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CHAPTER II

REVIEW OF RELATED LITERATURE

2.1.0 Chapter Preview

Understandably there has been a significant quantum of research work done in the discipline of education and related issues, but comparatively research attempts are less on the educational potential of the environment – natural and built-in. Within these limitations, this chapter makes a humble attempt to present a brief review of the existing relevant literature on the status of environmental education in the international, national and Kerala based research studies in the primary-and secondary-schools. This chapter also reveals the studies related to the role of botanic gardens in Environmental Education in the universities and schools all over the world. The chapter is closed with the major outcomes of the review which converge towards the need and relevance of the present research attempt.

2.1.1 Introduction

The emergence of the conservation of the environment along with the developmental activities poses a serious challenge to the policy makers as well as the common man. It is now generally recognised that knowledge is the first step towards protection of the environment and so attempts are made to explore ways to sensitize our young citizens about our environment. Several programmes to
develop a sense of responsibility and solidarity which will guarantee the conservation and improvement of the environment, were undertaken especially in developed countries. In the developing and third world countries such programmes are comparatively limited for want of sufficient environment-related research studies. The investigator likes to review the literature and studies with a view to ascertaining whether environmental education in study would be a base for the research in environmental problems that India in facing today. Another major bottleneck as far as the biodiversity conservation is concerned, is the lack of coherent programmes to extend the teaching and learning activities into immediate environment of the pupils beyond the classroom. Most of the studies throughout the world are mainly concentrated on botanic gardens, parks and zoos but they are very few in India. Not withstanding these limitations, some appreciable quantum of reference materials were collected as a support for the present research programme.

The environmental / ecological education includes different aspects such as:

(1) Environmental hazards
(2) Need for conservation
(3) Role of education in conservation:
(4) Target group and strategies for implementation of environmental education
(5) Conservation of biodiversity
(6) Measures for conservation of biodiversity
(7) Role of out of school activities in conservation
(8) Role of botanical gardens in conservation and environmental education.
The investigator is concentrating in this literature review on those aspects of environmental education which are directly relevant and necessary for the present research programme. These areas / aspects are

(i) General literature related to total environmental education.

(ii) Out of school approach: The present status pertaining to primary, secondary and tertiary levels.

(iii) Environmental education related to biodiversity with special reference to Botany

(iv) Environmental education related to the role of botanic gardens with special focus on schools.

2.2.0 General literature related to total environmental education

Meaning of the term environment is very wide in the sense that it is taken into account of all those factors which directly or indirectly have a bearing upon the natural surroundings of human beings. The Encyclopaedia Britanica defines environment as “the entire range of external influence acting on an organism, both the physical and biological i.e. other organisms, forces of nature surrounding an individual”

In a strict and natural cause effect interrelationship the biotic constituents are linked and balanced through the resource system of the environment. In this framework of relationships, the environment – ecosystem conceptual linkage could be traced back in the classical economic literature when Smith (1776) observed ‘the origin of all wealth came from the bosom of the earth and that there is a
limit to every barrel’. Here Adam Smith’s reference to ‘bosom of the earth’ is nothing but, the direct / original beginning of ecological / environmental relationships.

As we further enquire into the realms of deterioration of the environment, we come across the link between pesticides and crop improvement.

Agarwal (1999) reports that the tremendous advancement of industrialization resulted into economic development had also continuously degraded the human environment. Further, urbanization, over-population and poverty also intensified the problem.

In the present age human activities exert enormous influence on the natural conditions of the entire planet. Changes in the flora and fauna of land areas are particularly pronounced. (Bawa and Singh 1987). It is seen that even though the activities of modern man have altered the natural environment of our planet, these changes usually represent a sum total of local influences on the environmental process. It is not as a result of changes by man of global natural process that they acquire a global character, but rather because of local or regional influences are disseminated over large areas.

Problems arising from the pollution of human environment were not realized earlier and therefore attention was not paid to make rules and regulations in this regard. The United Nations in the first two decades had been painfully slow in dealing this topic.

The United Nations convened a major Inter-governmental Conference on ‘The Human Environment’ at Stockholm in June 1972. It was undoubtedly the
most important event of an international character and to a great extent international issues and concerns about our environment were discussed, reviewed and analysed. The conference undoubtedly raised the environmental consciousness of the world and sensitized public opinion. (Biswas & Biswas, 1987). The various environmental issues were discussed under three broad categories: interrelationship between people, resources, environment and development; rational use of natural resources and new patterns of development and lifestyles. Thus a realisation came that the man’s future on this earth is bleak if he does not use natural resources rationally and does not take immediate steps to repair the damage already done to ecosystem.

2.2.1 Environment : Its Protection and Conservation

The world’s first recorded conservation measures were enacted in India during the third century BC in the days of Emperor Ashoka, whose benevolence extended to all living beings. His edicts on stone, on nature conservation, survive even today. Thus, the Indian tradition of love, respect and reverence for nature goes back to time immemorial. Ishopanishad over 2000 years ago which says ‘This Universe is the creation of supreme power meant for the benefit of all his creation’. Each individual life form must therefore, learn to enjoy its benefits by forming a part of the system in close relation with other species. Let not any one species encroach upon other’s rights. Gadgil (1982) wrote that even at this time certain trees were regarded as sacred and never cut. Certain areas under forest were regarded as God’s grooves and deadwood and leaves were taken out from these areas. Thus, since time immemorial environmental protection was a religious duty in India. Even today some such areas in their natural condition are found (like Surpakavu in Kerala) in different parts of the country though their condition is rapidly worsening.
Kumar (2000) observes that there is now an acceptance of the idea of the oneness of survival of animal and plant life. The hoary tradition of our country in conservation continues even today and we have the inspiring example of the bishnoi community in Rajasthan, Haryana and Uttar Pradesh, dedicated to protecting our trees and wild animals.

Why is it important to save wilderness areas? Kaufman (1979) states several salient reasons that have been promulgated by various national and state conservation organizations. They include the following:

(i) To do ecological research.

(ii) To preserve endangered species of plants and animals.

(iii) To maintain the gene pool – to make available species of plants that can be used for crop improvement or as a source of wild plants that can be used to breed new, more desirable plants for people’s food, fibre and comfort.

(iv) To provide an ‘escape’ for people from the urban ghetto.

(v) To pursue hobbies such as mushroom hunting, photography and observing birds and other animals.

(vi) To facilitate nature education.

Thus, many countries have resorted to legislative efforts in protecting the environment. The Republic of Korea adopted a charter for the preservation of Nature in October 1978. It stipulates that development should be carefully pursued in harmony with nature and the preservation of nature should take precedence over development.
The same view was expressed by our late Prime Minister Smt. Indira Gandhi, in her address in 1972 at the United Nations Conference on Human Environment at Stockholm and she advocated that ‘Development without Destruction’ is the cardinal principle of planning.

Article 51 of the constitution merely reiterates our obligations towards protecting nature. One of our duties is to protect the environment with compassion towards all forms of life. The individual’s duty per se remains hollow without the means to discharge it. According to Dhayani (1993) there has been a tremendous increase in the number of institutions and organisations on the environmental issues at the grassroot level as well as on regional and international base. It was reported that while in 1972 there were 2500 NGOs dealing with environment, the number rose to 15000 in 1981. Likewise in 1972 only 10 Governments had State departments dealing with environment; it rose to more than 100 departments on environmental protection.

As well as the IUCN and the CMC there are many other organisations actively involved in the surveillance and census of wild life and natural resources. These include WWF for nature (WWF previously the World Wild life Fund, founded in 1961), The Friends of the Earth (FoE) founded in 1969 and Green peace which was founded in 1971. WWF has sponsored International research on species and wild life throughout the world. A recent WWF campaign, ‘Biodiversity a Conservative Imperative’ has promoted the work of the World Conservation Monitory Centre by listing plant and animal species on the brink of extinction (Spellerberg, 1991).
Subudhi (1997), reports television, broadcasting and newspapers have to play potent role in this context. Supreme Court of India has directed the Centre and all the State Governments to cancel the licenses of all those Cinema Halls, video parlours and mobile cinema, if they fail to exhibit at least two slides daily on environment. The court directed the UGC to examine the feasibility of making environment compulsory in schools and colleges. Hence, on TV the UGC programmes in India include environmental issues for people of all ages and students.

The Foundation for Revitalisation of Local Health Traditions (FRLHT) is a non governmental organisation which was launched to save and build upon India’s traditional medical legacy. One of the programmes that FRLHT has embarked on is that of conservation as well as sustainable use of medicinal plants expecially in the area of primary health care. In the area of conservation, 30 medicinal plants conservation areas and 18 ethnobotanical conservation parks are being set up in Karnataka, Kerala and Tamilnadu States of South India with the help of State forest departments, research institutes, universities non-governmental organisations and others. This is the first such conservation effort in the country that concentrates on plants rather than wild life and is perhaps the most comprehensive conservation effort in post-independent India. The foundation’s thrust areas include establishing a computerised information network on medicinal plants and natural products; promoting the utilisation of traditional medicine in rural and urban areas; fostering understanding about the theoretical foundations and epistemology of traditional knowledge systems. The initiative in boosting the use of medicinal plants in primary health care involves promoting a nursery network to raise medicinal plants and encouraging the public to avail the economical and toxicity_free benefits of ‘Green
Health’, or using plants that heal. This effort needs the commitment and support of the public as well as their willingness to turn to medicinal plants as the most practical primary health care self help system for a country like India (Manohar, 1995).

A few other organisations working for environmental protection are Animal Welfare Institute, Environmental Investigation Agency, Seashepared, Fund for Animals, Royal Society for the Prevention of Cruelty to Animals, People’s Trust for Endangered species, International Fund for Animal Welfare, Centre for Environmental Education, etc.

2.2.2 Studies on Environmental Education

Disinger (1983) claimed that at the international level the term ‘environmental education’ was used in Paris in 1948, at a meeting of the International Union for Conservation of Nature and Natural Resources. The first recorded use of this term in Britain may be traced to a conference held in 1965 at Keele University Staffordshire.

Malhotra (1985) identified that the necessity of environmental education was voiced by the IUCN way back in the sixties and reiterated over the years in many conferences.

The term environmental education is being defined in the very first issue of the Journal of Environmental Education [Stapp, 1969] as “communication aimed at producing a citizenry that is knowledgeable concerning our bio-physical environment and its associated problems, aware of how to solve these problems, and motivated
to work towards their solutions”. It should be noted that this loose definition does not specifically, identify the content that should be included in an environmental education curriculum. It does indicate the audiences at whom such programmes should be directed.

Though there is no common agreement on the definition of the concept of environmental education, the need for environmental education and the nature of its aims are interpreted in many and various ways by various agencies and individuals around the globe.

United States Environmental Education Act of 1990 consists of 11 sections. In section 2 it states as “It is the policy of the United States to establish and support a programme of Education of the environment for students and personnel working with students. Through activities in schools, institutions of higher education and related educational activities and to encourage post-secondary students to pursue careers related to environment.

This law calls upon through the Environmental Protection Agency of the US to work with local education institutions, State departmental education, non-profit educational groups, environmental organisations and private sector in efforts to support the development of curriculum materials, special projects and other activities to increase the understanding of the general public about the natural and built environment so that the awareness of the public about environmental problems is increased.

Several States now have legislation requiring in varying degrees in implementing environmental education in the schools and teacher training colleges.
The constitution of People's Republic of China states that the preservation of nature should become part of daily life through education at home, in the school and in society. The State protects the environmental and natural resources and prevents and eliminates pollution and other public harms. (Act 11).

The Council of Ministers of the European Community (1988) passed a resolution to promote Environmental Education as a matter of priority within all schools. In the national curriculum of U.K environmental education appears as one of the five cross-curricular themes. Council for Environmental Education is the main source of information about environmental education in the country. CEE is called upon to advise both Government and business organization in environmental education. A monthly newsletter goes to all schools which brings to teachers news about events and details of the latest publications.

National Association for Environmental Education’s (UK) (1992) prime concern is to help and encourage teachers to establish an environmental approach in every school. It provides information service with emphasis on initial and in-service teacher training, teaching methods and learning materials. The Scottish education system is entirely different from that in England, Wales and Northern Ireland. The working group on environmental education produced a national strategy of environmental education in Scotland namely “Learning for Life”. Environmental studies include all sciences, geography, modern studies, technology, economics, domestic studies, history and health. It is interesting to note that a certain measure of integration is implied by the subject grouping under the curriculum area of environmental studies. Even then firm divisions about the role of environmental education in the curriculum of Scottish schools still seem to be a long way off.
By the implementation of national strategy for environmental education the curriculum area will be well set in Scottish school. (SEEC, 1987)

The general consensus on the goals of environmental education is (UNESCO 1980): to foster clear awareness of, and concern about social, economic, political and ecological interdependence in urban and rural areas: to provide every person with opportunities to acquire the knowledge (values, attitudes, commitments) and skills needed to protect and improve the environment: to create new patterns of behaviour of individuals, groups and society as a whole towards the environment.

In 1970 the International Union for the Conservation of Nature and Natural Resources [IUCN] held a working group meeting on Environmental Education in the school curriculum in Neved, USA. The deliberations of that conference continue to be a major influence on the development of Environmental Education.

Formation of UNEP, the Belgrade charter (UNESCO, 1975) and the Inter Governmental Conference on Environmental Education, Tbilsi (1977) highlighted the role of Education in the halting of destruction of the environment.

The United Nations Environmental Program (UNEP) in 1975 at the International Workshop on Environmental Education held in Belgrade (Belgrade charter) listed aims, objectives, key concepts and guiding principles of the environmental education programme. The comprehensive set of objectives for environmental education prepared at Belgrade are summarised as follows. (UNESCO, 1975).
1. To foster clear awareness of and concern about economic, social, political, ecological, interdependence in urban and rural areas.

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

3. To create new patterns of behavior of individuals, groups and society as a whole towards the environment.

The first intergovernmental conference on Environmental Education, held in Tbilisi, UNESCO (1977) recommended for the wider application of environmental education in formal and nonformal education. This conference and the subsequent publications based on it provided the framework for the development of environmental education in the world today. The recommendations of this conference on Environmental Education are as follows-

A basic aim of environmental education is to succeed in making individuals and communities understand the complex nature of the natural and the built environments resulting from the interaction of their biological, physical, social, economic and cultural aspects and acquire the knowledge, values, attitudes and practical skills to participate in a responsible and effective way in anticipating and solving social problems, and in the management of the quality of the environment.

The general consensus on the nature, goals and principles of environmental education emerged at Tbilisi conference are stated below. These are based upon the Tbilisi Report Recommendation 1978 (Sterling, 1992).
Environmental Education

- is a life long process;
- is interdisciplinary and holistic in nature and application;
- is an approach to education as a whole, rather than a subject;
- concerns the inter relationship and interconnectedness between human and natural systems;
- views the environment in its entity including social, political, economic, technological, moral, aesthetic and spiritual aspects.
- encourages participation in the learning process.
- emphasizes active responsibility;
- uses a broad range of teaching and learning techniques with stress on practical activities and first hand experience.
- is concerned with building an environmental ethic.

Two major United Nations reports— the Brundtland Commission’s Our Common Future (United Nations, 1987) and UNEP’s, The State of the World Environment (UNEP, 1989) have dramatically drawn attention to the pressing need to devise and put into practice, in all countries and all parts of the world, long-term environmental strategies for achieving sustainable development.

According to Watts (1969) primary aim of environmental education is to help the child to understand the process which shape his surroundings, so that he doesn’t remain a passive and sometime bewildered spectator, but becomes an informal and active mediator of his environment with the confidence which comes from understanding.

According to Habrich & Kohler (1981) environmental education should aim at finding concrete solutions to problems and on the other hand, at providing for
the participation of teachers and pupils in a practice oriented teaching and learning process.

The basic aim of environmental education is clearly to show the social economical, political and ecological interdependence of the modern world in which decisions and actions by different countries can have international repercussions. Environmental education, should in this regard help to develop a sense of responsibility and solidarity among countries and regions as the foundation for a new international order which will guarantee the conservation and improvement of the environment.

Environmental Education is concerned with those aspects of human behavior, which are more directly related to man's interaction with the bio-physical environment, and his ability to understand these interactions. According to Atwal (1980) the aim of environmental education should be to bring man in to harmony with himself, his fellowmen and his environment. These goals and principles are adopted and documented for environmental education in the National curriculum for schools in England.

Agenda 21 of the Earth Summit 1992 gives primordial interest on education, public awareness and training. The programme areas described are:

1. Reorienting education towards sustainable development.
2. Increasing public awareness.
3. Promoting training.

The centre piece of the Rio agreement known as Agenda 21 is a major action programme setting out what nations should do to achieve sustainable development in the 21st century.
2.2.3 Environmental Education Initiatives in India and some Asian Countries

Ecology and environmental studies in education in India have not been satisfactory and do not match with the quantum of research in these areas of science being carried out in the country, although at international level there have been repeated efforts to identify the problems and stress the urgency of implementing the environmental education and research programmes on a very extensive scale.

Second international conference on environmental education was held in New Delhi in March 1985. In several papers, environmental education programmes in primary, secondary schools, universities, engineering institutions and other non formal education programmes were discussed. The importance of field studies and demonstration projects were brought out in some of the papers. These papers stimulated to formulate new ideas to implement environmental education programmes for a better future for the mankind. (Bandhu, 1987).

According to Das & Ghosh (1987) the goal of any environmental education programme should be to develop (a) awareness of and sensibility to the total environment and its allied problems (b) knowledge of the total environment, its associated problems and the responsible presence of humanity in it (c) attitudes, social values and strong feelings of concern for the environment, and motivation to participate in its protection and improvement (d) participation to infuse a sense of responsibility and urgency regarding environmental problems so as to ensure appropriate action to solve them (e) skills to solve environmental problems (f) ability to evaluate environmental measures and education programme in terms of ecological, political, economic social, aesthetic and educational factors.
Kopardekar (1985) observes that education on nature will have to be a very important item on the agenda of environmental education. This will help to restore the composure of human beings and their relationships with their surroundings. He thinks that if people are educated in this way they are less likely to take part in spoiling nature in their day to day life.

Chittibabu (1987) describes the interaction between education and environment.

(a) Education creates the urge for a clean environment.

(b) It inculcates in the young minds the basic principles of sanitation and hygiene

(c) It helps pupils and students to appreciate the need for conservation of our multifaceted heritage.

(d) It teaches newer and environmentally safe technologies

We in India may justly feel proud that our national documents, like the Report of the Education Commission (1964-66) and Curriculum for the 10 year school: An Approach Paper (1975), all emphasized the need of environmental education (Malhotra 1987). Our concern in this country is but a reflection of what is happening the world over.

The environmental education at higher level in India is provided by the Universities, Research Institutes, Schools of Planning and Management, Agricultural Universities, Engineering Colleges and a number of other agencies. Some of them have defined programmes of environmental education and the others have included
some components of environment in their curricula. The introduction of environmental education programme requires the involvement and participation of teachers, students and administrators etc. (Swain, 1997).

NCERT did pioneering work in Environmental Education by not only developing a modern curriculum for formal school system which incorporates environmental education concepts, but also prepared text-books and other instructional materials, teaching aids and audio-visual materials. Besides NCERT has extended these ideas to a larger section of school community through its teacher training programme and extension service to states.

Gujarat has initiated on firm footing a comprehensive environmental programme and this is one among the first states to introduce environmental education in India (Ravi, 1987). Both formal and nonformal environmental education programme was started in 1980. A comprehensive multi-dimensional and multi-disciplinary approach is adopted within the main objective of environment as ‘medium of instruction’. Here the main methodology is that the environmental issues and observations have to be derived from all the subjects which are being taught to the students, so that the student will learn the environmental issues within a holistic framework.

The Centre for Environment Education (CEE), Ahmedabad is involved in increasing consciousness about the environment among children and the general community. While the need for creating environmental awareness is wide-spread, CEE has developed programme for school children, visitors to national parks and sanctuaries, users of media, the rural poor living in areas where there is severe shortage of natural resources, the urban dwellers and the general public. (Agarwal, 1993)
Once the goals and purposes have been defined, the methods of achieving them have to be decided knowing that the whole spectrum of environmental education is much too broad a front, we have to make views and aims at what can be realistically accomplished within the community.

To the question that who are the target group to receive this environmental education Dayal (1987) identified that at both formal and non formal level there should be involvement of each and every human being on the continent. Children’s literature should be produced bringing out various aspects of environmental problems. A team of experts should be given the responsibility of developing and producing creative environmental education material for country wide use. (Balasubramonyam & Fonseka (1987) are of the opinion that any education, ecological or environmental being no exception is meaningless unless it reaches grass root level and that being the common man.

Souza (1987) states that environmental education need to be given priority from a tender age i.e., the level of elementary schools. The present educational system has some bias towards environmental education but this need to be enlarged.

Khoshoo (1984) appeals to teachers to organize, motivate and catalyse the student community to undertake ecological studies of the region in the vicinity of the schools colleges and universities.

There has been considerable discussion about the method to be used in environmental education. Cook (1978 / 79) suggests that, to be effective and useful, it should use problem solving approach because the purpose of environmental education is to teach people to understand their total environment, not only what
it was, but how it worked, as well as why problems existed and what it would take to ‘fix things’.

Saxena (1999) suggests that the nature of environmental education requires a different teaching methodology than the ones used in other disciplines. For example survey or experimentation could be more effective than lecture and demonstration methods. This would also require flexibility in approach and curriculum at different places.

Palmer & Neal (1994) reveals that they do not recommend any particular teaching style or approach to classroom organization. Rather these are matters of individual schools and teachers to decide. This view is also supported by Bramwell (1993) as well.

22.4 Environment-linked curriculum

The significant international endorsement of environmental education over the past 20 years or so has inevitably helped to shape the aims, objectives and planning of this curriculum area within schools and local educational authority in UK. Environmental education has been well established in the curriculum map of schools for some three decades. Local authorities, National organizations and individual schools and teachers have done a tremendous effort to promote its importance and to develop effective teaching and learning strategies. Palmer (1991) points out that in the National Curriculum of England, environmental education is reflected in the content of some subjects, notably Science and Geography, and he is of the opinion that because it is a cross curricular theme, it should be included both as a starting point and as unifying element. It should emphasise skills such
as problem solving, study and communication skills, which are fundamental to
environmental education, and are central to all subjects of the national curriculum.
Environmental education is, therefore, ideally suited to be taught as a cross curricular
theme, rather than as an individual subjects.

The cornerstone of environmental education is the identification of individual
with the environment. Curriculum developers should attempt to link the curriculum
of secondary education to the local environment and make it relevant to the
community at large.

In 1974, the government of Malaysia under the ministry of education
developed a new primary level curriculum which came in to full operation in 1983.
Officially, the programme is referred to as ‘Man and the Environment’. It is taught
from the 4th year onwards, when children are at least 9 years old, bringing together
five traditional subjects-geography, history, science, civics and hygiene- and treating
them in an integrated way. The objectives of this curriculum is centered on the
need to impart knowledge and understanding of the interactions of people with
their environment. Emphasis is also given to changes in the environment caused
by such interactions and to the inculcation of positive attitudes and values towards
solving problem. Training pupils to think, evaluate and draw conclusions is also
considered important. The need to live in unity and harmony in the Malasian
context is stressed and forms a basis for the curriculum.

In Japan in the frame work of traditional formal school education
environmental descriptions were scattered among various text books on language,
science, geography, history etc. (Jun Ui 1987).
Lob (1987) reported the principles of environment education in Germany. The aspects of environmental education are regarded as to be integrated into curricula already existing and developed in the future so that environmental education should not be perceived as an additional or separate but as an integral aspect of education.

Malhotra (1987) reports that the present curricula of general education in India, that is, classes 1 to 10 has in it, ample materials on the environment, its problems and conservation. But environmental education to mind is not just awareness and knowledge, it is far more. It is development of proper attitudes, the awakening of the urge to make the world a better place to live in, to be aware of what is happening around and above all, to act without fear.

In Pakistan the subject of environmental studies is not taught as a separate discipline in elementary or higher education but ‘infusion approach’ is adopted based on incorporation of environmental education within the appropriate traditional subjects. Khan (1987) states that all future strategies of formal environmental education emphasize on learning through activities centred on real life situations and the main objective of the future strategy for non formal education is to help pupils to improve the quality of their life. Emphasize is on competencies which students can use in solving of problems encountered in daily life.

Good quality teaching and learning materials can always help to a very great extent in promoting learning and retention. If it is augmented by an attitudinal change in teachers, it would result in making teaching-learning student centered, activity based and participatory. This would be a break through.
The changes with environmental knowledge and environmental attitudes as well as the relationship between the two were examined in Bradley’s (1995) study. Exposure to the environmental curriculum did appear to produce a more positive environmental attitude. In addition, an increase in environmental knowledge, following exposure to the curriculum is strong in relation to environmental knowledge and environmental attitude.

2.2.5 Out-of-Classroom Activities as Learning Experience

Learning by doing’ and Learning by living’ are the two cardinal principles of teaching and the same is more true in the learning of science. When pupils learn with materials collected by them, they may develop love for labour.

Science teaching in our classrooms is mostly rigid and verbal and, therefore, quite uninteresting. Even though suitable outdoor sources are available to learn science through concrete first hand experiences and situations, students are generally forced to sit in denatured buildings and encouraged to memorise unrelated facts and principles without understanding their practical implications.

For an effective programme of science, adequate teaching materials are also essential. Community resources that are suitable for the purposes should be made available and should be used when needed.

A Scottish botanist Sir Patrick Geddes (1854-1933) is considered to be associated as the earliest link between education and the quality of environment. His pioneering work included the extensive use of the outdoors as a resource for active learning. Also the thinking of some of the world’s great educationists
undoubtedly made a substantial contribution to philosophical deliberations on the interaction between people and their environment. Rousseau the great philosopher (1712-1778) described in his book *Emile*, the methods of bringing the child in contact with nature and he stresses the importance of teaching the child in a natural environment. The child should be left to behave naturally. He learns in the contact of plants, animals, birds and natural objects. Palmer & Neal (1994) believe that there is no single right or wrong way to approach the teaching and learning of environment in schools and whatever approach or combination of approaches is utilized, it is however, essential that first hand experience of the environment are at the forefront of teaching and learning.

Therefore, it is apparent that environmental education is based on as much first hand experience as possible so that the idea of moving out of the confines of the traditional classroom is one well rooted in the environmental approach. The most valuable resource available to all schools is the environment itself and immediate neighborhood will provide ample opportunities for activities to observe record, analyse and interpret their own investigations. The most effective education about the biodiversity is often not transmitting new information, but rather fostering appreciation of what is already known, practical knowledge about biodiversity, its local use and ways to manage sustainably.

Curriculum statement for Kent, under the title ‘Education for life’ (1988) emphasizes the multi disciplinary nature of environmental education and says it provides a particular style of teaching allowing teachers to extend their work beyond the confines of the classroom in to the immediate environment of the pupil, extending gradually from the home and school to the natural and built.
environments. The outdoor is the one most neglected by teachers, curriculum developers and researchers (Orion & Hofstein, 1994).

Outdoor activities (field trips) have the potential to enhance constructive social relationship among students as well as many of the variables that characterized learning environment measures. Saxena (1987) points out that out of school activities can be very useful for environmental education because children are self motivated and these do not overburden the school curriculum. Many a time the activities to be taken up are also decided by the children themselves. To create a healthy learning environment, there is a need for more research that will assess how time spent on fieldtrips affects students' perceptions of the learning environment. It is desirable to further study the effect of different modes of field trips in the context of different science subjects on the learning environment.

In Kenya, the primary school children are planted a green belt of trees across the savannah as a part of the celebrations of the 10th anniversary of the Stockholm Environment Conference. The focus of the programme is to encourage children to nurture and appreciate their environment. “For Every Child a Tree” aims to help children to understand what is actually going on in the world around them; an awareness that must be created in children for they are the leaders of tomorrow who will shape and influence our world for future generations. The organizers hope to generate in children an interest in the problem of the world’s rapidly disappearing trees and forests and the possibilities of reforestation. Hancock (1982) narrates that the campaign will help children learn to appreciate the essential role trees play in balancing our ecosystem. “A child’s mind flows with a never-ending stream of questions about the world around him. Why are trees important? Why are they essential to our survival? These questions need answers.
A similar experimental study in environmental education organized under the auspices of UNESCO by the French ministry for the environment proved a great success. 1000 children aged 7 to 14 met together at Unesco Head Quarters in Paris to celebrate ‘the world of trees’. Some of the feelings expressed by them were ‘I love trees!’ , ‘It’s impossible to breathe without trees’, ‘Trees are as precious as air, but they are more beautiful’. (Cerrans 1990).

British Government Panel on Sustainable Development (1995) clearly envisages that environmental education far transcends the boundaries of formal education. Work in the field as well as the classroom, bringing in local community, is an essential part of the process from nursery and primary school upwards.


Hoff (1950) strongly feels that field trips and demonstrations are effective in making science subjects more real and interesting to pupil of all grades. Another study by Joseph (1976) explored in detail the potential and practices of using school resources in conducting science clubs. The study found that resources like fields, and gardens are present near almost all schools. But only a small number of teachers use these environmental resources for teaching science.

Han, Eun Sok (1991) made a comprehensive analysis of the Teacher/School Administrator attitudes towards out-door education camping Kyonggi. The study
found that, in general, teachers and school administrators are quite positive towards the value of outdoor education and school camping. Another significant finding was that the teachers and school administrators are not equipped with the knowledge and skills related to outdoor education.

Raju (1985) and Sheenu (1995) studied about the utilization of available community resources in the teaching of biology in the secondary schools of Kerala.

Thies (1997) conducted a study to determine efficient procedures for operating residency outdoor environmental programme. The analysis of results revealed that;

(i) The environmental programmes are weak, if not integrated with ongoing educational curricula.

(ii) Better training programmes and certification requirements need to be developed.

(iii) Inquiry methods with hands-on student activities need to be developed for such programmes.

(iv) The current interest in environmental education is to be exploited for programme support.

(v) Universities should arrange outdoor environmental education courses for teachers.

Field trip plays a very important role in the teaching of Biology. The basic reason for conducting a trip is to provide additional information and experience that cannot be had within the classroom. Moreover, students get to know their community and surroundings better.
Collette (1968) is of the view that field experience permits easier transfer of learning to the solution of real life problems. Coudsward (1977) goes to the extent of remarking that "where structure dominates instruction, learning is inhibited". He is of the opinion that student must be given the opportunity to relate the things they feel.

A field trip is a process-oriented approach which focuses on an active interaction process between the students and the environment. In this process, students actively conceive information from teachers. The advantage of 'active learning' over 'passive learning' is based on constructivist theory as well as outcomes of studies conducted in this domain. A field trip conducted as an integral part of a particular curricular unit should be placed as early as possible in the learning sequence to provide a more concrete basis for understanding the abstract concepts. Students should be properly prepared for the field trip. The preparation should employ concrete activities to reduce the effect of the 'novelty space' of the outdoor event.

Orion, et al (1996) developed an instrument for assessing the environment of out-door science activities. In an earlier study, Orion and Hopstein (1994) tried to identify the factors that influenced learning during a scientific field trip in a natural environment. They found that the 'novelty space' of the field setting consists of at least three novelty factors- the cognitive novelty, the geographical novelty and the psychological novelty. The cognitive novelty depends on the concepts and skills that students are asked to deal with throughout the field trip. The geographical novelty reflects the acquaintance of the students with the field trip area. The psychological novelty of the study group in this research reflected their previous
experiences with field trips as socially adventurous events, rather than learning activities.

Vandersteen (1966) has stated the importance of school garden for teaching biology. The garden can supply multifarious materials for the pupils laboratory and for demonstration experiments.

Conningham (1969) has stated that the class room provides an extremely artificial situation for the study of organisms. Outdoor environments, such as the school garden, school neighborhood, city park can be utilized for the study purpose. Myer and Lee (1980) highlighted the importance of field trips as aesthetic experiences.

Padmavathy (1985) studied the effectiveness of field trips in teaching biological sciences. A later study by Ambika (1993) had similar results. She studied the potentialities of field trips for learning Biology in standard IX.

Ambika (1993) conducted a study on the potentialities of field trips for learning Biology of standard IX. The study aimed at finding out the field-trip experiences that are currently being provided in the learning of Biology and also those field-trip experiences that can be made possible for improving teaching-learning of Biology.

The study came to the conclusion that the teaching of Biology at present is very much formalised within the four walls of the classroom. The teachers are unaware of the latent potentialities of field trips and how they can be used in learning Biology. It was also found that teachers tended to avoid outdoor activities,
because they were very often unfamiliar with the philosophy, technique and organisation of field trips.

The findings of a study by Oloke (1994) revealed that indoor-outdoor laboratory method of teaching was more effective than the traditional method of teaching Ecology in producing cognitive gain and was also effective in promoting a positive ecological attitude.

Lindenmeier (1996) conducted a study on outdoor education components. The research project was undertaken to determine to what degree Environmental Education and Adventure Education are interdependent components of outdoor education. The study found that environmental education and adventure education are significantly dissimilar in several key respects.

Orion (1993) developed a model for the implementation of field trips as an integral part of the science curriculum. The important conclusions arrived at regarding the role of field trips as a tool of concretisation were that (1) the field trip should be placed at the early stage of the learning process and (2) the field trip should focus on concrete activities which cannot be conducted effectively in the classroom.

John (2000) developed a Guided-Field Study Model (GFSM) and tested its effectiveness by comparing the achievement in Ecology of the treatment groups viz., Guided–Field–Study Method (GFSM) group, Lecture Method (LM) group and Self-Study Method Group (SSM). The findings of the study led to the conclusion that Guided Field Study Method is superior to Lecture Method with regard to Post test achievement. The study also showed that resource
units based on GFS models are a necessity in higher secondary schools to help teachers realise the possibilities and potentialities of guided field study method.

The place of activity in learning has been stressed by several researchers like Keiren (1974), Cotler (1977), Tapie (1981) and Washton (1977).

Reviews of research on outdoor educational experiences conclude that the out of school activities provide a more stimulating learning environment, especially if it is of sufficient duration. This has been reported by Washton (1977), Crompton and Seller (1981), Backman and Crompton (1984), Miller (1988) and others. They all share the opinion that such methods will help increase students’ ability to accommodate and assimilate matter, retention power and also in promoting positive ecological attitude.

Washton (1977) gives importance to the role of community resources, research centres, science clubs, museums, field trips to forests, lakes etc. in the learning experience. Dighal (1988) tried to establish the fact that charts, models, excursions, science exhibitions, film shows and orientation programmes brought better results and helped remove drudgery in teaching biological sciences. Vandersteen (1966) has stated the importance of school garden for teaching Biology and brought out the importance of using nature calendar.

Swafford (1995) made a survey to determine the perceptions of outdoor educational professionals concerning the best methods, strategies, materials and resources for elementary teachers to use in developing an outdoor laboratory for their school. He designed an outdoor laboratory based on the significant activities by the participants.
The ability of young learners to acquire scientific concepts in informal learning institutions such as museums, zoos, aquaria and science centres is enhanced by using authentic investigative methods similar to those employed by scientists. This is the finding of Arenson (1996) from using the Zoo Reach Program. He proposes the program as an effective model for further development of informal learning techniques. This program was designed for kindergarten, first and second grade students in order to heighten the students’ awareness of wildlife and to assist them with their acquisition of related concepts by allowing scientific study of the Los Angeles Zoo. The program includes teaching, training, curriculum materials, and hands on objects used while touring the facility.

Deopuria’s (1984) study found that the environmental approach in teaching will help in developing better attitude in students towards the environment. Similarly, a recent study by Abraham and Nair (1998) concluded that environmental approach helps in developing positive attitude, stimulating cognitive aspects, effective behaviour, psychomotor skills and better retention in students.

2.2.6 Environmental Approach to Learning Biology

Coffey (1983) conducted a study to describe the present status of environmental education as it is incorporated in high school Life Science classes in the State of Oregon. Findings revealed that the objectives were focused more on understanding the environment and developing an appreciation for it than on helping students to solve environmental problems or develop environmental data collecting techniques. The majority of instructional materials come from single discipline text books, materials developed by the staff or a combination of these
rather than from materials developed by the school system or commercially prepared programs, the content comes primarily from teacher interest and the highest ranking constraint to curriculum development was lack of time.

An ecological study conducted by Shoemaker (1977) revealed that ecological concepts can be presented effectively at secondary level through field exercises and that students who participate in field exercises have a better understanding of ecological principles than those who do not.

Santos (1988) conducted an investigation on the effectiveness of Nature’s Classroom Programme on students, and concluded that the Nature’s Classroom experience positively affects both short term and divergent processes of cognitive development.

Harvey (1951) studied the effects of short field trips on the scientific attitudes of ninth grade students. After a brief free exposure to real problems in the field, she was able to demonstrate improvement in student scores on a locally constructed instrument.

Field studies conducted by Riban and Koval (1971) revealed that the field work experience has been shown to be highly effective educational mode in the area of scientific methodology.

Research conducted by Lavie (1988) showed that studying in the field has a positive influence in learning, feeling and educating.

Andrews (1978) investigated interrelationships between cognitive and affective attributes and participation in activities in an outdoor environmental education program for sixth graders. He found a positive correlation between attitude towards environmental concepts and knowledge.
A field study conducted by Branch (1983) on “Local Stream and Science related community problems”, revealed that students who received science instruction in the form of a generalized approach to problem solving using teacher developed materials, became more positive in their views towards school science and exhibited a greater tendency to apply knowledge of science to societal issues and that the instructional strategies employed in the study was superior to the conventional methods of science teaching.

A study conducted by Han (1991) to diagnose teacher and school administrator attitudes towards the value of outdoor education and school camping and skill level necessary for conducting outdoor education and school camping programs revealed that:

1. Teacher and school administrators are positive towards the value of outdoor education and school camping.
2. Teachers and school administrators are not equipped with knowledge and skills related to outdoor education and school camping.
3. Among the constraining factors identified “administrative difficulties” and “Teacher inconvenience” was considered the most constraining factors.

De Pree’s (1992) study was designed to provide information on the merits of a newly designed environmental course in a suburban high school. Four major areas were investigated: knowledge, source of information, concerns and solutions to ten dilemmas. Findings from this study provided convincing evidence on the positive effects of the course on the students.
A research study conducted by Ghawanni (1986), to explore the background of current usage, resources and factors or problems that limit the use of field trips as an effective method of teaching science, indicated that teachers, principals, supervisors and ministry officials all recognize the value of field trips in instructing students in science. The study also revealed that field trips are rarely conducted as part of the instructional programme. Reasons for declining importance of field study include:

1. lack of knowledge of educational policy about field trips by teachers and principals
2. teacher’s misconception of administrator’s desire for field trips
3. scheduling conflicts

Thies (1997) undertook a study to determine efficient procedures for operating a residency outdoor environmental program. The analysis of results revealed that:

i. Environmental programs are weak if not integrated with ongoing educational curricula
ii. Better training programs and certification requirements need to be developed
iii. Inquiry methods with hands on students activities need to be developed for such programs
iv. The current interest in environmental education need to be exploited for program support
v. Universities should include outdoor environmental education courses in course offerings for teachers.
Jaus (1978) conducted a study to ascertain the effectiveness of 30 hours of Environmental Education instruction on elementary and middle school teachers' attitudes towards teaching this subject in their classrooms. Analysis of results indicates that the group of elementary teachers who received training in environmental education possessed significantly more positive attitudes towards teaching in their classrooms than their counterparts who did not receive training.

Bin (1993) conducted a study to obtain data regarding the perceptions of teachers about the status of Alam dan Manusia (ADM) i.e., Man and environment. The major findings are:

1. A great majority perceived the ADM materials in the existing curriculum as accomplishing the goals from “a little” to “moderate extent”.
2. The majority felt they required training from a “moderate” to “a complete extent” to accomplish goals.
3. A great majority indicated they were willing to participate in training from “a moderate” to “a complete extent”.

Volk (1983) conducted a study to perceive Environmental Education (EE) curriculum needs in United States. The results obtained showed that:

1. Professional Environmental Educators believe that there exists considerable discrepancy between the desired and existing status of EE.
2. It was perceived that EE goals were not being met with existing curricula.

3. Need for in-service teacher education for EE curricula was perceived at all academic levels.

A study by Yogamoorthi (1992) stressed the need for environmentally trained teachers for environmental education. In India, though we do have in-service programmes for teachers to reinforce their skills and knowledge in their concerned subjects like mathematics and science to make the process of teaching-learning meaningful and up-to-date, such in-service courses do not include anything substantially on Environmental Education.

There is no scarcity for resources in India and our country is rich in natural resources. Kerala, the south west part of the peninsular India has been so lavish in the mix of elements and there are innumerable opportunities, both outdoors and within the institutions. Students can collect many materials and preserve them. An economically developing country like ours, should not neglect these educational resources which have immense potentialities for enhancing science learning.

The different aspects of environmental education were discussed by several researchers in India and abroad. Some of the major aspects discussed were the challenges and problems in environmental education Das 1994; Mukherjee, 1997; Manuel, 1998), the support system in environmental education (Bartlemus, 1994; Gayford 1996), using environmental resources and strategies for teaching children (Coudsward, 1997; Lilly, 1978; Mays, 1985; Kronholm, 1994), formulating and evaluating environmental approaches for biology education (Mathew 1976;
Mariamma, 1977; Manuel, 1978; Shaharban, 1978; Krishnankutty, 1997), and evaluation of the environmental science curriculum (Blum, 1982; Bradley, 1995; Bartlemus, 1994) discusses the concepts and strategies of suitability for the perspective of environment growth and development.


The ethno botanical components relevant for the educational context of Kerala were analysed in detail by Exemmal (1980) and Valsala (1982). Yogamurthy (1992) stressed the need for environmentally trained teachers for environmental education. His study further revealed that in-service courses do not include anything substantially on environmental education.

The importance of indigenous knowledge as an empowerment tool for sustainable development has been highlighted by several researchers like Gupta (1978), Barthakur & Jain (1979), Dei (1995) and Brower (2000).

Rajaput (1988) has found that differences exist in the awareness about environment among children of two different geographical areas and that the students in general lack in the application part of their knowledge of their environment.

Manuel and Exemmal (1988) made an attempt to identify different factors and develop different models of environmental education in Botany relevant for the socially disadvantaged children in the schools of Kerala, which could be handy for teachers and in-service workers. The researchers proposed six models which included (a) Ethno-science, cutting into the process of science, (b) Process approach applied
to the living world, (c) Application-oriented models, (d) Ecology activity-oriented model, (e) Interdisciplinary models and (f) Higher explorations.

De Pree (1992) studied the merits of a newly designed environmental course in a suburban high school. Four major areas were investigated, knowledge, sources of information, concerns and solutions to ten dilemmas. Findings from this study provided convincing evidence on the positive effects of the course on the students.

Ross (1994) developed a framework for problem-solving in environmental skills and environmental studies. 64 junior grade students from grades 4, 5 and 6 participated in the study. The objective was to identify student problem solving skills generated by the two teaching environments. First one is developed for a content oriented environment and the second for a problem-solving oriented environment. Results showed a shift in knowledge patterns from the content environment to the problem solving environment.

Manuel (1978) made an attempt to give a brief analysis of the repertoire of processing model and competencies which a teacher might need to make a success of environmental approaches (EA), compared to that of formal approaches (FA). He argues that Kerala folklore and environment are very rich in the tradition of ethno-science. It is likely that this is a characteristic found in varying degrees all over India and it is possible to connect school culture with folk culture using this base.

Brower (2000) reports that the distinction between conceptualisation and practice is lacking in most, if not all, indigenous knowledge studies. According to him, quite often indigenous knowledge is local, but it need not be traditional, as knowledge is always in the making.
Blum (1982) evaluated an environmental studies curriculum in terms of student perceptions of course usefulness for achieving various goals. Results were interpreted as evidence that an inquiry-oriented curriculum can have a positive effect on student’s perception of the usefulness of school subjects.

Suni (2000) developed an identification key on the topic ‘Inflorescence’ using environmental method. The study arrived at the conclusion that environmental method is significantly superior to lecture method and self-learning method, with regard to post-test achievement, and, therefore, environmental method can be adopted as an effective method for teaching ‘Inflorescence’ at higher secondary level.

Analysis of teachers’ as well as students’ responses also showed that environmental method is effective in realising the educational outcomes listed under the categories – Cognitive, Affective, Process skills, Social, Environmental and Teacher competency.

The study also found that the available environmental resources are not being properly utilised.

Geethalekshmi (1994) identified the curricular potentials of ten local edible fruit yielding plants for the study of Botany at the higher secondary level. The fruit yielding plants selected for the study were Mango, Jack fruit, Papaya, Amla (gooseberry), Passion fruit, Anona, Guava, Cocunut, Pineapple and Banana. The study brought out the revealing finding that all the ten plants selected for the study have immense potential for teaching of the content in the Botany textbooks of higher secondary classes.
A similar study by Binu (1997) identified the curricular potentials of select plants bearing commercially important flowers for the study of certain major concepts in the Botany syllabus of Kerala. Besides content analysis of the B.Sc. Botany syllabus, a questionnaire and an awareness test for students and a questionnaire cum rating scale for teachers were used for collecting data relevant for the study. The plants bearing commercially important flowers selected for the study were Nerium, Plumaria, Ixora, Gomphrena, Rose, Chrysanthemum, Helianthus, Anthurium, Orchids and Lotus. The potentials of these plants for learning Botany at B.Sc. level were identified.

The teachers under study were of the opinion that all the plants bearing commercially important flowers selected for the study were appropriate for teaching the different concepts in Botany at B.Sc. level. The measures that can be utilised for improving the existing pattern of teaching – learning Botany are also suggested.

Analysis of the curricular potentials of certain medical plants was the subject of study for Lelitha (1984). The medicinal plants used for the study were Onion, Swet Flag, Sida, Neem, Cyprus and Henna. The study highlighted the fact that medicinal plants, if included in the syllabus possess ample curricular potentials worthy of studying Biology at secondary level.

In an earlier study which is special to the Botany curriculum for colleges, Jayasree (1979) examined a few medicinal plants and suggested that the secondary school curriculum may also be constructed in such a way that the students may understand the plants and their common use in medicine.
Nair (1998) conducted a study on the content analysis of the Biology text books of standards VIII, IX and X she showed that only a few aspects of environment protection were dealt within standard VIII and coverage was much less in standard IX. But in standard X many of the environmental protection aspects were included, though not in depth.

Scaria’s (1984) study on the curricular potentials of local plants of food value highlighted the fact that majority of the secondary school students are lacking practical and utilization knowledge about the commonly available local food plants. The investigator suggested that pupils should be encouraged to make use of these plants, as it may be helpful to reduce some of the deficiency diseases.

Susan (2000) conducted a study to identify the curricular potentials of select occupations for the study of biological sciences at the higher secondary level and concluded that the existing biological curriculum at the higher secondary level is inadequate to develop student’s skill in biology based occupations.

A study conducted by Valsala (2002) establishes to a great extent that field visit could be instrumentalised as a living technology system which has got significant potential to impart science and ecological education focusing towards an integrated sustainable development process.

2.3.0 The unique role of botanic gardens in conserving the environment

Biodiversity is basically an ecological topic, but biodiversity problems and issues are connected to every fabric of our global society. It is reported that during the next 20 to 30 years, the world could lose more than a million species
of plants and animals-primarily because of environmental changes due to humans. At 100 species per day, this extinction rate will be more than 1,000 times the estimated "normal" rate of extinction. The list of lost, endangered and threatened species includes both plants and animals. About 10% of temperate region plant species and 11% of the world's 9,000 bird species are at some risk of extinction. In the tropics, the destruction of forests threatens 130,000 species which live nowhere else. This alarming rate of extinction is the global problem which has kindled world-wide interest in "biological diversity" or "biodiversity". Biodiversity implies more than simply the number of species that inhabit our planet. The ecological interactions among these diverse species and the physical environment make up the ecosystems upon which the human species depends for survival. Loss of biodiversity is the problem: conservation biology is the science to understand the problem and propose solutions. Environmental education is the means of getting solution implemented (Connect, 1992).

The planet's biodiversity is important to human beings in many ways. For example, it provides a potential resource for food, medicine and industrial material. Presently, approximately 80% of the world food supply is provided by fewer than two dozen species of plants and animals. It is estimated that more than 25% of all medicines available today are derived from tropical plants. This makes even more pronounced the need to preserve genetic diversity needed to find food species which can adapt to new conditions. To control the ecological imbalance our country has set up 122 wildlife sanctuaries, 47 National Parks and 11 Biosphere reserves, besides all these, a number of seed banks, pollen banks, tissues and cell culture and biotechnological centre are also opened (Tani, 1997).
Teaching activities in environmental education about biodiversity can be conducted in various manners and under various heads like sciences, social sciences, visual arts, languages, geography, history, etc. An activity may be conceived under each head separately or under several heads at a time. For example, a biodiversity problem could be presented to students in the form of a moral dilemma, thus linking it with the social sciences. The teacher’s role would be to present the problem and explain the dilemma to the students who individually, in small groups and all together would react through individual reasoning, group discussions and evaluation. The teacher would encourage students to experience personal conflict in the dilemma and to facilitate discussions which allow students to apply and evaluate their own levels of reasoning. At the close of the activity the teacher could amplify the particular problems used and link it with other wider issues.

According to Nair (1989) there can be no better ‘learning laboratory’, than the environment itself as far as environmental education is concerned. The first step in any educational effort related to natural habitats and conservation must be the creation of an interest in knowing the plants and animals that constitute their natural environment. Most children lack any curiosity to identify a bird, a plant or insect that they pass by. Concern for conservation can emanate only from a love for nature and an understanding of how nature works. Sabata (1997) reported that it was of paramount importance to create love and concern for nature in young minds so that they grow up with an awareness that would lead to action. Hence proper inventory methods are to be taken for identifying and later monitoring and conserving the biodiversity for protection of the plants.
Traditionally Botanic gardens have always placed education high on their list of priorities and many owe their existence to universities. Now with the appointment of their own education officers, the role of Botanic garden is being further extended to provide a service to schools.

Botanic gardens themselves as a physical and thoughtful establishments play an important part in environmental education. They are the main thrust of the hidden curriculum for environmental education in the formal education centre. The fabric of the place must be functional and attractive the display areas should stimulate the visitor and incumbent alike so that at any time every child can say quite simply, it is a nice place. (Palmer & Neal, 1994)

Botanic gardens are wonderful places for people to learn more about plants - where they come from, what they are for and why they are important. They give people a chance to see plants, not only from the country they live in, but also from other countries (Willison, 1993). Here arises the question what Botanic garden offer in terms of education.

Swaminathan (1989) in his Forward to The Botanic Gardens Conservation Strategy pointed out that by enabling village schools to develop small botanic gardens with the active involvement of students in the planning, planting and protection of such gardens, awareness of beauty and necessity of biological diversity can be generated through field level action.

The traditional role of botanic gardens and arboreta has been to collect, identify, classify and grow plant species from all over the world. The general
practice is to display the various plant species under the best and visually most attractive conditions (Balick, 1986). Thousands of people of all ages visit botanic gardens everyday for recreation as a part of their leisure activities. This passive and generally unplanned show of a wide spectrum of plant life in fact creates an element of education informing society on the protection and rational use of natural resources. This public education component has been actively pursued by some of the world botanic gardens. Gradually a realisation came, whether the people come informally to walk around the garden or more formally to participate in an educational activity. This opportunity must be utilized to promote the conservation of biodiversity. Therefore botanic gardens are gradually intensifying their efforts and resources in order to educate the population paying special attention to the school children (Torre, 1993). Thus, one of the principal roles of botanic gardens is public education, and the best teachers are the plant themselves in their infinite variety. These plant collections including the rare, endangered, endemic species can be a considerable economic asset to enhance biodiversity of their own region if they are well presented and interpreted.

2.3.1 Role of Botanic Gardens in Environmental Education

A botanic garden’s responsibility under the Convention on Biological Diversity includes the transfer of information (Articles 12 and 13) to as wide an audience as possible. With necessary resources there is enormous potential to promote wider learning opportunities, and to increase visitor numbers and raise awareness of the importance of plants.
Heywood (1987) in the second International Botanic Gardens Conservation Congress pointed out that Botanical Gardens are globally concerned with conservation of the enormously rich biological resources of the tropics and seeking ways of developing and using them in a sustainable manner so that they will be available for future generations. He reiterated that today in accepting a major conservation role, it is the botanic gardens in those countries with rich floras that have a clearly defined role to play. Perhaps most important is to find out new ways of using botanic gardens more effectively for environmental education.

Boden & Boden (1985) accepts the fact that education in botanic gardens has been slow to develop as an accepted function and Willison (1993) exclaims that for many educators working in botanic gardens is a daunting task to set up environmental education programmes.

There are several examples where gardens have developed comprehensive programme of environmental education stressing the need for the conservation of biodiversity. These programmes are developed by the garden and then offered to the schools. Literature on environmental education through botanic gardens and their effect on the students of India is not sufficient in terms of quantum and diversity. However such literature from other countries especially developed countries is satisfactorily available. Therefore most of the research studies referred to here are from developed countries.

Visitor surveys carried out in many gardens indicate that visitors come attracted by a variety of reasons like enjoying the garden as a whole package, offering an attractive setting for relaxation and refreshment and some gentle intellectual stimulation through its educational displays and the exotic plant collections. (Willison & Green, 1994). Schools are now frequently looking outside
their own institutions for professional guidance and botanic gardens are increasingly focusing their education programmes on supporting classroom teachers. Consequently this presents opportunities for zoos, botanic gardens, public parks, etc., to make valuable contributions to enhance public education with their thousands of visitors and the incredibly diverse collections of plant and animal species they houses, Botanic and zoological gardens have the potential to influence public attitudes towards plant conservation, providing one of the most exciting educational tools - 'living collection'.

Taylor (1992) reports that an area of education in the botanic garden relates to those programmes allied with public school programmes whether at the junior, elementary or senior levels. This type of programme can only be effectively operated if the public school system initiates and requires the participation of the botanic garden in its programme. Thus, he observes that botanic gardens can suggest programmes, but the impetus must come from the originating school organizations. Clearly the botanic garden in any community represents a resource agency that can be tapped by the school system, but unfortunately the resource is often left dormant because of a lack of interactions between the two organisations. Therefore, there arises the need to develop some successful co-operative educational programmes between botanic gardens and education systems.

Pushpangadan (1994) reported that botanic gardens are visited by millions of people each year. They are thus ideally suited to perform a very important role in education in the whole field of nature conservation. This aspect is very explicitly seen in the mission statements of various botanic gardens and it clearly defines the vital role they play in the conservation of plants both insitu and exsitu. (Leadlay 1993).
The mission of the Royal Botanic Garden Sydney, Australia is: “To increase knowledge, awareness and understanding about plants, their importance and their conservation, by managing and displaying living and preserved collections and through botanical and horticultural research”.

The purpose of Limbe Botanic Garden Project, Cameroon is: “To become a regional centre for the conservation and sustainable utilisation of biodiversity in Equatorial Moist Central West Africa.”

There of the Royal Botanic Garden, Kew, UK is: “to enable better management of the earth’s environment by increasing knowledge and understanding of the plant kingdom—the basis of life on earth.”

National Botanical Institute, South Africa is “to provide the facilities, knowledge and expertise necessary to ensure the conservation, sustained use, appreciation and enjoyment of South Africa’s exceptionally rich flora and vegetation.”

There have been some successful co-operative programmes where garden educators have developed the plant conservations. Mexican Botanic Gardens have developed course lectures, workshops, guided tours and varied research programmes for various sections of the society. They have designed programmes for teachers from elementary school to high school who are working with a large number of students. (Linares, 2001).

The success of botanic garden education activity is that they include a practical activity where the participants can touch the plant material or smell it. These activities help the students to feel and familiarise with the plants. This will motivate them to know more about the plants that they use every day.
Royal Botanic Garden, Kew, became the cradle of environmental education instrumentalising it as a very effective tool for propagating ecological education especially among the school children. This has produced a new teaching resource, 'Plants across the curriculum' to introduce children between 8 and 13 to the world's treasury of plant life and the vital role it plays in our lives. Ten to fifteen courses are given throughout the year. Each course consists of 30 hours of instruction and is taught by the staff of Botanic Garden and the Department of Botany at the university. The courses include plant classification and identification, plant use, gardening, etc. Field trips, workshops and visits to garden and exhibitions are included in these courses. (Ailena & Julia, 1995).

Sir Harold Hiller Garden and Arboretum (SHHGA) provides educational service for schools. Besides giving information and advice to schools on the best methods to address environmental education, certain programmes are also conducted in the garden for students. The most commonly used activity is the 'Leaf Slide' programme. Each child collects a leaf, or an assortment of leaves, according to its shape, colour, etc. Each leaf is placed between the halves of the slide frame and the slide is held up to the light. In summer, freshly picked green leaves are translucent due to water content, autumn leaves appear as darker. South (1999) claims that this activity can be used in a number of contexts and programmes (a) leaf shape and form (b) distribution patterns (c) discussion of a plant's water needs. (d) photosynthesis (e) classification and keys (venation is used) (f) colour comparisons (g) listening (h) talking and describing (i) stimulation for imagination and creativity.
The Fautino Miranda Museum and Botanic Garden has been running an annual summer course since 1993. The course which runs for 15 days, is for children between the ages of eight and fifteen years old. All themes developed during the course are in relation to the use, conservation, and biology of plants.

The Botanic Garden Foundation, Colombia has developed a 45 hour theoretical environmental course. The principal objective of the course for primary and secondary levels is to train volunteers, students and community leaders in new educational methods, basic ecological concepts and teaching applications. The methodology includes individual and group work, analysis of videos and library text and occasional trips to zones of ecological interest.

Botanic gardens have an obvious vital role in supporting classroom teachers. Research in the United Kingdom indicates that teachers want programmes that are practical in nature, giving them models and activities that they can easily apply to their everyday work. It also indicates that teachers appreciate in-service training which takes place outside the school, giving them a chance to ‘stand back’ from the normal work place. (Ailene & Julia 1995).

The State botanic garden of Georgia initiated a workshop for students to work with endangered plant network in 1996. Through this project students work to increase the number of plants on their school grounds by adding common and endangered plant species on their sight. Shenk & Ceska (2001) claim that the project offers many opportunities for student involvement in science inquiry. Teachers spend time observing native plants and learning answers to the questions. Teachers quickly discover that there are a multitude of inquiry possibilities to interest and
challenge their students Chelsa Physic Garden runs a one day In-Service training course for secondary and tertiary teachers. The aims of the one day course were:

- to demonstrate the diversity of plants
- to discuss what a species is
- to explore the properties of materials using plants
- to present the Chelsa Physic Garden as an educational resource

Conservatoire at Jardin Botaniques (CJBG), Geneva, Switzerland has transformed a small house within the garden to provide a classroom and meeting place. The building which can accommodate 20 people is equipped with basic audio visual materials as well as office and storage space. CJBG has produced two new volumes in their educational series which include worksheets and drawings. The volumes are (i) What does a Botanic Garden do?. (An introductory programme for teachers) (ii) Tropical discoveries and observations focusing plants useful to humans. (Ailena & Julia 1995).

Providing educational experiences for the public was selected by the highest percentage of garden directors as a very important purpose of North American public gardens. Therefore, public gardens conduct a varied array of programmes to fulfil the educational, aesthetic interpretative and entertainment purposes. Some of the programmes are aimed specifically for children, students or professional horticulturists while others are designed for adults or general groups. These activities may take place in the garden, at nearby schools or community centres or in home through radio or TV. Among the programmes that are most often scheduled are
guided tours and walks for general groups, special lecture demonstrations for children, classes for adults and special exhibits. (Correl, 1980).

In New York Botanic Garden, educational activities for the public are arranged at all levels from the very simplest observation of plants to serious formal courses for adults. Formal course work for the public is very diverse, ranging from single courses of one to eight sessions to formal two-year programmes that lead to certificates in Botany, Horticulture or garden design. Children's Garden Craft Programme is very effective because it deals with how to grow vegetables and flowers. In its effort to bring successfully accurate information about plants to the general public, in addition to the classes and exhibits the Botanic Garden has embarked on a major programme of publications (Steere, 1969).

Gardens is the South east, West and Canada place the most emphasis on children's programme and gardens in the North East, Mid West and mountain plains selected adult educational programmes as most important. 24% of the gardens supplement school programmes with preparatory or follow-up activities in the schools. (Correl, 1980).

In a co-operative programme with New York city schools, approximately 20,000 children come to Brooklyn Botanic garden each year for instruction by staff teachers. A leisure time programme on saturdays and in the summer attracts more than 1000 additional children. In-service courses for teachers are still another educational offering. Thus, (Balgooyen & Avery, 1969) reports that this garden is acting in the dual role of offering people popular level educational opportunities in horticulture and gardening and serving as a conservator of the world.
Nanging Botanic garden and six other institutions have joined together to provide after-school scientific and educational base for middle and primary schools in Nanging. The theme Love, Learn and Apply science have been adopted in the hope that students will take advantage of the wealth of educational resources. Nanging Botanic Garden introduced biology and horticulture to students through environmental education.

The Young Ecologists’ Club was set up with Moscow university botanic garden with the aim of using the garden as a teaching resource for children living in the city. After-school sessions were conducted for the students to learn more about the natural world through observation, experimentation and practical work. The aim of YEC is to.

(1) Develop the interest of children in plants and their life;
(2) Teach children to observe nature;
(3) Teach some specific aspects and general perspectives on the complex relationships of man and the biosphere;
(4) Study the relationships between plants and other components of ecosystems; and
(5) Teach children practical skills to enable them to work with plants. (Andreeva & Parshin, 1999).

A short term work of environmental education applied to the medicinal plants is going on in the Botanical Garden of Asuncion, through the CEAM (Centro de Education Ambiental de la Municipalidad), the Centre of Environmental Education of the city of Asuncion. It consists of courses and workshops on
medicinal knowledge of the living plants, toxicity fand measurings, the problems of misuse and self-medication, familial planning, etc. These courses are primarily aimed at sellers of medicinals, teachers, healthcare and environmental promoters in the different districts of the capital. The educational activities could also be decentralized through a small and mobile interactive exhibition presented in a bus. (Roguet, 1999).

More than 1000 students and visitors visited an exhibition entitled ‘Promoting biodiversity conservation’ organised by Shenzhen Fairy Lake botanic garden. Many of them asked questions about biodiversity conservation and the visitors were supplied with a souvenir set of four bookmarks, all of which were in the shape of different leaves aimed at demonstrating plant biodiversity. (Lucy & Julia, 2000).

As far as India is concerned Indian Botanic Garden, Culcutta with its picturesque vistas, some delightful lakes with marvelous lotus, waterlilies and vast greeneries serve as a source of inspiration, education, research and recreation to millions of visitors to this garden throughout the year from India and abroad. Special facilities for visitors are available in the form of guided botanical trips inside the garden on Sundays and holidays. Other activities include extension services through open week exhibitions, flower shows, film shows and distribution of materials during Vanamahotsava (Chakraverty & Mukhopadhyay, 1990).

In the Gurukula Botanical Sanctuary at Kodaikanal workshops and programmes are undertaken for school students, youths, nature clubs, botany students etc., around the central theme of conservation and sustainable living. Seshan (1999) reports that during local school visits enough time is spent in looking at and discussing the forest world and exploring the feelings and impressions it arouses.
in their minds. And this is done through a playful exploration of plants, an excited and eager rediscovery of their native landscape and wild community. She emphasises that the understanding of nature needs a direct involvement, in whatever way, and it can happen in city parks, with a home garden, or trips out to the wilderness.

Tropical Botanic Garden and Research Institute (TBGRI), Trivandrum is playing a significant role in providing Environmental Education through botanic infrastructure available in the garden. Presently in South India TBGRI is undertaking innovative ecological education programmes both for students and general public. The plant wealth of this garden consists of more than 750 medicinal plants, thousands of wild trees, apart from orchidarium, palmetum, conservatory, bamboosetum and fernarium. There exists in TBGRI an incredible opportunity for imparting environmental education to students and general public. Pushpangadan, the Director, in his presidential address on the occasion of the inauguration of the environmental education programmes in TBGRI in 1995 stated that institutions like TBGRI can function as a nodal agency in evolving and developing suitable interpretative educational materials and co-ordinating, implementing and monitoring the action programmes at various schools and colleges in the State. Accordingly TBGRI is being engaged in structuring, developing and implementing environmental education programmes to students to observe, understand and appreciate the natural resources and to use these resources judiciously for our sustenance. The present research attempt is the outcome of such an environmental activity conducted in TBGRI.

The conclusion emerging out of this literature survey concerned with botanic garden education is that even though the size and resources vary hugely, botanic
gardens are united in the important role that they must play in preserving the world’s biodiversity. Thus, Botanic Gardens present the opportunity to be close to nature and to learn about plants. The diversity within the plant kingdom can be demonstrated and children would acquire knowledge in an incidental and informal way and would be able to retain it permanently. Moreover learning through environment is very enjoyable. Another benefit from this approach is that children would learn many desirable attitudes and also develop observational skill and scientific approach. Botanic Garden is a shop window for conservation education and therefore the youngest pupils in school groups to the oldest pupils in our continuing education programme can carry the message about the global crisis attributed to environmental degradation to a wide audience. Thus a new trend in education associated with botanical gardens is emerging. The transition from passive forms of education to active ones is obvious. The new circumstances have defined a new role for the botanic garden as a unique place for environmental education; in fact one could not find a better place for it.

2.4.0 Summary of the Literature Review and Previous Research

The literature review endeavour undertaken and presented above reveals many interesting bits of information about the role of man in conserving the environment and how environmental education as a means can change the attitude of people in conservation. Also, these theoretical foundations were further strengthened by the above studies. Hence, the existing literature with sufficient authenticity establishes that environmental degradation is attributed to economic development and there is an urgent need for developing region specific environmental education programmes and compatible curriculum modules.
Environmental education scenario

Further literature investigations reveal that within the total environmental education framework, this type of study is the most pivotal one, as the same is having multi-faceted pathways and consequences and therefore the most effective tool in maintaining a harmonious relationship between nature and man is environmental education and awareness.

The contributions done by organisations like IUCN (1970), and many international and national conferences like Stockholm (1972), Tbilisi (1977) and Earth Summit (1992) establish the fact that environmental education is the most effective step in controlling environmental degradation. They thus initiate and maintain sustainable development process.

The process of environmental education

The works done by organizations like United Nations (1987) Brundland Commissions Report (United Nations 1987) and UNEP (1989) The State of World Environment and many others like Branch (1983), Dayal (1987) and Abraham & Nair (1998) helped to establish that school children is the major target group to receive environment education and from various perspectives school is an important base centre for environmental education and action and this is supported by adequate field study.

Methodology / Field visit

Studies done by Ebel (1969), Crompton & Sellar (1981), Palmer & Neal (1994) and many others show that out of school activities is the most compatible
method for environmental education which, in the long term, helps to create sustainable development. The above studies also point out that the immediate environment (natural or built) is the richest resource base for environmental/ ecological education.

Cook (1978 / 79) and Saxena (1999) suggests that environmental education requires a different methodology. Survey, experimentation and problem solving are more effective than lecture and demonstration methods. Studies conducted by Hoff (1950), Padmavathy (1985) and Ambika (1993) reveals that field trip plays an important role in the teaching of biology. Vandersteen (1966) and Joseph (1976) stated the importance of natural resource base for teaching biology. Shoemaker (1977) revealed that ecological concepts can be presented effectively at secondary school through field excersices. Deopuria (1984) and Nair (1989) concludes that environmental approach helps in developing positive attitude, stimulating cognitive aspects, psychomotor skills and better retention capacity in students. All these studies reveal that in one form or another, environment has a presence in school programme for as long as there have been schools.

Environmental Education in Botanic Gardens

Other than schools, botanic gardens, zoos, NGOs can also undertake environmental education activities. The studies conducted by various botanic gardens like Royal botanic garden Kew, North American Public gardens, etc., show that botanic gardens are ideal places for students to observe and understand the different varieties of plants. The above studies also point out that a nature trial through these gardens provides a living lesson on ecology. Moreover, such activities play fundamental role in the field of biodiversity conservation by motivating the students and creating interest in nature and its protection.
Though significant research efforts in environment education are made in different parts of the world, such studies are very few in the case of botanic gardens of India.


Thus, from the above literature survey / review the investigator observes that:

(1) Research efforts on environmental education were not adequately undertaken in the botanic gardens of India when compared to the developed countries.

(2) An area of education in the botanic garden relates to the programmes allied with schools—primary, secondary, or tertiary. Botanic gardens can suggest education programmes, but the impetus must come from the school organizations.

(3) Sufficient research efforts were made so far as international agencies are concerned but number of research attempts in India to establish biodiversity conservation is very few.

(4) Empirical studies to establish the potential of field visit as an effective tool for science education are also very few.

(5) Activities that can play a fundamental role in the field of conservation (especially biodiversity conservation) by motivating the students and creating interest in nature and its protection are yet to be explored.
To develop successful and effective education programmes or a strategy collaborating with schools and botanic gardens is most urgent. As the research scenario (especially research related to environmental education and biodiversity conservation) happened to be so, the present research attempt aims at using nature as a teaching/learning laboratory for environmental education. Botanical gardens are ideal places to teach people about the richness of the plant kingdom and therefore the scope of education is endless in botanic gardens. There is a need to find the ways of using botanic gardens more effectively for environmental education using nature as a teaching/learning laboratory.
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