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TEACHING OF ENVIRONMENTAL SCIENCE AT UNDERGRADUATION LEVEL – A STUDY

P. Chakrapani Reddy
Research Scholar, Department of Chemistry, Ekalavya University
Damoh, Madhya Pradesh
Faculty, Department of Chemistry, Government Degree College, Atmakur(A)
Vanaparti, Telangana State, India

Abstract

Air pollution is defined as any atmospheric condition in which certain substances are present in such concentrations and duration that they may produce harmful effects on man and' his environment. The major constituents of air are nitrogen (78%), oxygen (20.94%) and argon (0.93%). In addition to nitrogen and oxygen which make up 99% of the atmosphere, there are small amounts of other gases, minute droplets of various liquids and tiny particles of varieties of solids. The atmosphere which is a gaseous envelope around the earth is divided to several concentric zones. Troposphere which contains the air that has a definite composition of different gases is closest to the surface of the earth. When due to some natural processes or human activities the concentration of substances is increased in the air, it causes pollution of the atmosphere. Air pollution has become an important- factor of environmental degradation. Air pollution occurs due to release of smoke from the chimneys of the industries, burning of fuels like coal, wood as well as the exhausts from automobiles. Now a day's rapid industrialization and use of automobiles for transport to cope with the growing demand of the growing human population have become the major sources of air pollution. The amount of pollutant in the air is expressed in terms of its mass/volume concentration, usually as micrograms of pollutant per cubic metre of air. This research paper to be critically analysed Teaching of Environmental Science at Under graduation level- A Study"

Keywords: Environmental Degradation, Self Formulating, Multidisciplinary, Human Environment, Self Motivated Effort, Environmental Ethics.

Introduction

Statement of the Problem

Nature is the mother and the habitat of man, even if some times a stepmother and an unfriendly home -
John Dewey

Environmental Education is the process of recognizing values and clarifying concepts related to environment and its problems in order to develop skills and attitudes necessary to understand the environment. It also entails practice in decision making and self formulating a code of behavior about issues concerning environmental quality. Environmental Education curriculum is mostly of multidisciplinary or interdisciplinary nature, depending upon organization of concept and the treatment during the study. In interdisciplinary model relevant components of many disciplines are drawn to create an un it of environmental education.

Environmental Science is the process of recognizing values and clarifying concepts related to environment and its problems in order to develop skills and attitudes necessary to understand the environment. It also entails practice in decision making and self formulating a code of behavior about issues concerning environmental quality. The Educational Institutions and universities have a crucial role to play by educating people at all levels, conducting research, making objective assessments and advising on policy matters. To make this movement an observable reality in India, universities and colleges should come forward and give Environment Education it is to be a proper place in teaching, research as well as extension activities in all courses of environmental science study.

In multidisciplinary model the concepts of a theme of environmental education are infused into various established disciplines multi desiparadas approach is more, comprehensive but requires curriculum coordination to achieve in depth coverage. The characteristics of environmental education are as:

i. Environmental education should be integrated into the whole system of formal education at all levels.
ii. Environmental education should be interdisciplinary in nature.
iii. Environmental education should adopt a holistic perspective which will examine the ecological, social, cultural and other aspects of particular problems.
iv. Environmental Education should be centered on Practical problems related to real life.
v. Environmental education should aim at building up sense of values.

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Environmental Education in UG Level

The concept of environmental education is about a century old there has been a sudden increase in the activities related to it, during the past quarter century. This is visible in the form of a large amount of literature, variety of school, college and university curricula, plays, films, radio and television programmes, conferences, seminars and many other national and international activities. In 1899, Patrick Geddes, the Scottish professor of botany, founded a unique educational establishment, 'The Outlook Tower' in Edinburgh, England. Its purpose was to improve upon the existing environment and qualities of education were closely interdependent.

It was in 2015, at the University of Keele, Germany, the environmental education was agreed to be an essential part of education for all because of its immense educational potential and importance of understanding the environment. With the organization of conference on 'Human Environment' at Stockholm in 1972, Environmental Education became truly international. This conference is popularly known as 'Stockholm Conference' and was attended by 113 nations, United Nations agencies and-governmental organizations. The conference established the need of environmental education in view of generalized environmental problems and show that there is wide interest to solve these problems. As a part of its action plan, the conference recommended that United Nations Environment Programme (UNEP) be established, 'environment fund' be launched 5th June be celebrated every year as 'World Environment Day'.

The recommendation takes the necessary steps to establish an international programme in environmental education, interdisciplinary in approach, in-school and out-of-school, encompassing all levels of education and directed towards the general public, in particular the ordinary citizen. Unison together with United Nations Environment Programme (UNEP) launched in Jan. 2015 an International Environment Education Programme (IEEP). Its major objectives were designing and evaluating new methods, curricula, materials and programmes (both in school and out-of-school; youth t/ and adult) in environmental education, training and retraining personal to adequately staff environmental education programmes. In October 2015, IEEP organized the historic International Environment Education Workshop in Belgrade Yugoslavia. Majority of countries (63%) said that they need environmental education programme for both types, formal and non-formal education sectors.

In 2018, Ministry of Human Resources Development (MHRD) launched the scheme of Environment Orientation of School Education: This scheme is implemented in the states and union territories through education department and the voluntary agencies having expertise and interest in environmental education. Environment generally consists of two main aspects natural and manmade or social. The study of interactions between the man, the natural and social environment is called Environmental Science. Environment is the outer biophysical system in which people and organisms exist. In a broad sense the word environmental can be used to refer to anything, living CI or non-living that surrounds and influences living organism. Environmental Science is an integral process which deals with man's interrelationship with his natural and man-made surrounding's including the relation of population growth, pollution resources allocation and depletion, conservation, technology / urban and rural planning to the total human environment. Environment education is a study of the factors influencing ecosystems, mental and physical health, living and working condition, decaying cities, and population pressures. Environmental Science is the process of recognizing values and clarifying concepts related to environment and its problems in order to develop skills and attitudes necessary to understand the environment. It also entails practice in decision making and self formulating a code of behavior about issues concerning environmental quality.

Problems of Environment

Industrial emission of pollutants to the atmosphere, soil and water cause environmental problems far beyond the city limit. The exploitation of natural resources required to maintain the standard of living in urban areas bring about spills and emissions of environmental pollutions into the environment. Thus, the need for air, water and soil quality monitoring at a global level grows and increases exponentially as land, water and soil use intensifies. In this chapter, a short review of existing literature on air, water and soil quality, broad objectives of the research problem are presented.

Air pollution is defined as any atmospheric condition in which certain substances are present in such concentrations and duration that they may produce harmful effects on man and' his environment. The major constituents of air are nitrogen (78%), oxygen (20.94%) and argon (0.93%). In addition to nitrogen and oxygen which make up 99% of the atmosphere, there are small amounts of other gases, minute droplets of various liquids and tiny particles of varieties of solids. The atmosphere which is a gaseous envelope around the earth is divided to several concentric zones. Troposphere which contains the air that has a definite composition of different gases is closest to the surface of the earth. When due to some natural processes or human activities the concentration of substances is increased in the air, it causes pollution of the atmosphere. Air pollution has become an important- factor of environmental degradation.

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Air pollution occurs due to release of smoke from the chimneys of the industries, burning of fuels like coal, wood as well as the exhausts from automobiles. Now a day's rapid industrialization and use of automobiles for transport to cope with the growing demand of the growing human population have become the major sources of air pollution. The amount of pollutant in the air is expressed in terms of its mass/volume concentration, usually as micrograms of pollutant per cubic metre of air.

Sources of air pollution

Pollution problems associated with the gases arise not because of the magnitude of the anthropogenic emission but because this emission gets concentrated in the areas where general mass live and work. The sources of air pollution can be either natural or artificial. The natural sources of air pollutants include forest fires, wind erosion of soil, volcanic eruption, evaporation of volatile organic matter, bacterial decomposition and so on.

Most of the potential air pollutants artificially added to the atmosphere due to human activities including the burning of fossil fuels in power plants and industries (regarded as stationary sources) and in motor vehicles (regarded as mobile sources). Some of the principal sources of air pollution are given below:

1. Most of the industries release several air pollutants like CO**2**, CO, nitric Oxide, and nitrous oxide and different hydrocarbons. The textile industries release a lot of cotton dust to the atmosphere. The industries involved in the production of chemical, chemical fertilizers and pesticides release chloride, fluorine, naphtha vapour, ammonia etc. in addition to particulate matter.
2. The burning of fossil fuels produces carbon dioxide, carbon monoxide, sulphur dioxide, oxides of nitrogen and metallic traces
3. Automobile exhausts contain carbon monoxide, oxides of nitrogen and hydrocarbons due to incomplete combustion.
4. The chlorofluorocarbons are released to the atmosphere from air conditioners and refrigerators and pollute the air.
5. Decomposition of organic wastes releases a lot of gases to the atmosphere which also contribute to its pollution.
6. Due to mining activities and crushing of stones, a lot of particulate matter and dust is released to the atmosphere.

Air pollutants

The air pollutants can be classified as primary or secondary pollutants. The primary air pollutants are harmful chemicals which directly enter the air due to natural events of human activities. When any carbon containing substance is burnt, it will produce carbon dioxide upon complete burning or carbon monoxide when burned partially.

Another primary air pollutant is sulphur dioxide which is emitted to the air by volcanic eruption or burning of fuels which contain sulphur impurities. A secondary air pollutant is a harmful chemical produced in the air due to chemical reaction between two or more components. That is primary pollutant combines with some component of the atmosphere to produce a secondary pollutant. For example, sulphur dioxide can combine with oxygen to form sulphur trioxide. This SO3 can react with water vapour in the atmosphere to produce sulphuric acid.

Suspended Particulate Matter

Particulate Matter can exist both as liquid droplets and solid particles. Natural dust forms about 50% of the total mass of particulate matter in the air. When a particulate matter remains suspended in the air, it is defined as an aerosol. These concentrations vary widely depending on the sources of pollution and their distribution, meteorological conditions and the topographical features in the polluted area. The source of particulates are either naturally occurring flora, fauna, dust storms, volcanic eruption etc. or manmade activities involving fuel combustion, industrial operation (mining, smelting, furnace etc.), industrial process fugitive particulate emissions, non industrial processes (roadway dust, construction etc.) and transport sources such as vehicle exhaust. The fine particulate matters are more harmful to human health than the coarse particulate matter. Particulate matter has variety of chemical compounds such as heavy metals, hydrocarbon etc. depending on their origin.

Effect of air pollution

Air pollution has both acute and chronic effects on human health. The type and severity depends on the nature and concentration of pollutants in the air. They damage the respiratory system leading to bronchitis, silicosis, lung cancer etc. Certain gases may cause headache, allergies, nausea etc. Among asthmatics, air pollution has been shown to aggravate the frequency and severity of attacks. Both short-term and long-term exposures have been linked with premature mortality and reduced life expectancy. Different people are affected by air pollution in different ways. Poor people, undernourished people, very young and very old, and people with pre-existing respiratory disease and other ill health, are more at risk.

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Air pollution interferes with the normal metabolism of the plants. Exposures of plant to air pollutants lead to the loss of waxy coating from their leaf blades resulting in excessive loss of water and necrosis of the leaves. The foliar injuries like necrosis, chlorosis affects the foliar biochemical. Gaurd cell in stomata get affected by air pollutants. Pollutants even induce premature leaf shedding and damage the flowers and fruits.

Description of Environmental Science

The concept of Environmental Science is about a century old there has been a sudden increase in the activities related to it, during the past quarter century. This is visible in the form of a large amount of literature, variety of school, college and university curricula, plays, films, radio and television programmes, conferences, seminars and many other national and international activities. In 1899, Patrick Geddes, the Scottish professor of botany, founded a unique educational establishment, 'The Outlook Tower' in Edinburgh, England. Its purpose was to improve upon the existing environment and qualities of education were closely interdependent.

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Goals of Environmental Science

The goals of Environmental Science are to develop concern and awareness among world population about the total environment and its associated problems and commitment to work individually and collectively towards solution of current problems and the prevention. The goals of Environmental Science are:

i. To improve the quality of environment.
ii. To create an awareness among the people on environmental problems and conversation.
iii. To create an atmosphere so that people participate in decision-making and develop the capabilities to evaluate the developmental programmes.

Objectives of Environmental Science

The objectives of Environmental Science are classified as follows:

i. **Awareness:** to help social groups and individuals acquire an awareness of and sensitivity to the total environment and its allied problems.
ii. **Knowledge:** to help social groups and individuals to gain a variety of experiences and acquire a basic understanding of the environment and its associated problems.
iii. **Attitudes:** to help social groups and individuals to acquire a set of values and feeling of concern for the environment and the motivation for actively participating in environmental improvement and protection.
iv. **Skills:** to help social groups and individuals to acquires the skills for identifying and solving environmental problems.
v. **Participation:** to provide social groups and individuals with an opportunity to be actively involved at all levels in working towards the resolution of environmental problems.

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The objectives of Environmental Science are very essential for the successful formulation, implementation and evaluation of its programme. However, these objectives can only be achieved and understood properly, if we know what our environment is, what is contained in it. Objectives of Environmental Science can be subsumed in three domains discussed by Bloom in his book. "Taxonomy of Educational Objectives": i.e., cognitive, affective and psychomotor.

i. The cognitive domain includes those objectives which deal with the recall or recognition of knowledge of development of intellectual skills and abilities, which means. it includes the following behaviors: remembering; problem solving; concept formation and to a limited extent, creative thinking. In other words, this area includes all conscious mental processes from ordinary recall or recognition to higher ones, like solving a problem which involves abstract thinking.
ii. The affective domain includes the objectives that describe changes in interest, attitudes and values and the development of applications and adjustment. This area covers the entire continuum from ordinary attention to an object to deep own existence, involvement in the service of the suffering masses, involvement which is reflected in the indomitable spirit of those who conquer mountains tame rivers who scud in space or stay at the bottom of the sea for days together. It also includes contrary behaviors, that is the aversion, antipathy or fear one shows for certain objects.
iii. The psychomotor domain covers the manipulative or motor-skill area. This area includes neuromuscular coordination's found in handwriting, speech-making, performing physical exercises, dancing, doing yoga, winding a screw, using a saw and it doing a lot of the things which are required to be done under socially useful productive work and in vocational and technical courses.

Principles of Environmental Science

The Principles that butters support to the inclusion Environmental Science in school curriculum are given below:

i. Environmental Science helps in programming learning experiences from simple to complex.
ii. Environmental Science helps to proceed form indefinite ideas to definite ones.
iii. Environmental Science helps to proceed from concrete to the abstract.
iv. Environmental Science helps in the ordering of learning experiences from the empirical to the rational.
v. A corollary of the foregoing principle which is so dear to the hearts of educationists is that education should help the child in the process of self-development.
vi. The important educational principle which is germane to the programmes of Environmental Science is the pleasurable excitement which these programmes create in the pupil.
vii. The principle of Environmental Science is that it makes education problem based, for understanding environment and the hazards of its pollution, the pollution of air and water.
viii. The important principle of Environmental Science is its social relevance, its relevance to man's interaction with his physical and social environment, its relevance to changing human attitudes.

The Environmental Science (EE) is as diverse as the environment at various places itself. Efforts have been made for EE through legislation, involving community at large, using formal and/or informal education system, as a disciplinary, multidisciplinary and interdisciplinary subject area and so on. The Environmental Science should be at all aspects of education including primary, secondary and tertiary education, through formal and informal system of education. This has been shown Environmental Science has the target population that includes students, doctors, engineers, administrators, leaders, housewives and the common man. One has to use both formal and informal systems of Education. It has to have special emphasis on teacher education so that the quality of EE improves in the formal system of education.

National Curriculum Frame Work for School Education

It has been mentioned in National Curriculum Framework 2015 that teaching and learning would be woven around the environment of the learners and integrate environmental concerns as well at classes I and II. Environmental studies will be separate subject for study at class III to V. Environmental Science will be included in science and social sciences at Upper Primary Stage (3 Years). Essentially it has to be learnt mainly through concrete situations related to immediate environment during the first two years at the primary stage.

The remaining three years of primary education where environmental studies are to be introduced. The focus would, however, remain on object, events, natural phenomena and learner's environment. Children would continue to learn to observe, explore and identify occurrences in their environment. At upper primary stage the environment should continue to be a major source of the learning and the students should try to understand the changes talking place all around. At secondary stage, learning of science would continue to be built around natural and social elements of environment.

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Sufficient self-motivated efforts have not been made to implement Environmental Science in universities and colleges. University Grants Commission (UGC) issued notices to all universities in India for compulsory implementation of six month module for environmental studies for undergraduate courses in all branches of higher education with effect from academic year 2003-04. For this purpose, the course outline of the module has been also developed and sent by UGC to different universities. he core module syllabus for Environmental Studies proposed by UGC is quite comprehensive. It has eight different units, (i) The multidisciplinary nature of environmental studies, (ii) Natural Resources, (iii) Ecosystems, (iv) Biodiversity and its Conservation, (v) Environmental Pollution, (vi) Social Issues and Environment (vii) Human Population and the Environment and Field Work.

Environmental Science in India Education

The universities have an important role to play in generating public awareness, protecting the environmental and promoting sustainable development. The Indian universities can play an important role in meeting environmental challenges by undertaking the activities in teaching, research and extension. In teaching by introducing at the Master's level el1vironment- specific courses/ papers in each subject by developing 'certificate' and 'diploma' programmes on different aspects of environment and by designing short courses on environment management and conservation of resources, essentially for managers. In research by undertaking, at M.Phil. and Ph.D levels, by undertaking surveys aimed at obtaining multifaceted information on areas that are relevant to sustainable development and by encouraging consultancy services related to pollution-control. In extension by undertaking programmes aimed at raising public awareness about the environment, and by involving its students, through NSS and similar activities, in programmes of eco-development like afforestation and water conservation.

The need for trained personnel is becoming more and more apparent today. It was during the first Inter Governmental Conference on EE convened by UNSECO during 1977 in Tbilisi, USSR, that worldwide recognition was given to the need for teacher training in EE. The Tbilisi Conference Report recommended the following points on the training of personal in EE:

- Environmental Science should be included in the curricula for pre-service teacher education.
- The staffs of teacher education institutions should be educated in these respects.
- The implementation and development of inservice training. including practical training in Environmental Science should be made in close cooperation with professional organizations of teachers
- Teachers and learners should be involved in the preparation and adaptation of instruction a! material of environment education.

The Tbilisi Conference recommends that teachers in formal education, organizers in non-formal activities for young people and adults, administration personal and educational planners and instructors should be familiarized with environment linked subject matters. Teachers training programme in environment education should focus on development of knowledge, skills and attitudes concerning environment, its issues and problems and development of competences in the teaching and supervision of the activities related to EE. The Wilkes 1985 stated that "The key to successful Environmental Science is the classroom teacher. If teachers do not have the knowledge, skill and commitment to environmentalise their curriculum, it is unlikely that environmentally literate student will be produced. For this, special training to prospective and individualized behavior based on global ethics, which can be realized only through the enlightenment and training of educational professionals, this idea was advocated by Simpson el al (1988). Thus, there is a need for intensive teacher education programme for both teachers and teacher educators". UGC and NCERT have also undertaken various programmes for the enhancement of university and school curricula in the field of Environmental Science. The UGC had granted a project on Environmental Science in April 1994 and Faculty of Education, Mahatma Gandhi Kashi Vidyapeeth, Varanasi was designated as regional resource centre for teachers training in Environmental Science. This intensive teacher training programme in the field of Environmental Science is being conducted at different levels.

Summing up

The teacher plays an important role in shaping and molding the habits, manners and good character of the children. Therefore, to gear up environmental awareness programme, It is essential that teacher should have sufficient knowledge of Environmental Science. It is the responsibility of teachers training college and universities to groom teachers for this task also. The existing teachers training course should be suitably amended to incorporate Environmental Science content emphasizing methods to deal with Environmental Science content at school and college and to develop skills in organizing Environmental Science programmes with co-curricular activities like NCC, NSS etc.


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