I INTRODUCTION

1.1. INTRODUCTION

Earth has enough resources to meet everybody’s need, but not for anybody’s greed - Mahatma Gandhi

We are yet to find out if any other planet beyond Mother Earth sustains life in any form. But, as of now Earth is our home; the most cozy and comfortable abode of the mankind, the other animals and plants species. This Earth is full of excitement and surprises, is rich in diversity and colours. But we have plundered its resources, defiled the environment and used as the garbage bin for ages now. Our self-esteem as the “Masters of the Universe” has received many setbacks after man-made calamities and disasters that have befallen us in recent times. We have realized our mistakes and have taken corrective measures. Many more need to be taken. Next few decades in this century will decide not only our love for Mother Earth, but also our survival on it, (Pramod, 2008).

Two hundred million years back when dinosaurs roamed around the earth, entire landmass of the earth was connected in one giant super-continent called PANGAEA. Later it broke and separated out, giving rise to the present continents. Changes have taken place not only in the geological formations in biotic and abiotic worlds too. Today, dinosaurs are extinct; so are millions of other animals and plants species. But with all that, which remains, human beings share this unique planet. There cannot be any concept of supremacy or dominance in this Earth. With 71% water and 29% land, this planet has created its environment in a highly balanced manner. Disturbing this balance would undoubtedly cause irreversible changes (Pramod, 2008).

The challenge we face in this century is that of reorienting the development of human society along a path that does not threaten the ecological health of the planet. In the 1980s, this came to be known as the challenge of achieving ‘sustainable development’. This task will not be
accomplished once for all. Each community and each generation will have to address the question of what sustainability means, and how it will be achieved, in its own particular circumstances. Without an active and informed citizenry this will not be possible. Finding a new balance between the welfare of our species and health of the planet will require a high degree of environmental understanding and commitment on the part of all members of the society. In short it will require environmental citizenship. The basic knowledge, skills, and values that an environmental citizenship might need can be acquired only through environmental education (Gadgil, 2008).

1.2. ENVIRONMENTAL EDUCATION

Environmental Education is a learning process that increases the peoples’ knowledge and awareness about the environmental and other challenges, develops the necessary skills and expertise to address these challenges and fosters attitudes, motivations and commitments to make informed decision and take responsible actions.

Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his bio-physical surroundings. It also entails practice in decision making and self formulation of a code of behaviour about problems and issues concerning environmental quality, (UNESCO Working Committee, 1970).

1.3. EVOLUTION OF ENVIRONMENTAL EDUCATION AT GLOBAL LEVEL

The first international concern to the deteriorating quality of environment was shown when UN Conference on Human Development was organized at Stockholm in 1972 which declared that “man has the fundamental right to freedom, equality and condition of life, bears a solemn responsibility to protect and improve the environment for the present as well as for future generations”. Subsequently an international workshop on environmental education was organized at Belgrade in 1975 which stated that the goal of environmental education is ‘to develop a world population that is aware of, and concerned about the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations and commitment to
work individually and collectively towards solutions of current problems and prevention of new ones”. Further Asian Regional Meeting was held at Bangkok in 1976, with recommendations for environmental education, personnel training, Non-formal environmental education and materials for environmental education. Subsequently inter-government conference on environmental education was organized at Tbilisi in 1977 which resulted in the culmination of the first phase of environmental education programme. The goals specified for environmental education at Tbilisi conference are:

1. to foster clear awareness of and concerned about economic, social, political and ecological – interdependence in urban and rural areas;
2. to provide every person with opportunities to acquire knowledge, values, attitudes, commitment and skills needed to protect and improve the Environment;
3. to create new patterns of behaviour in individuals, groups and society as a whole towards environment.

Further, United Nations Conference on Environment and Development held at Rio de Janerio in 1992 is a great landmark in awakening global consciousness on the issue of environment. UNESCO Thessaloniki Declaration (1997), presented sustainability as an ethical and moral imperative and the objectives to which education should devote as a matter of choice. Education is described as an ongoing process aimed at developing the capability of adapting to rapid changes in the world, but first and foremost as a process of transmitting knowledge and information to make the public understand the problems and to stimulate awareness.

1.4. EVOLUTION OF ENVIRONMENTAL EDUCATION IN ANCIENT INDIA

The term environmental education is new but it has ancient roots in Indian culture. Every scripture in India considers man only as a part of nature. Environment according to Indian thought is not conceived as physical, lifeless entity- it is living mechanism where homo - sapiens are one of the many species. Nature’s capacity to satisfy everybody’s needs has been acknowledged, provided harmony and balance is maintained between man and environment. According to Rigveda there are three kinds of God, the celestial, the aerial and terrestrial and harmony between these three and
human being is necessary for balance in the universe. To highlight the importance of various components of environment, various rituals have been institutionalized in our culture. Some mountains, trees, lakes, birds and animals have been considered sacred in Indian culture and are still being worshipped. Festival and events solemnizing the worship of Kailash and Govardhan mountains, Ganga, Jamuna and Saraswati rivers, Mansarovar lake, cow-dung, falcon, animals, peepal and banyan trees and tulsi plant are still celebrated in India.

1.5. PRESENT STATUS OF ENVIRONMENTAL EDUCATION IN INDIA.

- India has a long history of environmental education. The Bombay Natural History Society (BNHS) spearheaded non-formal environmental education in terms of species conservation. Dr. Salim Ali, the doyen of conservation in India was the first Nature Education Officer at BNHS. They focused attention on training school students, and also held training for teachers.

- World Wide Fund for nature (WWF) is running Nature Clubs of India. WWF-India has moved from nature trails treks and camps into more formal teacher training.

- At the national level, the Ministry of Environment and Forests (MoEF) has a major programme of environmental education in schools through its ‘National Green Crops’, a globe programme and network of eco clubs all over the country.

- During the last decade, institutes such as Bharathi Vidyapeeth Institute of environmental education and Research (BVIEER), Pune, felt the need to use their experiences with non-formal techniques of environmental education in formal school curricular education.

- The MoEF has funded a project, implemented by BVIEER, to evaluate the existing environment concepts in school textbooks produced by the SCERT’s from every state. This has created one of the largest data bases at the country-level to understand the level of inclusion of environmental concepts in the school textbooks and the gaps in information. It also showed that textbooks could not bring about pro-conservation action at the student-level. Based on this
work the Centre for Environmental Education (CEE) has had interactions with several textbook bureaus to help incorporate the subject of environment in school textbooks.

- Centre for Environmental Education (CEE) is a national institute established in 1984 and supported by the government of India, Ministry of Environment and Forests. CEE’s primary objective is to improve public awareness and understanding of environmental issues with a view to promote the wise use of nature and natural resources. To achieve this, CEE develops innovative programmes and materials and field-tests them for their validity and effectiveness. Among the thrust areas of CEE are EE through schools and colleges, through mass media, through ‘Experiencing the Environment’, EE for decision-makers, industry, natural resource management, and EE in the urban context and training.

- To spread the message of holistic, integrated environment education, Centre for Environmental Education (CEE) conducts its own in-house programmes. Among them: The Environmental Educators’ Workshop for Teachers, which helps them incorporate environmental awareness and learning into their subjects; and the Ecological Footprint Project comprising a package of four eco-tours (Yamuna Yuk Ride, Water Walk, Jungle Jog, Raising a Stink and Sanitation) to make students aware of their role as urban consumers and its impact upon their immediate environment, hinterland and beyond.

- Centre for Science and Environment (CSE) also publishes Gobar Times, an environment-focused monthly magazine for teachers and children (Sinha and Satyanarayana, 2007).

1.6. ENVIRONMENTAL EDUCATION AT SCHOOL LEVEL IN INDIA

Concerned over the hazardous ecological imbalance created by the human activities, many educators and experts have advocated introduction of environmental education in educational institutions to promote environmental protection. This is also reflected in the National Policy on Education (1986) which emphasizes that “there is an urgent need to create a consciousness of the environment. It must permeate all ages and all sections of society
beginning with the child. Environmental consciousness should inform teaching in schools and colleges. This aspect will be integrated in the entire educational process”. Similar concerns were shown by Hon’ble Supreme Court of India in its order issued on 22nd November, 1991 “the awareness of the environment and its problems related to pollution should be taught as a compulsory subject. We would require every Education Board connected with education up to the matriculation stage or even intermediate college to immediately take steps to enforce compulsory education of this requirement”.

**National Curriculum Framework for School Education (2000) also mentioned:**

Understanding of the environment in its totality, both natural and social and their interactive processes, the environmental problems and the ways and means to preserve the environment is general objective of education. With this consideration, environmental education has been made a compulsory subject for classes I to XII.

At the secondary stage, curriculum should lay emphasis on awareness, life experiences, and conservation and action skills. Since major aspect of environmental education is experience and relationship, experimental learning should be major teaching strategy at secondary stage. Emphasis should be on hands-on-grounded in direct experiences, applied learning, learning by doing etc., Students should be given opportunities to get involved and contribute to improving the environment. It should lead to sense of hope, accomplishment and sense of responsibility. Moreover, there should be relevant connection between the subject matter presented and students’ day to day lives. Students are likely to find learning experiences more valuable if it is connected to their own lives. Innovative teaching learning strategies like role playing, simulation exercises can be used by the teacher.

**1.7. NEED FOR INSRUCTIONAL STRATEGIES AND MATERIALS**

Since the objectives of environmental education demand challenging learning outcomes, the existing classroom practices need to be supplemented with more innovative techniques. Major objectives of environmental education are as follows:
To improve awareness about environmental concerns
To develop understanding of ecological principals
To arouse concern for environmental problems
To stimulate commitment for environmental protection and
To demand action to promote conservation of natural resources

The teacher has to draw from a wide range of learning resources and employ a variety of techniques to take the learners to the goals. Already burdened teachers have neither the aptitude nor the skill to develop new techniques.

Position Paper, National Focus Group on Habitat and Learning (2005), also discusses the need for development of different types of model instructional material. The scope and purpose of this exercise is likely to be quite different in the case of environmental education due to its inherent nature and specific needs to contextualise learning experiences extending from local to global environmental issues and concerns.... The possibility of preparing more than one variant and trying them out in schools may be explored in order to evolve the most suitable designs of syllabi and instructional material.

Hence the researcher, choose to develop different instructional packages, and use them in actual classroom.

1.8. BASIS FOR DEVELOPING INSTRUCTIONAL PACKAGES

‘A Guide to Green Material’ published by Centre for Environmental Education, (Mamata,1999) Ahmedabad, gives detailed guidelines for preparing instructional resource material. The material needs to be different from traditional text books; it needs to be systematically planned, based on verifiable facts and empirical evidence; and related to the Indian context, and problems. At the same time, it must be flexible enough to be adaptable to the situations and needs of individual teachers and students.

A wealth of learning objects and settings are available everywhere. The challenge is to transform them into fascinating, exiting, challenging, thought - provoking and answer-providing material and opportunities. These materials...
should try to combine participation and enjoyment, while retaining factual accuracy and accountability.

In preparing such material, the interdisciplinary nature of environmental education demands that along with scientific or technical information, it must include the elements of social, economic, aesthetic, ethical and other aspects that all together constitute the environmental considerations and decision making.

Instructional resource material for should thus not be in the nature of additional subject or textbook to be crammed into already crowded schedules and curricula. Rather these should be seen as ‘user friendly’ resources that break down the walls between subject-matter pigeon holes and integrates them for a common purpose—that of enriching learning, broadening perspective and deepening insights. They must serve to enrich, as well as complement, areas of the existing curricula.

Taking into consideration the above stated guide lines, the researcher developed materials for different instructional strategies.

1.9. LIMITATIONS OF THE STUDY

Government departments and non-governmental agencies conduct activities related to environment. Regular courses and also programs related to environmental education are done at various levels of education namely, colleges and schools. Among them the researcher chose schools because environmental education given at schools would be of great value to the student community who would be the future guardians of this earth. Among the different levels of school education, pupils at primary level were too young to understand and interpret the complexities of environmental crisis. At higher secondary level, the courses were diversified into different streams namely science, arts and vocational streams and hence were found to be not comparable in terms of strategies. Hence the researcher selected secondary school level for the present study. Among the classes from six to ten in secondary level, the most appropriate representative class was standard eight and this warranted the selection of class eight.
In schools, two major modes of environmental education are employed namely beyond the school experiences and school campus experiences. The former involved field trips, nature trails, visit to places like zoos, botanical gardens, science parks etc., participation in clean green projects, campaigns, field work and environmental quality monitoring. Due to limitations like paucity of time, financial implications and restrictions imposed by educational authorities citing safety reasons, the percentage of pupils exposed to such activities was dismally low in India. Hence any research carried on about these experiences would be of use only to a very small fraction of students. This warranted the selection of campus experiences.

Among campus experiences, the researcher confined herself only to curriculum transaction because activities like film shows, news letter, project work library reference, exhibitions did not involve all the students or they were not carried on daily. The researcher had planned to involve only those strategies that could be used by all the teachers so that the entire student community would reap the benefits of the findings of this research.

Though the study was meant for all the grades in secondary level, since all classes could not be included due to paucity of time and funds, it was limited to eighth standard. For want of time and for calculation purposes, the sample was limited to six hundred and twenty seven pupils of Coimbatore Educational District of Tamil Nadu, India.

1.10. SIGNIFICANCE OF THE STUDY

Successful learning in learning environmental education was closely related to strategies used by the teachers and the learners. In this age of growing information the entire educational paradigm changed continuously due to increasing social and technological changes and the expected learning outcomes of environmental education. Strategies studied by researchers across India were: video programme (Antoniswamy, 1989; Singh, 1995), cultural programmes (Amsaveni, 1992), multimedia package, (1996), activity method (Vaijayanthi, 1992), eco-club activities (Lohani, 2000), integrating environmental concepts in school subjects (Srivastava and Saksena, 2002), joyful activities (Chhabra, 2005) and cultural programmes along with field trips (Anitha, 2004).
Interest in strategies of learning, were renewed now a days for several reasons. For example, society gives priority to students and directs strategies of teaching and learning towards the development of his/her autonomy in acquisition of cognitive aspects as well as change in attitudes. Hence, this study on application of different strategies in environmental education would be a value addition to the already existing body of knowledge about educational strategies at school level.

1.11. SCOPE OF THE STUDY

This study was on the strategies adopted by practising teachers across in India and was based on Tamilnadu state board syllabus. These strategies were designed in such a way that they could be used for learning of environmental education by school students inside school campus and require only the existing facilities in the schools. All the three instructional materials gave free scope to the practising teachers to employ them in his/her classroom situations, pupil’s entry behaviour and needs and according to the innovativeness of the teacher. It was explicitly stated in the activity manual. Multimedia and visual aids instructional materials were also designed in such a way that the teacher could employ them according to his/her needs.

The concepts selected were from the existing curriculum and so the teachers were willing to employ the strategies in their classes as it would enhance the performance of the pupils.

1.12. OBJECTIVES OF THE STUDY

The main objectives of the present study were as follows.

a. To develop instructional materials for different environmental education strategies namely, activity based, multi media based, and visual aids based as per state board eighth standard syllabus.

b. To make a comparative analysis of the efficacy of the above mentioned strategies along with conventional strategy on the basis of mean gain in achievement and attitude.

c. To analyse the comparative effectiveness of the strategies on different areas of environmental education and on the basis of adjusted final scores in achievement and attitude.
1.13 DEFINITIONS OF TERMS USED IN THE STUDY

i. Learning:

ii. Environmental education:
According to Tbilisi Conference 1977, the goal of environmental education is to develop a citizenry that is aware of, and concerned about, the total environment, and its associated problems, and which has the knowledge, attitudes, motivations, commitment, and skills to work individually and collectively toward solutions of current problems and the prevention of new ones.

Dr. William Stapp (North American Association of Environmental Education) defines, “Environmental education is aimed at producing citizenry that is knowledgeable concerning the biological environment and its associated problems, aware of how to solve the problems, and motivated to work toward their solution”

According to Zimbabwean Ministry of Higher and Tertiary Education: Environmental education is a response to risks, issues and crises and opportunities arising from the biophysical, social, economic and political components of the environment. Environmental education includes varied learning processes that provide opportunities for people to develop knowledge, skills and attitudes, which enable them to act in an environmentally responsible way within their communities. These active teaching learning processes may take place through formal and non formal ways through information, communication and awareness campaigns.

iii. Secondary School:
Secondary school means standards VI to X - catering to the students approximately in the age group of 11 to 15 years.
iv. **Instructional:**


v. **Strategy:**

The word strategy in its etymological derivation owes its origin from a Greek word ‘strategia’ and may be defined as plans and specific ways devised and employed for the realisation of a goal (Mangal and Mangal).


1.14. VARIABLES SELECTED FOR THE STUDY AND DATA USED

The independent variables considered for this study were of two types namely attribute and treatment variables. The attribute variables were:

- Type of school (Government and Private)
- Locality (Urban and Rural)
- Gender (Boys and Girls)
- Medium of instruction (Tamil and English)

The treatment variables chosen for the present study were:

- Conventional strategy
- Activity strategy
- Instructor controlled multimedia strategy
- Visual aids strategy

Scores obtained in pre-test (initial scores) and post-test (final scores) were of the following categories.

1. Total achievement scores and achievement scores split based on different content areas namely noosphere, biosphere, pollution and natural resources scores.
2. Attitude scores.
Since initial scores were found to have significant effect on the final scores, adjusted scores were calculated by removing this effect. The adjusted scores were put to analysis to find the effects of teaching strategies employed in the study. Hypotheses were framed based on independent variables and the data collected in the form of scores.

1.15. HYPOTHESES

The following hypotheses were framed in order to test the result obtained by appropriate statistics.

Hypothesis - 1
There is no significant difference between the initial and final achievement scores with reference to independent variables.

Hypothesis - 2
There is no significant difference in adjusted means of achievement scores by type of school and type of methodology

Hypothesis - 3
There is no significant difference in adjusted means of achievement scores by type of locality and type of methodology

Hypothesis - 4
There is no significant difference in adjusted means of achievement scores by gender and type of methodology

Hypothesis - 5
There is no significant difference in adjusted means of achievement scores by medium of instruction and type of methodology

Hypothesis - 6
There is no significant difference between the initial and final Noosphere scores with reference to independent variables.

Hypothesis - 7
There is no significant difference in adjusted means of noosphere scores by type of school and type of methodology

Hypothesis - 8
There is no significant difference in adjusted means of noosphere scores by type of locality and type of methodology
Hypothesis - 9
There is no significant difference in adjusted means of noosphere scores by gender and type of methodology.

Hypothesis - 10
There is no significant difference in adjusted means of noosphere scores by medium of instruction and type of methodology.

Hypothesis - 11
There is no significant difference between the initial and final biosphere scores with reference to independent variables.

Hypothesis - 12
There is no significant difference in adjusted means of biosphere scores by type of school and type of methodology.

Hypothesis - 13
There is no significant difference in adjusted means of biosphere scores by type of locality and type of methodology.

Hypothesis - 14
There is no significant difference in adjusted means of biosphere scores by gender and type of methodology.

Hypothesis - 15
There is no significant difference in adjusted means of biosphere scores by medium of instruction and type of methodology.

Hypothesis - 16
There is no significant difference between the initial and final pollution scores with reference to independent variables.

Hypothesis - 17
There is no significant difference in adjusted means of pollution scores by type of school and type of methodology.

Hypothesis - 18
There is no significant difference in adjusted means of pollution scores by type of locality and type of methodology.

Hypothesis - 19
There is no significant difference in adjusted means of pollution scores by gender and type of methodology.
Hypothesis - 20
There is no significant difference in adjusted means of pollution scores by medium of instruction and type of methodology

Hypothesis - 21
There is no significant difference between the initial and final natural resources scores with reference to independent variables.

Hypothesis - 22
There is no significant difference in adjusted means of natural resources scores by type of school and type of methodology

Hypothesis - 23
There is no significant difference in adjusted means of natural resources scores by type of locality and type of methodology

Hypothesis - 24
There is no significant difference in adjusted means of natural resources scores by gender and type of methodology

Hypothesis - 25
There is no significant difference in adjusted means of natural resources scores by medium of instruction and type of methodology

Hypothesis - 26
There is no significant difference between the initial and final attitude scores with reference to independent variables.

Hypothesis - 27
There is no significant difference in adjusted means of attitude scores by type of school and type of methodology

Hypothesis - 28
There is no significant difference in adjusted means of attitude scores by type of locality and type of methodology

Hypothesis - 29
There is no significant difference in adjusted means of attitude scores by gender and type of methodology

Hypothesis - 30
There is no significant difference in adjusted means of attitude scores by medium of instruction and type of methodology
1.16. ORGANISATION OF THE THESIS

First chapter dealt with introduction to the problem under investigation, a brief account of evolution of environmental education at global level and in ancient India, present status of environmental education in India and at school level, basis for developing instructional packages, need for instructional strategies and materials, limitations of the study, significance of the study, definitions of the terms used in the study, variables selected for the study, objectives of the study and the list of hypothesis.

Chapter II elaborated the literature related to the present investigation and were grouped as literature on environmental education curriculum in India and abroad, literature on environmental awareness, knowledge and attitude in India and abroad, literature on instructional materials and strategies of environmental education in India and abroad and other related literature.

Chapter III dealt with research design, environmental education concepts under the study, a brief account of the theoretical background behind the strategies employed, design of instructional materials, development of the tools, feasibility study of the packages, sample selection, treatment and the data collection procedures.

Chapter IV gave the scheme of analysis of the data and analysis of achievement scores, noosphere scores, biosphere scores, pollution scores, natural resources scores and attitude scores accompanied by relevant interpretations.

Chapter V dealt with an account of the design of the study, summary of the findings, recommendations and suggestions for further research.