected in future. This is very crucial initially but continuity and consistency in efforts may show results in favour. The world is far ahead in building ecological aware society as compared to Pakistan. This has been done only through continuously organizing awareness development programs. If footsteps will be followed there is no doubt that positive results can be taken in Pakistani society too.

4.5 Reliability of the Questionnaire

1. The reliability of questionnaire was tested by applying Cronbach’s alpha coefficient. Cronbach's alpha coefficient (also known as the coefficient alpha technique or alpha coefficient of reliability) is a test of reliability as internal consistency (Cronbach, 1951). The questionnaire comprised 100 questions in which
50 questions were narrated as positively while remaining 50 questions were stated in negative mode. By using Likert scale the positive statements were marked as 5 to 1 (strongly agree to strongly disagree) while negative statements were given 1 to 5 (strongly agree to strongly disagree). The split half method was used to apply Cronbach’s Alpha test to derive the reliability. For achieving this purpose, the fifty positive and fifty negative statements were bifurcated to check the reliability of whole questionnaire. The calculated value of Cronbach’s Alpha Coefficient was ‘0.815’ which was near to 0.8 and it was considered as good reliability so the questionnaire was reliable in good manners to re-use in future under identical conditions.

2. The questionnaire was then divided into 11 segments to measure the awareness level of respondents in different categories of knowledge of environmental science. The values of Cronbach’s Alpha for each segment of questionnaire were calculated separately to check the reliability (Bench 4.2.5 to Bench 4.2.15). It was proved that items in the questionnaire were related strongly with each other. On the basis of data generated it was deduced that 100 questions in the questionnaire are co-related with each other, moreover, the questionnaire was reliable segment-wise to re-use in future under identical conditions.

3. The gains made by the experimental process as a result of the treatment, that is, the teaching conducted as part of the experiment was subjected to ‘t’ test. The data was subjected to ‘t’ test to develop a re-assurance that the questionnaire would not generate more than 5% error if re-used in identical circumstances. The calculated ‘t’ value (2.88) was greater than tabulated ‘t’ value (2.0) from t table at df(60). It is, therefore, considered that the questionnaire is reliable for re-use in identical conditions. It is assured that this test developed by the scholar would not generate more than 5% error due to internal factors in any future use in identical testing conditions. The teachers and researchers are however cautioned that they must keep the limitations and the geographic boundaries of the study in view when reusing this questionnaire and modify the test as per local dictates.

4.5.1 Validity of the Questionnaire

The validity of the questionnaire was attained by subject specialists and educationists to valid the process of data collection and interpretation. (Annexure ‘C’)
CHAPTER 5

SUMMARY, INFERENCES, CONCLUSION
AND RECOMMENDATIONS

The following chapter presents the summary of the whole research project. The inferences drawn from qualitative analysis and quantitative discourse shall be elaborated. The discussion of inferences shall lead to conclusions which in turn shall form the basis of recommendations intended to serve as guideline for future action towards social reconstruction. Recommendation shall be made on future researches undertaken on similar lines to improve the drills recommended herein towards enhancement of “Environmental Awareness” amongst teachers, students and society at large.

5.1 SUMMARY

The research was undertaken to develop the awareness level of Environmental Education at tertiary Level Education in Islamabad Metropolitan, the capital city of Pakistan. Review of Literature brought sharp focus on international and non-governmental processes currently underway to enhance awareness of environmental awareness. As per the Hungerford model that guided this research, the research stressed the need for environmental through regular curricular teaching. Such education is a popular subject all over the world. The efforts to create awareness on environmental concerns are progressing well in developed world.

Enormous research work has been done in this field in pursuance of Millennium Goals. The gigantic task includes the effort by states under the charter of United Nations and its allied organizations to create higher level of Environmental Awareness globally. It is believed strongly in the United Nations that the ownership of the task of creating
awareness of environment or climate change should be transferred from international scenario to national, local and community levels all over the world without any discrimination. For achieving this target the process of generating environmental awareness should be made easy by converting the colossal subjects of environmental education into easy concepts which can be opted and followed in daily life routines to protect the environmental hazards at local cum community levels. To spread the awareness at bottom level in communities, it is recommended to make it compulsory part of education from primary level but with the stipulation that the real spirit of concepts should be transformed through teaching process. Keeping in view the enormous effort required for achievement of this goal, the scholar chose the teachers as change agents and laid emphasis on training of teachers on regular basis from the perspective of environmental education.

United Nations favours Environmental Education at Tertiary level. This consideration coupled with scholar’s own preference to make this task part of his doctoral effort led the researcher to choose this particular topic that aimed to develop environmental awareness at tertiary level education hoping that trainee teachers, once properly indoctrinated in awareness issues, shall act as agents of change and transform their students at school level. The objectives of research were accordingly formulated. In order to cure the existing situation regarding environmental awareness education through improvement of regular existing training programs, the existing curriculum was examined. Having assessed the shortfalls vis-à-vis the need, development of modules was initiated that were specifically aimed at developing environmental awareness amongst trainee teachers.

At this stage guidance was sought from research done abroad. A comprehensive review of literature was initiated to learn from the research work already done in the field of environmental education especially from the perspective of generating awareness through teaching-learning processes. The essence of foreign research became the guiding light for the development of curricular material in the shape of modules that form part of this research as an appendix. The class experiment consisted of (1) teaching the modules; and (2) assessing the gain made by the trainee teachers which was attributable to teaching and teaching alone thus assuring the researcher that the modules, if taught as per the established principles of pedagogy, would sensitize the students and successfully create amongst them awareness of environmental concerns.
The curricular modules were designed under the pedagogical guidelines provided by Robert S. Zais (1976) *Curriculum: Principles and Foundations*. The contents of the syllabus were enriched with global, national and local issues. The class experiment followed the testing procedures advised by Best and Kahn (1999) *Research in Education*. The capital territory Islamabad was delimited for the conduct of experimental study. The Tertiary Level education in teaching is being delivered in three public sector universities in Islamabad. Further, Federal College of Education is responsible for developing teachers training programs. In private sector, teachers training programs are available under the charters of Sarhad University, Gujrat University, Sargodha University and Open University. The Federal College of Education was selected to conduct the experiment. Five teachers training programs are being offered in the said college which are (1) M.Ed., (2) B.Ed., (3) M.A. Education, (4) B.S.Ed., and (5) B.A. Ed. The researcher selected the M.Ed. program which is traditionally considered as the leading teachers training program for senior teachers and professionals. Permission was obtained to teach the M.Ed. class in Federal College of Education through Secretary Education in Capital Administrative Division (CAD). The modules were taught by the researcher himself on account of familiarity with the concepts of Environmental Awareness. A pilot study was initiated during time period of three months from March’2013 to May’2013 in M.Ed. class. The strength of sixty two available trainee teachers was divided equally into one control group and experimental group of 31 students each.

A questionnaire was prepared to assess the sensitivity level of participants towards environmental issues. Pre test was conducted before the commencement of experiment and post test after completing the teaching phase. The modules were improved by the researcher in the light of feedback from the pilot study. The shortcomings were overcome through modification of contents. The department of Environmental Sciences in ARID University was consulted for expert opinion throughout the process of developing and upgrading of modules. The second and final teaching phase was planned and conducted during December 2013 to February 2014. The comprehensive questionnaire (carrying 100 questions, 50 positive and 50 negatively matched statements respectively of 25 important topics) was applied to test the reliability of the whole research process. The data thus obtained was analysed to assess gain attributable to treatment, that is, teaching of modules. The arithmetic mean of raw scores were calculated and comparisons were drawn between results of
experimental group and control group. The observations indicated that sufficient level of awareness was generated as overall raw scores of experimental group were significantly higher as compared to control group. It was considered that the gain made was attributable solely to the teaching of modules.

For the purpose of analysis, the questionnaire was split into eleven groups representing essential topics. It was revealed that, having started at identical entry level, the performance of experimental group was significantly higher than the control group at post test level which suggests success of the chosen strategy of teaching environmental concerns to trainee teachers with a view that they would in turn sensitize their students at secondary level. Further, it can be expected that school children would carry these concerns with them to their homes and eventually the entire society would generate at least some environmental awareness. The inferences were drawn on the basis of analysis of available data.

The four suggested null hypotheses were prosecuted in the light of analysis of quantitative data. As inferred in Chapter IV in the light of various data tables, the outcome suggested rejection of null hypotheses. As a consequence of rejection of null hypotheses, the alternative hypotheses were suggested for adoption.

The inferences from various data tables are elaborated below. These would in turn lead to conclusion and recommendations. Finally, recommendations would be drawn for the future researches to be conducted on this subject.

5.2 INFERENCES

The inferences drawn from the study are presented in the two sub-sections below (1) inferences drawn from quantitative data analysis; and (2) those drawn from qualitative analysis.

5.2.1 Inferences drawn from Quantitative Data Analysis
1. The performance level of experimental group and control group were almost identical at the pre test level before the conduct of the class experiment (Bench 4.2.1). The awareness level of both groups being at same level before commencement of the teaching process, the readings at the post test level are coordinated and referred to the same datum.

2. The awareness level of both the experimental group and the control group was rather low at pre test level as evident from the fact that most items of the questionnaire were responded to using “Neutral” option (Bench 4.2.1).

3. The performance level of the experimental group was significantly higher than control group after the conduct of class experiment as evident from the fact that the arithmetic mean of raw scores of the experimental group was significantly greater than the mean raw score of the control group (Bench 4.2.2). The gain in raw scores marked by the experimental group testifies to the fact that the class experiment achieved its objective, in that, the treatment given to that particular group generated awareness of environmental issues amongst the participants. By comparison gain shown by the control group from pre test to post test was minor and insignificant and attributable to socialization amongst the students.

4. The comparison of performance between pre test and post of experimental group showed significant gain (Bench 4.2.3). The gain shown by the control group being negligible points to the fact that the gain made by the experimental group is attributable solely to the treatment i.e. teaching of the modules prepared by the researcher for this purpose. Hence, the conclusive evidence to researcher’s proposition that teaching of environment-related contents in a classroom through regular instructional courses will generate awareness of those concerns that form part of the contents.

5. The contents were split into sections representing sets of related concepts. The data was analysed section-wise accordingly. Questions number 1, 11, 19, 43, 58, 82, 90 and 100 measured the environmental awareness of basic ecological concepts (Bench 4.2.5). The gain made by the experimental group in the aforementioned segment of questionnaire was considerably higher than the gain shown by the control group marking the success of the experimental study in the sub-domain of basic concepts.
6. Considerable gain was likewise marked in the scores of post test of experimental group in subsection consisting of questions number 12, 14, 24, 34, 67, 77, 87 and 89 covering Water Pollution (Bench 4.2.6). The attainment of experimental group in the aforesaid segment of questionnaire was significantly higher than the control group by depicting the achievement of the experimental study.

7. A remarkable difference was testified in the results of post test of experimental group vis-à-vis questions number 5, 27, 40, 48, 61, 74, 95 and 96 to representing environmental awareness in respect of Air Pollution (Bench 4.2.7). The accomplishment of experimental group in this segment of questionnaire was noticeably higher than control group.

8. Noteworthy difference was recorded in the results of post test of experimental group pertaining to questions number 9, 18, 28, 32, 36, 65, 69, 73, 83 and 92 relevant to Deforestation, Water management and Waste management (Bench 4.2.8). The gain in score obtained by experimental group in this section of questionnaire was prominently higher than control group marking the achievement of the objectives of experimental study.

9. Significant gain was evaluated in the results of post test of experimental group comprising of questions number 8, 10, 16, 22, 79, 85, 91 and 93 towards Agriculture and Biodiversity (Bench 4.2.9). The obtained score of experimental group in the aforementioned division of questionnaire was outstandingly higher than control group marking the success of the experimental study.

10. A vital difference was calculated in the results of post test of experimental group comprising of questions number 2, 4, 13, 17, 49, 51, 52, 84, 88 and 97 testifying the gain in environmental awareness regarding Population and Urbanization (Bench 4.2.10). The score obtained by experimental group in the aforementioned subdivision of questionnaire was exceptionally higher than control group establishing the success of the experimental study.

11. Notable difference was tabulated in the results of post test of experimental group consisting of questions number 25, 29, 31, 38, 41, 60, 63, 70, 72 and 76 marking gain in the environmental awareness in respect of vital issues Ecological Cycles (Bench 4.2.11). The mean score of experimental group in
this portion of questionnaire was much higher than the control group verifying the success of the subsequent experimental study.

12. A prominent difference was observed in the results of post test of experimental group consisting of questions number 15, 20, 21, 26, 44, 57, 75, 80, 81 and 86 relevant to the environmental awareness of Food management, Hunger and Rights of Native People (Bench 4.2.12). The score achieved by experimental group in the aforementioned sector of questionnaire was higher in a prominent way than control group by proving the success of the experimental study.

13. Momentous difference was generated in the results of post test of experimental group consisting of questions number 3, 33, 35, 42, 50, 59, 66, 68, 98 and 99 gauging the environmental awareness in the potent field of Policy Management and Environmental Protection (Bench 4.2.13). The post test score of experimental group in this segment of questionnaire was higher by a tall margin than the control group by recording the success of the experimental study.

14. A large difference was noted in the results of post test of experimental group comprising questions number 6, 7, 30, 46, 53, 55, 71 and 94 to weigh the environmental awareness in respect of the gigantic ecological issue regarding Effects of Industrialization (Bench 4.2.14). The observed results of experimental group in the aforementioned sub-section of questionnaire were considerably higher than the control group showing the success of the experimental study.

15. The evident difference highlighted in the results of post test of experimental group including of questions number 23, 39, 45, 47, 54, 56, 62 and 78 pertaining to essential ecological issue of Wild Life Protection (Bench 4.2.15). The results of experimental group in the abovementioned segment of questionnaire were remarkably higher than control group highlighting the success of the experimental study.

16. On the strength of above inferences, quantitative evidence suggested rejection of the null hypothesis \( H_0 \) which read, “There is no relationship between ecological awareness amongst masses and sustainable development of Pakistani society” (Bench 4.2.3). Rejection of \( H_0 \) suggests the affirmation of alternative hypothesis \( \text{viz.} \) “There is a strong relationship between ecological awareness amongst masses and sustainable development of Pakistani society.”
It is deduced in the light of the experiment conducted as part of this study that, by developing a mechanism for generating environmental awareness in the Pakistani society through a regular school-based educational process, the achievement of the elusive target of sustainable development is possible; and that this would contribute directly to raising of the living standards of our masses and attainment of Millennium Goals declared by the United Nation.

17. The null hypothesis $H_0^2$ read “There is no relationship between the ecological awareness of trainee teachers and enhancement in the quality of life in Pakistan.” The inferences linked teaching of environment-related contents at tertiary level with generation of environmental awareness, and through school level students, diffusion of awareness in the society at large eventually resulting in improvement in quality of life (Bench 4.2.2). The inference suggested rejection of null hypothesis $H_0^2$ and consequently adoption of the alternative hypothesis which proposed, “There is strong relationship between the ecological awareness of trainee teachers and enhancement in the quality of life in Pakistan.” The study accordingly expounds that the quality of life in Pakistan can be enhanced significantly by promoting ecological awareness among trainee teachers through a well planned and executed teachers training programs.

18. The null hypothesis $H_0^3$ proposed, “Adequate curricular contents and effective teaching strategies have been developed and employed for the purpose of enhancing ecological awareness amongst trainee teachers in teachers’ training institutes in Islamabad.” $H_0^3$ was rejected on the basis of data (Bench 4.2.1, 4.2.2 and 4.2.3) and therefore the alternative hypothesis was affirmed as “Adequate curricular contents and effective teaching strategies have not been developed and deployed for the purpose of enhancing ecological awareness amongst trainee teachers in teachers training institutes in Islamabad.” It was evident after teaching the modules of Environmental Awareness twice in the research study that by developing and implementing adequate contents along with effective teaching strategies, the level of awareness amongst trainee teachers can be enhanced at large scale, which ultimately leads towards the practices of preservation and conservation of ecological sustainability. However no such strategies were observed in concerned institutes.
19. The null hypothesis $H_0^4$ suggested, “Development of adequate curricular contents and adoption of effective teaching strategies will not enhance the effectiveness of trainee teachers in creating ecological awareness amongst their students.” The hypothesis was rejected on the basis of data (Bench 4.2.5 to 4.2.15). Accordingly the alternative hypothesis was affirmed which read, “Development of adequate curricular contents and adoption of effective teaching strategies will enhance the effectiveness of trainee teachers in creating ecological awareness amongst their students.” It was empirically observed after the successful completion of the teaching phase that trainee teachers were enabled to effectively indoctrinate the subject of Environmental Awareness into their respective students if adequate curricular contents were made available and updated regularly and effective teaching strategies were incorporated in teachers training programs. The scholar found the curricular contents developed by him most effective for this purpose and recommends that these may be adopted by teachers training institutes for the intended purpose.

5.2.2 Inferences drawn from Qualitative Data Analysis

The following inferences are drawn from analysis of qualitative factors as discussed in Chapter IV in fuller detail:

1. Environmental sensitively should be seen as an agent/ method to invoke quest for in depth knowledge relating to environmental issues

   The environmental sensitivity can play a vital role in promoting caring attitude towards environment. There is a need to develop environmental sensitivity among young generation at priority basis. To achieve this goal the environmental education should be made part of curriculum right from early childhood education. The
researcher concludes that a continuous teaching of ecology in curriculum would create sensitivity towards environment which ultimately may lead to quest of in depth knowledge.

2. Knowledge of consequences of behaviour (both negative and positive) leads to a personal commitment to issue resolution

The researcher Hungerford and Volk’s model of 1990 presents the concept of environmental education. The researchers emphasized that consequences of both negative and positive behaviour affect the issue. Further, it leads to personal commitment of individuals toward issue resolution. This research concludes that the minds of students must be made clear regarding the consequences of their both positive and negative behaviour towards environment. It can be done only through teachers having skill and knowledge on the subject.

3. Knowledge of and skills in using environment action strategies is an essential agenda for modification of behaviour

Knowledge of and skills in using environment action strategies is an essential agenda for modification of behaviour. Environment education should be included in the regular curriculum. Students’ behaviour should reflect sensitivity towards environmental concerns and intentions to acquire and use skills towards ecological issues individually and collectively.

4. Personal investment and sense of ownership in projects related to environmental issues increase the quality of behaviour modification

After acquiring sensitivity towards environmental concerns, the students must feel ownership in this regard. They should consider working to resolve the ecological issues as essential part of their life.

5. Environmental education contributes to sustainable development of society

Land pollution, noise, water pollution, air pollution, population growth etc. are core issues which impact the behaviour of humans directly. Revolutionary steps are required to provide awareness to general public. The teaching of environmental education regularly as part of the curriculum can contribute largely towards the sustainable development of society.
6. Greater ecological awareness enhances quality of life in the society

The environmental education is not getting its due status in the Pakistani society. Further, the print and electronic media are not focusing on it seriously. The quality of life can be significantly enhanced if environmental awareness is made part of formal education. People would be able to overcome hindrances in promotion of ecological awareness in the society.

7. Identifying the agents of change in creating greater ecological awareness in society

The scholar believes that the teachers would be the best agents of change in creating greater ecological awareness in society. A teacher has full command over students during teaching. So a teacher can easily influence the minds of students. There is need to design teachers training programs and contents in favour of ecological awareness so that large number of society members may be able to learn and contribute towards sustainability.

8. Formal education can be a potent source of developing ecological awareness in society

In formal education a direct relationship is established between teachers and students. A comprehensive plan of action must be developed and implemented to make people aware of the importance of conservation of their natural environment through dedicated efforts at regular schools and colleges.

9. Measures to enhance ecological awareness of trainee teachers will contribute to enhancement of ecological awareness amongst masses

A well planned and organized teachers training programs in teachers training colleges will enhance ecological awareness amongst the teachers, and through them awareness will spread amongst the students. The students will carry these lessons home. The parents, siblings and eventually the general public would learn about the right ways of caring for environment.

10. Enhancing ecological awareness of trainee teachers would lead to enhancement in the quality of life in Pakistan
The scholar believes that enhancing ecological awareness of trainee teachers would lead to curbing the unchecked malpractices such as that of making a soakage pit in one corner of the house. The message will be popular as the philosophy of environmental education is in accord with the moral values of our religion.

11. Participation of community would be greatly enhanced by introducing ecological awareness in teacher training curricula and in school curricula

The participation of community would be greatly enhanced by introducing ecological awareness in teacher training curricula and in school curricula. By making environmental awareness a compulsory subject of curriculum, participation of community would be increased largely. Students of primary level have sharp minds. They can learn to care for environment with relative ease.

12. Inclusion of ecological agenda in teachers’ training institutes curricula

The teachers training institutes are not paying proper attention to ecological awareness agenda. Even though, a syllabus of environment education has been designed by the Higher Education Commission but is still not being taught on regular basis in teacher’s training institutes. It is essential to update the curriculum according to United Nations’ charter and add skills and information by adding contents of ecology in the syllabus.

13. Teacher’s training institutes must develop adequate curricular contents

Teacher’s training institutes must develop adequate curricular contents and adopt effective teaching strategies to enhance the effectiveness of trainee teachers in creating ecological awareness amongst their students. Services of subject specialists are urgently required for the purpose to update the contents in the syllabus in accordance with the emerging ecological issues of Pakistani society.

14. Identification of emerging ecological issues in Pakistan

The most critical emerging ecological issue in Pakistan is population growth, the cutting of trees, clean drinking water, conservation of wildlife and use of steroids in food and fodder given to chickens, buffaloes and chicken which must be addressed forthwith.
15. Contents required to be developed towards ecological awareness in Pakistan

The contents designed by the Ministry of Education are not comprehensive. The civic responsibilities of individuals must be highlighted and given priority in the syllabus. Pressing ecological issues in Pakistani society must be given weight such as urbanization and transfer of population from villages to cities.

16. Contents and strategies required to be developed towards ecological awareness of trainee teachers as part of B.Ed. and M.Ed. level of education

The training of teachers must be planned in such a manner that the required outputs can be activated in the field. The teacher should have interest in the subject and be able to deliver clear concepts about ecology. The field trips and surveys are most important. The observation of trainee teachers should be strengthened by organizing a set of questions and activities on the spot. The students should develop a garden at school and develop consciousness about its protection.

17. The need to design separate courses to develop ecological awareness among students of various levels

There is a strong need to design separate courses to develop ecological awareness among students of various levels. It is strongly related with the cognitive development of the students which is a gradual process linked with age of students. Courses of ecological awareness should be developed as per their age group at primary, secondary and higher education. The syllabus should depict the ecological issues of respective locale within certain geographical limits.

18. Availability of subject specialists/instructors to teach ecological-awareness-related courses to students at various levels

The availability of instructors or subject specialists to teach ecological awareness in Pakistan is itself an issue. The potential subject teachers can be trained for various levels of education through specific training programs. These specialists can be hired from organizations which are conducting researches on environmental issues.
19. **Workshops/ seminars/ conferences to provide awareness on ecological issues at schools, colleges and university levels**

Workshops, conferences and seminars play a vital role in promoting awareness on any issue or topic. The conduct of seminars, conferences and workshops are very effective in mobilizing the society on any issue. The universities should take lead and organize workshops or seminars to raise environmental awareness.

5.2.3 **Classroom Experience**

1. The experiment was conducted for the period of three months in both phases that is pilot testing and final study. The study was planned to equate a single semester study course. The modules were developed accordingly. The important observation of the researcher was that the semester course was enough to generate the Environmental Awareness in the “Would be Teachers” but with the observation that the subject must be made compulsory part of teachers training programs.

2. The researcher tried to control difficult situations during the conduction of teaching phases but naturally it was not possible in real life settings. The M.Ed. class was selected to deliver teaching materials. The basic criteria for admission in M.Ed. was only the degree of B.Ed. anyhow most of the students belonged to social sciences background but some had natural sciences background too. Thus a minor difference was observed in the understanding level of concepts of students during class participation as students having natural sciences background were better than social sciences background.

3. The strength of M. Ed. class was bifurcated into two groups *viz.* experimental group and control group. The thirty one students were put in each group but the challenge was to make the both groups equal competency wise. For this purpose the results of last college exam was used to divide class into two groups almost on equal grounds “potential wise”. The students were categorized into “above average”, “average”, and “below average”.
Subsequently, students from abovementioned three categories were placed in both groups equally. The criterion was as under:

Above average: Above 75% marks in last college exam
Average: Below 75% and Above 50% marks in last college exam
Below average: Below 50% marks in last college exam

4. A strong observation was recorded that maximum students were not aware of the basic concepts regarding Environmental Awareness during the conduction of pre test in both groups. The participants were eagerly asking about the nature of the subject. Later on it was observed that students of experimental group participated actively in the class trial by showing their maximum interest. Moreover, the students in the control group were also showing eagerness in the teaching learning process of Environmental Awareness. As students from control group were inquiring about the nature of subject from the researcher and students of experimental group throughout the conduction of class trial.

5. It was beyond the control of the researcher to stop control group from being inquisitive about the subject of environmental awareness. A lot of information is available online and internet access is not an issue in present era. Interaction between students of the experimental group and the control group could not be suppressed either.

6. It came into observation that students in experimental group participated actively but 100% involvement was not possible naturally due to human factors. The students were having their personal issues also like in natural settings. There were some students who couldn’t maintain the attendance properly even there were a typical low interest level of below average students in the class.

7. The level of understanding of students was different regarding different topics of the subject. For example topics like “Population and Urbanization, Air Pollution, Water Pollution, Food & Nutrition, Deforestation” were very interesting for them while in some subjects like “Agriculture and Biodiversity” the students felt difficulty in understanding concepts.

8. The modern teaching methods were practised during the teaching phases. The important teaching strategies were concept teaching, group discussion, assignment method, presentation method, project method and question answer
sessions. The aforesaid teaching strategies were very helpful in developing sound understanding of the Ecological concepts. The analysis at the completion of teaching experiment regarding Environmental Awareness was that the aforementioned teaching techniques were very effective in clarifying the concepts of the students comprehensively.

9. The group discussion was especially very popular among students as the researcher observed the peak level of interest of students during the conduction of group discussion. It was very helpful in building creative thinking process. The varieties of ideas were pooled during the discussion processes regarding the solutions of local cum national environmental issues. It was very interesting to observe as a researcher that effective and practically possible solutions were suggested by potential teachers involving in group discussion regarding local hazardous of environment keeping in view the ground realities of a particular area.

10. Field trips and excursions are very important teaching methods to upgrade the Ecological knowledge of the students. The two field trips were proposed during the conduction of teaching phases but due to non avoidable circumstances the management of Federal College of Education was not willing to allow such field trips. Consequently, the study tours were not arranged as morally and ethically the researcher was bound strictly to follow the instructions of the host institution that was facilitating the experimental conduction. Although the denial of field trip was a discouraging factor for the researcher and students too particularly but determinations were shown during the whole teaching process to continue concrete efforts to introduce alternates for maintaining the motivation level of the “would be teachers” which was resultantly a great achievement for the success of experimental study.

11. The Questions-Answers sessions were always very fruitful in promoting in-depth knowledge about the subject. It was a potent tool to get feedback regarding motivation level of participants. The feedback was “above satisfactory” level as the “would be teachers” was very enthusiastic in responding the questions and asking the critical questions. The critical questions were very informative in setting the positive trends in the class and helpful in upgrading the daily lectures. The observations were recorded that majority of students were showing interest to ask inquire regarding the
environmental hazardous at their community level. The “intentions to act,” the term indicated in the model of Responsible Environmental Behaviour by Hungerford and Volk in 1990, the said model being the base of the study, described an important aspect to consider while inquiring critically the solutions for ecological hazardous in their respective surroundings. The continuous teaching process may set the trends in individuals to think about practical steps seriously in daily routines for the improvement of surroundings.

12. The subject of Environmental Awareness was not a regular part of studies at the institute so it was a challenge for researcher to assign home tasks as generally the students couldn’t concentrate on such assignments and consider it over burden in case of non credit hours but the case was opposite here. The short assignments were awarded individually to every student and the responses were positive from maximum participants which was a great source of encouragement for the researcher. The assignments were awarded by making groups in the class and the focus was only to assess the awareness of students on their respective environmental issues at community level. The outcomes were according to expectations of the researcher as assignments were completed by putting full interest in them. The solutions were near to ground reality which was a solid proof towards an important aspect in the model of Responsible Environmental Behaviour by Hungerford and Volk 1990 “A personal commitment to issue resolution”. By making Environmental Awareness as regular subject of Tertiary Level of Education, a huge mob could be possibly prepared to bring the improvements in their surroundings by removing negligence towards Ecological Sustainability.

13. The Concept Teaching method was practised at beginning of the lectures to build the strong foundation of M.Ed. class as the temperament of subject was entirely new for the whole class. The conceptual understanding was developed by breaking basic concepts into small fragments to make them clear and easy for students. Consequently, due to aforesaid teaching tactics the researcher was able to fabricate a sturdy base of the subject which was utilized in other teaching practices. The innovative thinking process was gained entirely to strengthen the research project.

14. The Environmental Sensitivity was enhanced up to a certain extent at the completion of successful teaching phase. The students of M.Ed. class
determined serious concerns regarding their respective local cum national Environmental issues. The achievement was marvellous in a limited time frame as the results of nonstop teaching process in tertiary education would contribute gigantic contribution towards “sensitivity of environment” which was mentioned as initiating point in Responsible Environmental Behaviour by Hungerford and Volk in 1990.

15. The project method was highly helpful in building motivation towards practical steps among participants of the study. The aforesaid method led the “would be teachers” to one of the very important dimension of Responsible Environmental Behaviour by Hungerford and Volk in 1990 “knowledge and skills in using environmental action strategies”. The small fragments practically were highly effective in conveying society the need and importance of ecological preservation and conservation. The observations were documented that such teaching tactics were fruitful in enhancing confidential level of “would be teachers” to inculcate the ecological concepts efficiently in future to their respective students. As a result a lot of society members would be trained by a single teacher which would lead ultimately to huge mobilization in the community and vice versa.

16. “The personal investment in issues and environment” was an important variable in Responsible Environmental Behaviour by Hungerford and Volk in 1990 and due to it a strong mechanism of advocacy would be determined to mobilize the community for environmental protection at local level. It was deduced at the completion of teaching process that the abovementioned indication was achieved upto certain extent as there were some limitations in teaching process just like time constraint and non credit hours for the subject. A regular teaching process of Environmental Awareness would contribute towards the advocacy for ecological sustainability within the members of the society through well planned and organized educational processes. Due to brainstorming with the help of teaching process the personal investment would be possible by a large number of people in society.

17. “To pin point emerging ecological issues in Pakistan” the said objective was achieved comprehensively by discussing ecological issues in class trial thoroughly. The water management, deforestation, population and urbanization, energy resources, agriculture, biodiversity, wild life protection
etc were discussed with “would be teachers” and resultanty the solutions for such issues were proposed in the projects, assignments presentations etc. It is very important to mention here that the designed curriculum was entirely new for the learners but their interest was high because the subject matters were near to real life settings and due heed was given by the “would be teachers” to suggest solution of ecological issues at national cum local level. The efforts were done to develop an insight regarding environmental issues by maintaining the interest of the participants throughout the teaching process.

18. “To develop an outline of contents that may be included in the curriculum of trainee Teachers to enhance their ecological Awareness” the said objective was proved by developing an outline for the curriculum of Environmental Awareness. The curriculum was valuable to enhance ecological knowledge of the students which was highlighted in the group discussions, presentations, assignments etc. The continuous curriculum implementation of ecological awareness in teachers training programs was a great source to develop a momentum of environmental preservation at national cum domestic level and the aforesaid objective was achieved convincingly during the experimental study. Another very important aspect was also determined at the completion of experiment that the valuable cum proficient goal could have been possible only due to well train cum competent and professionally sound teachers/instructors.

19. “To highlight the need for holding of workshops/seminars/conferences held routinely at schools, colleges and university levels to provide ecological awareness in society” the purpose of aforesaid objective was to analyse the existing conditions of conduction of workshops/seminars/conferences in educational institutions including universities/colleges/schools regarding Environmental Awareness at regular interval of time. It was deduced that there were no such record of events in the college. There were no workshops/seminars/conferences on the subject of enhancing Environmental Awareness in Federal College of Education. Moreover, there was no record of such efforts were present in the departments of Universities responsible for providing Tertiary Education like Allama Iqbal Open University, International Islamic University and NUML. The topic was under discussion at many occasions during the class trial regarding the significance of routinely
conduction of workshops/seminars/conferences. In the light of those discussions the consensus was developed that there must be plan to conduct workshops/seminars/conferences on regular basis in educational institutions (not only in universities and institutions delivering tertiary level of education but in colleges and schools also) to mobilize the young generation towards Ecological Sustainability because without achieving this objectivity in present era the real progress of the Pakistani society couldn’t be possible. Further, it was found that for achieving the purpose of conduction of workshops/seminars/conferences in a regular interval of time the trainee teachers would be the essential part of the system because without properly trained teachers/instructors the quality in the system couldn’t be attained.

5.3 CONCLUSION

1. The scholar was motivated to undertake this particular study by the fact that the level of Environmental Awareness among masses in Pakistan is generally poor. The issue is strongly related with sustainable development in the Pakistani society. It would not be possible to reap the benefits of social development for any length of time, if it cannot be sustained. The present situation is reflected in total disregard for concerns like cleanliness, water management, water quality, air quality, nutrition, deforestation, urbanization etc.

2. The Tertiary Level of Education is being run in conventional manners all over the country. The syllabus of Teachers Training Programs is based mostly on traditional subjects. There is a dire need to add new subjects in the system which should be based on modern educational and technological concepts. The subject of Environmental Awareness is a potent subject to support advanced educational purposes.

3. The scholar strongly believes that a persistent formal educational process regarding Environmental Awareness, starting at tertiary level and permeating downwards into secondary and primary levels, will lead towards quality of life because small fraction of efforts at local level will be combined to produce large effect at national level. The objectives of the research were accordingly set and these being in a practical domain demanded a demonstration that was
arranged through the preparation of purpose-designed modules and a class experiment.

4. The proposed objectives of the research were achieved comprehensively at the completion of experiment. It was demonstrated effectively that environmental awareness was generated convincingly as a result of experimental teaching. The level of environmental awareness was very low before the conduct of study because “would be teachers” were not aware of the concepts of preserving ecology. At the start of the experiment, there was no concept in the minds of “would be teachers” to care for environmental sustainability in real life settings. However, as a result of the teaching of the purpose-developed modules, as evident from the difference in the mean results of experimental group between pre test and post test, the sensitivity towards environmental concerns was generated amongst trainee teachers substantiating central hypothesis that appropriate teaching of environmental knowledge through regular courses and time tested teaching strategies would generate the desired awareness.

5. The success of the modules prepared by the researcher for the experiment encouraged the researcher to conclude that inclusion of regular course work at tertiary level of education will produce sensitivity towards Environmental Sustainability in our society. The regard for environmental protection will be boosted at local and national level by making Ecology part of regular teaching process.

6. The Trainee Teachers attained desired Environmental Awareness through appropriate curricular contents. This highlights the need for developing custom-designed curricular material on Ecological Sustainability at local and national and international level. The teaching of environmental concerns at teachers training colleges will set up a chain reaction. The newly passed out teachers will enhance Environmental Awareness at large scale in schools, colleges and other educational institutions. Students at primary, secondary and tertiary level will carry this knowledge home and diffuse it to their parents, siblings and members of their community through informal discussions. Consequently, a large segment of society will be sensitized and mobilized to preserve and conserve ecology in their respective community at local and national levels.
7. The Ecological Awareness was developed among “would be teachers” by practicing advance teaching strategies (concept teaching, group discussion, question answer session, assignment method and project method) during the class trial. Using a variety of teaching methods in the classroom was found very helpful in strengthening the concepts pertaining to Environmental Awareness.

8. The performance of “would be teachers” was remarkable in certain fragments of the questionnaire with above average level which indicated that different persons are attracted to different aspects of environmental concerns. Hence, curriculum developers should keep the range of their topics diverse and the studies wide-based rather than making it too technical and narrow-based.

9. The researcher feels strongly that workshops/ seminars/ conferences should be held frequently to spread awareness among population at large regarding environmental concerns. Universities should take lead in this regard and associate schools/colleges with them in this task. The workshops/seminars/conferences are expected to be a great source of launching nationwide campaigns for conservation of ecology and resources.

10. The students participating in these activities will be motivated to develop the habit of caring for the respective ecology around them through practical measures. The regard for environmental sustainability will diffuse from them into Pakistani society. The chain process through education will serve the objective of obtaining a prosperous national destiny through high quality environment and standard of life just like in New Zealand, Australia, Germany, Norway, Sweden, Denmark etc.

5.4 RECOMMENDATIONS

1. A national of development framework is needed for promoting environmental concerns and providing Environmental Protection to citizens positively. The researcher recommends that, to this end, as the first step, a formal regular
course on Ecological Awareness should be added to various programmes at tertiary level. At secondary level contents may be diffused within in science subjects. At primary levels, doctrine may be included in teaching and inculcation of “manners.” The locally developed syllabi of Ecological Awareness must incorporate contemporary lines of thought and action according to the latest perspective prevalent in the 21st century.

2. The Tertiary Level of Education is an appropriate platform to develop trends in the public at large in the light of international efforts made by United Nations. Teachers are the most effective agents of change in this campaign. The subject of Environmental Awareness should be made compulsory in teachers training programs to start a chain process for sensitizing teachers on national and global environmental issues. The regard would then spread from them to their students and diffuse through their students at primary and secondary levels into the society at greater radii.

3. The teachers should be trained properly by subject specialists/ experts from the field of Environmental Awareness because without this the “would be teachers” will not be able to transfer the real spirit of the concerns to their respective students. The properly initiated teacher would be able to deploy teaching strategies from the Ecological point of view qualitatively and quantitatively to mobilize younger generation.

4. The administration of Islamabad Capital Territory should take positive steps to practise essential environmental protection concepts in Islamabad. Targets should be set to achieve international standards of Environmental protection (like those adopted in Auckland, Sydney, Oregano, Vatican city, Oslo, Malta, Doha etc.) in Islamabad by developing comprehensive long and short term processes and requisite mechanisms in the light of ongoing researches.

5. Pakistan is a vast country area wise and its climate varies from province to province. The northern area of Pakistan comprises of hills while southern area have deserts also. With such diverse climatic conditions the scheme for Ecological preservation varies largely from area to area. The teaching of
course work on Environmental Awareness should be adjusted to the climatic conditions of various regions of to cater for local environmental needs.

6. The Doctoral/ M.Phil/ B.S. level researches should focus on Environmental Awareness topics. Research should highlight ecological issues at community and national levels and propose solutions. Valid solutions would hopefully receive provincial and federal government funding to implement recommendations.

7. The curriculum is the pathway to prepare a common mindset of people for positive actions towards Environmental Protection. Modules should be prepared and constantly refined to align the curriculums for all the tiers of education. The researcher has prepared the modules which are now public domain property. It is for teacher now to use the proposed module and modify it as required for teaching purpose.

8. The researcher proposes that further research be undertaken in the moral, ethical, aesthetical, social, religious aspects of Ecology. Values may be described which may ultimately lead towards reduction of misuse and outright obliteration of natural resource within communities. The combined thrust of researches investigating these concerns will attack the wrong concepts and malpractices from multiple dimensions which is urgent need of our country.

9. Workshops/ conferences/ seminars should be organized regularly in schools/ colleges/ universities to highlight the importance of Environmental Protection to sensitize and motivate young generation all over the country. The aforementioned activities are now funded by the Higher Education Commission and foreign and native experts can be arranged by the Commission to bring the quality in the effort.

10. The researcher believes that Environmental Awareness will lead to attainment of higher quality of life amongst public at large. The undertaking is labour-intensive rather than capital intensive and this goes to our advantage as we are
blessed with a large body of youth. The bottom line is: let’s get organized and do it!

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