CHAPTER – II

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

This chapter discusses about the review of related literature and researches carried out in the area. Literatures from various sources were reviewed to study the trend in the area. The reviewed literature and researches are categorized into i) studies on Environmental Education (EE) - one of the components of ESD, ii) studies related to issues on ESD, iii) studies on sustainable development, iv) studies on ESD and curriculum, v) studies on ESD and various learning approaches, vi) studies of ESD on the consequence variables like critical thinking, problem-solving and values on ESD.

2.2 STUDIES ON ENVIRONMENTAL EDUCATION – ONE OF THE COMPONENTS OF ESD

Most of the researches in the past have been carried out in the area of Environmental Education which is one of the dimension of ESD at present. Gupta et al (1981) studied the awareness of environment among rural and urban schools and non-formal education centers and found that school going rural children did better than the urban samples and the non-formal center students were more aware of environment than urban students. Padmini (2007) also stressed the importance of environmental awareness for sustainable development. Pande (2007) in a study on environmental awareness among rural and urban children found out that majority of the students did not appear to have much knowledge of the environment related issues and problems and they were not aware of the importance of the content and the environmental issues. Results showed that children from urban habitation had a fair idea about the problems related to the environment than their rural counterparts. The reason given for this was, the classroom teaching and the media exposure; the rural children were deprived of these facilities for improving their mental horizon. Deopuria (1984) also compared the traditional and environmental approach and found that primary students did
better than middle and secondary level students and both male and female teachers showed a positive attitude towards the environmental approach to learning. Subramaniam and Prabha (2008) found out that there was a significant difference in the awareness about environment between boys and girls and urban and rural areas, but no difference was found among schools of different types namely, matriculation, aided and government schools. Joshi (1981) also found that environment outside the class was potent enough to initiate learning and hence Environmental Education should be considered essential at least at primary level. Unfortunately, teachers and syllabus were found responsible for limiting the growth of this approach. Kumar & Patil (2007) found that students with EE background has better environmental attitude. It was also found that there was no significant difference between male and female students in their attitude towards environmental pollution and related issues. The higher secondary students improved their achievement on environmental pollution after viewing the video programme. Veliappan et al (2008) studied the awareness about environmental pollution among higher secondary school students and found out that about two third of the students had moderate awareness level on environmental pollution, and there were significant difference with reference to gender, age and geographical location of the school.

While preparing a curriculum in environmental studies at college level, Pai (1981) also found that the experimental group gained more awareness than the control group in environmental activities. Vipindernagara and Dhillon (2007) observed a significant variation in the awareness on Environmental Education of secondary and elementary school teachers with the former scoring higher. No significant difference was noted in the EE awareness of male and female school teachers. But the interaction effects of level and sex showed significant difference upon EE awareness. Asha (2008) found out that the environmental awareness for promoting human health and quality of life of teacher educators was higher in females and urban teacher educators than male and rural teachers. But the awareness level did not differ significantly between Science and Arts teacher educators. Indu and Suryalatha (2008) conducted a study to find the awareness and attitude of the student teachers towards environmental issues and found out
that majority of the student teachers had moderate attitude and the Physical Science student teachers were found to have a favorable attitude towards environmental protection in comparison to their Life Science counterparts. Locality, educational qualification and subject specialization did not contribute significantly towards the knowledge scores on environmental awareness of the student teachers. Rajeswari (2008) conducted a study on environmental awareness among adolescent students and found out that they have only average knowledge about environment. The level of awareness about environment does not differ significantly between male and female B.Ed. and D.T.Ed. students, Science students have better understanding of the concepts of environment than Arts students. Pande (2007) found that both urban and rural teachers are aware of the environment and know all about its protection and preservation. Jubilee and Manjula (2008) found out that majority of the Maldivian secondary school teachers have a moderate awareness of environmental problems, issues and other related aspects. They also have a positive attitude towards conserving the environment. The study revealed that there was a relationship between environmental awareness and environmental attitude and there was no significant difference between male and female teachers in their awareness and attitude towards Environmental Education. It was also found out that the environmental awareness do predict the environmental attitude of Maldivian Secondary school teachers. Lakshmi and Sailaja (2008) found out that there were differences in the level of attitude towards Environmental Science and Science among the women prospective secondary school teachers. The subject of methodology of B.Ed. level influenced the environmental attitude of the women prospective teachers and students of Science subjects had higher attitude than that of other subjects. Attitude towards Environmental Science and Science were significantly correlated. Ravikiran (2008) found out that there is a significant difference between male and female elementary teachers in their awareness towards ESD and there was no significant difference in awareness towards ESD between rural and urban teachers, government and private school teachers and teachers with different years of experience. It was also found that there was no significant difference in their attitude towards ESD between males and females, rural and urban,
government and private school teachers and teachers with different years of experience.

Since attitudinal change is related to awareness, most of the studies reviewed were of these types. Studies on the EE conducted by Mallika (1984), Sharma (1996), Sharma (1998), Radha (2005) showed that awareness of students and teachers are high. Sharma (1986), Indubala (1999) have also studied on teacher’s attitude and awareness towards EE and found that there is high awareness and attitude about EE, but the pre-service teachers were not provided with suitable training experiences.

It was observed that studies were carried out in Environmental Education among students with different subject backgrounds. Kumar and Ram (2006) while studying about the awareness of Environmental Education among students, found out that in Science stream, Post Graduate students were more aware towards EE than the students of Arts and Commerce stream. The study also revealed that the female students of Science and Commerce stream were more aware than male students. In Arts stream male students were more aware than female students towards EE, and no interaction between sex and subjects were found towards EE among Post Graduate students. Suresh and Kadhirvanan (2007) conducted a study on the influence of personality on the environmental awareness ability of college students and found out that it was affected by demographic variables like subject specialization, residential area, parental income and parent’s level of education. But gender does not affect them. The Delhi Chief Minister Dixit (2006) in an article stated that children are environment ambassadors, and youth should come forward in protection of environment which is facing a great challenge due to rapid urbanization. It was emphasized that one can make a cleaner and greener Delhi only with constructive contribution of the younger generation who would also become role model for the entire society. Due to the efforts of various agencies and a massive involvement of the eco-club students and teachers, Delhi’s green cover increased from 26 sq km in 1997 to 268 sq km in 2003 which has further gone up to more than 320 sq km.
Holden and Linnerud (2010) analyzed the relationship between environmental attitudes and energy use in the home and for transport by Norwegian household. Quantitative surveys were used to find statistical correlations, and qualitative analysis to reveal mechanisms that influences the ability to behave in an environmentally friendly way. Three theses about attitude, mechanisms and household consumption were presented. Firstly, a desire to project an environmentally friendly image has little influence on energy use in the home and for transport. Secondly a sense of powerlessness prevents people from translating positive environmental attitudes into low energy use in the home and for everyday transport. Thirdly, a desire to self indulge prevents people from translating possible environmental attitudes into low energy use for long distance leisure travel. These results have found to be important in implications for environmental policy. It was found that the public information and awareness campaigns could give consumers information on how to behave in an environmentally responsible manner, but tend only to influence categories of consumption with little environmental impact.

Dash, Mishra and Satapathy (2008), conducted a study on the attitude of secondary school teachers from Orissa towards sustainable development and found that both pre and in-service teachers had a positive attitude for sustainable development. Except low, middle and high socio-economic categories of Arts female in-service teachers, all categories had favorable attitude for sustainable development. Pre service teachers irrespective of their years of training showed positive attitude. Two years programme teachers were more favorable than 1 year and 4 year pre service teachers.

From the studies reviewed, one may conclude that, there are innumerable studies related to awareness and attitude on EE at school level. There were no gender difference in the environmental awareness and attitude of students, but majority of the studies showed that rural students had better awareness than their urban counterparts. It means that the rural children are naturally inclined to protecting environment, due to their close proximity to nature since their childhood when compared to urban. From the studies reviewed, it was observed
that the variables other than awareness and attitude have not been explored and sustainable development has also not been the focus.

2.3 STUDIES RELATED TO ISSUES ON ESD

Studies were reviewed pertaining to various issues related to ESD. The social, economic and environmental issues falling under the scope of ESD are reviewed in this section. David (2007) conducted a research project on climate capabilities: an ethical analysis of anthropogenic climate change (2008-2010) which highlights the theoretical and practical conceivable need for universal climate change values versus the phenomenon of contextual moral outlooks. The paper contributes to further knowledge on the nature of intrinsic values threatened by climate change and also contributes to a critical debate on foundational ethical climate change values for global and local climate change justice in political practice. Silby and Kagawa (2010) are of view that ESD is the latest manifestation of the ‘closing circle’ of policy driven Environmental Education. Characterized by definition haziness, a tendency to blur rather than lay bare inconsistencies and incompatibilities and a cozy but ill considered association with the globalization agenda, the field has allowed the neoliberal marketplace worldview into the circle so that mainstream ESD facility embraces economic growth and an instrumentalist and managerial view of nature that goes hand in glove with an emphasis on the technical and the tangible rather than the axiological and intangible. Runaway climate change is imminent but there is widespread climate change denial including within mainstream ESD. A transformative educational agenda in response to climate change is offered. Recent calls for the integration of Climate Change Education (CCE) within the mainstream of ESD should be resisted unless the field breaks fire of the ‘closing circle’. Robertson et al (2004) opined that environmental research in agriculture is largely reactive, focused on problems at small scales and conducted within narrow disciplinary boundaries. This approach has worked to abate a number of environmental problems created by agriculture, but it has not provided effective solutions for many of the most recalcitrant ones. Furthermore, the approach fails to position agriculture to deliver new environmental benefits that the public and policy makers increasingly demand.
They are of the opinion that new vision is needed for environmental research in agriculture-one that is anticipatory; promotes long-term, systems-level research at multiple scales; better incorporates important interactions between the Biophysical and Social Sciences; and provides for the proper evaluation of deployed solutions. Achieving this vision will require major changes in funding strategies, in institutional reward structures, and in policies that presently inhibit collaborations across disciplinary and institutional boundaries.

Tapas and Sunanda (2007) suggest that the climate issue dealt with in the textbooks of Bangladesh briefly compare to the present requirements. The Social Development Research Centre (SDRC) and Action Aid Bangladesh have developed a board game as part of a co curricular activity for the secondary level. School awareness programs can be used to promote and enable a culture of climate resilience at the community level. The learning kit when utilized by communities can play an effective role as an entry point into the raising of awareness on climate challenges in general, and in demonstrating how risks can be addressed and managed in community specific contexts. To achieve effective results, such co curricular activity may be a useful tool. Introducing climate change issues in the textbook is a must for the country considering the present circumstances. Hyogo Framework for Action (HFA) has also suggested the introduction of the issue in the community in a non formal way.

Constantina and Maria (2007) is of the view that environmental refugees and climate exiles are people who can no longer gain a secure livelihood in their homelands because of drought, soil erosion, desertification, deforestation and other environmental problems, together with the associated problems of population pressures and poverty. According to them, sustainability represents a sound way to deal with the environmental refugee issue, through greater policy emphasis on environmental protection, together with efforts to address associated problems of population growth, poverty, landlessness, and basic human needs. The key to this difficult prospect is education. Education for sustainable development is particularly important to ensure a clear understanding of sustainability among the local decision makers, stakeholders and the general population, and it would
prove a pay off and long run investment in fostering sustainable development in developing or developed countries.

Anjali and Chaman (2007), conducted a study on the pollution caused by various festivals in India, like Deepavali, Holi, Lohri, Ganesh Chaturthi, Navratri, etc. Various natural resources are used (wood, flowers, water) for celebrating them. Many harmful resources are utilized (chemicals, poisonous colours) which have strong effects on the environment. The major agenda at this point of time is to create awareness among the people about safeguarding our environment from the harmful effects of our celebrations through “Environment Education” while also reiterating the importance of celebrating our rituals and customs which will help us to be rooted in our culture for years to come. Hence various strategies was suggested for celebrating our festivals in an extensively eco friendly manner. Further, the author stress on the recommendations for various religious groups/bodies to promote these new suggestions and alternatives for our festival celebrations.

Efrat et al (2007) presents the result from a multinational EE project that took place throughout the year of 2004. The project relied on a theoretical model of combining together best practices in the field of EE and implementing them in a multinational setting which allows for multinational culture interactions and inquiries into a common environmental problem. By doing so, it was expected that social aspects of sustainable development and education for sustainability would evolve naturally and be addressed as a natural inherent part of the learning process rather than a topic addressed externally. The project involved 10th grade students from Israel, Cyprus and Greece. The 210 students were divided into working teams of six students each, with members of mixed nationalities – two students from each country. The project’s core topic was bio-invasions to the Mediterranean Sea, in particular Lessepsian migration – the migration of species from Red sea to the Mediterranean Sea through the Suez Canal. Students in the three participating countries simultaneously collected data along the Lessepsian migration route. The data was analyzed by each team in accordance with the teams’ specific research questions. Thirty five multinational teams presented their final results. The project’s implementation model included an internet site which
was constructed for communications among academic supporters from the fields of education and marine ecology, high school teachers from three Mediterranean countries, high school students from the three countries, and a facilitator who coordinated the multi pathways communications and interactions. Results showed a high acquisition of scientific skills and environmental knowledge among the students.

Sharma and Goel (2010) are of the view that there is a huge gap in energy/power production, supply and demand in India. A large section of the country’s population suffers from power cut throughout the day or no power supply at all. Major portion of the energy production in India is being fulfilled by thermal and hydro power plants currently, which is not sufficient for the total energy demand of the country. It is therefore important to consider an alternative source of energy production, which is environment friendly as well as economically feasible for the Indian people. Wind and solar energy are the most environmentally sustainable sources of power generation which have been harnessed successfully in several countries, but they require high initial investment. Nuclear power would be an alternative to fulfill the energy demands of the country. India has been successful in making nuclear agreement recently with nuclear fuel producing countries to get uninterrupted supply of nuclear fuel (i.e. Uranium) to solve power shortage in the country. Before installing any nuclear power generation plants in India, it is important to implement stringent regulations for the health and safety of the people and for protection of the environment, soil and water from the nuclear and hazardous waste produced in the power plants. Although some initiatives have been taken for radioactive waste disposal in India, the current hazardous and nuclear waste storage/disposal regulations are still too soft and not being implemented properly in the country. There are several examples of improper handling of hazardous waste by industries in India and elsewhere, which ultimately pollutes the surface water and ground water continuously.

Baker (2002) did an analysis of the structural and institutional contexts in which poverty exists with an understanding of the everyday livelihood strategies used by households who are poor. The study goes beyond conventional income poverty measures by bringing together a sustainable livelihoods framework and
participatory poverty assessment methods. Participatory method was used to study the poverty of those living in difficult circumstances to participate in an analysis of their own livelihood situation. A participatory poverty assessment has been facilitated with a small group of women who are members of the food co-op at project SHARE. The participatory poverty assessment explores issues of well-being, assets, the role of institutions, coping strategies and a community action plan. The contribution of both the exploration of assets and the participatory poverty assessment are brought together in a discussion of livelihoods including issues of well-being, gender, social solidarity, capabilities and functioning and the power of institutions. The combination of a sustainable livelihoods framework and a participatory poverty assessment has demonstrated the importance of non-material needs, uncovered unmet needs, demonstrated the importance of social relationships in sustaining livelihoods, added to an understanding of poverty as an inseparable interaction between means and ends, and demonstrated how the institution of welfare administration shapes and constrains the possibilities for livelihood well being.

Corvalan, Kjellstrom and Smith (1999) in his paper discusses the links among health, environment, and sustainable development and presents a framework that extends from the epidemiological domain to the policy domain and includes the driving forces that generate environmental pressures, creating changes in the state of the environment and eventually contributing to human exposures. Health effects are the end result of this complex net of events. Environmental health interventions should not be limited to treatment of cases and directly reducing human exposures. The paper discusses the need for integrated action at all levels and, in particular, on the need to focus on long-term action directed at reducing the driving forces that generate the environmental health threats. Only this approach can achieve sustained health benefits and environmental protection in accord with the principles of sustainable development.

McCurdy et al (2004) were of view that Pediatric medical and nursing education currently lacks the environmental health content necessary to appropriately prepare pediatric health care professionals to prevent, recognize, manage, and treat environmental-exposure-related disease. Leading health
institutions have recognized the need for improvements in health professionals’ environmental health education. Given the biologic, psychological, and social differences between children and adults, there is a need for environmental health education specific to children. The National Environmental Education and Training Foundation, in partnership with the Children’s Environmental Health Network, created two working groups, one with expertise in medical education and one with expertise in nursing education. The working groups reviewed the transition from undergraduate student to professional to assess where in those processes pediatric environmental health could be emphasized. The medical education working group recommended increasing education about children’s environmental health in the medical school curricula, in residency training, and in continuing medical education. Similarly, the nursing working group recommended increasing children’s environmental health content at the undergraduate, graduate, and continuing nursing education levels. Working groups also identified the key medical and nursing organizations that would be important in leveraging these changes.

Fien and Maclean (2000) opined that our schools and educators face a compelling responsibility to serve society by fostering the transformations needed to set us on a path to sustainable development in the 21st century. Mortensen (2000) focussed on the need to have science embedded at the core of the education for sustainability and the need to increase and enhance teacher education to develop the necessary interdisciplinary thinking and transformative learning for the new millennium.

Sunitha (2007) conducted a review on the disaster management system in Tamil Nadu, India and the capacity of local community to respond to natural disasters, and to propose a strategy using audio-visual media for the dissemination of tsunami knowledge while raising public awareness of tsunami and other coastal disasters with respect to the ‘two step flow’ model of media influence. Natural disaster takes a huge toll of human lives and property which severely hampers development. It may not be possible to prevent natural disasters totally, but an effective pre-disaster planning and preparedness through audio visual tools could
be done in order to reduce the adverse effects of the hazards and the consequent economic loss.

Dinah and Cecily (2001) opined that within their value chains of suppliers through customers, many businesses are becoming more aware of the environmental aspects and impacts of their organizations. Viewed as a continuum of behavior, business environmentalism can range from simply complying with the law to accepting and pursuing a goal of sustainable development. The point on the continuum at which an organization chooses to operate is reflected in its environmental mission, policies, and actions. They have examined attributes of the various levels of behavior and classification of some organizational mission statements. David (2007) conducted a research project on climate capabilities: an ethical analysis of anthropogenic climate change (2008-2010) which highlights the theoretical and practical conceivable need for universal climate change values versus the phenomenon of contextual moral outlooks which contributes to knowledge on the nature of intrinsic values threatened by climate change and also contributes to a critical debate on foundational ethical climate change values for global and local climate change justice in political practice. Ding & Shen (2010) presents a model of the Sustainable Development-Value (SDV) which integrates sustainability assessment into the building process. SDV measures the significance of the concerned project to the attainment of Sustainable Development-Value at different stages of a building life cycle and the SDV at each stage will be amalgamated into the model of SD Ability (SDA). SDA is used as a prototype to demonstrate the extent of sustainable performance to aid decision making. They present a methodological framework of SDV and SDA and the implementation was demonstrated using a case study.

The exercise of review revealed that there have been studies undertaken on sustainable development in the areas of Energy (production, demand and supply), poverty alleviation, agriculture, drought, soil erosion, deforestation, desertification, pollution etc. The studies give emphasis to specific areas that hinder sustainability or help in attaining sustainability. Many areas that need sustainability are yet to be explored and researched upon in order to solve issues related to sustainable development.
2.4 STUDIES ON SUSTAINABLE DEVELOPMENT

Tasaki et al (2010) have surveyed Sustainable Development Indicators (SDIs) adopted by 28 national governments, regions and international organisations and compiled them into database. The aims of the study were to understand the elements of Sustainable Development (SD), examine SDIs developed in certain fields and countries and determine future tasks to improve SDI development. A total of 1,790 indicators were surveyed and classified into 77 subcategories in four categories. Most of the indicators measure various SD elements and the indicators reflected each country’s developmental stage and specific concerns. Several advanced or unique indicators were also identified. Five major tasks in the future development of SDIs identified were; (a) creating time conscious indicators, (b) measuring interactions between elements of a system, (c) dealing with trans-boundary issues in a national SDI systems, (d) measuring SD quality (including subjective elements), (e) including ordinary citizens by showing the relationship between SDI and everyday life. The indicators identified were; (i) Social-social aggregated indicator; poverty and dependence; economic inequality; gender inequality; generation inequality; regional inequality; race/immigrant inequality; social exclusion (including the disabled); work; working conditions; national status; food safety; mortality, life expectancy and health; sanitation and drinking water; alcohol; child care; education; literacy and numeracy; culture, leisure and time; family; social relationship and participation; international cooperation; housing; child living conditions; services and public facilities; information; crime; social security; population change; peace/conflict; spiritual; (ii) Environmental-environmental aggregated indicator; climate change; ozone layer depletion; air quality; agriculture and livestock; soil; chemicals; land use; landscape; forests; desertification; urbanization; coastal zone; fisheries; water quality; water quantity; ecosystem; endangered species; disaster; noise; radioactivity; Perception of environmental pollution; water cycle; bio security; resources; commune with nature; (iii) Economic-economic performance; capital and investment; trade; financial status; household financial status; business and industry; eco business; energy use; transportation; material use; waste generation and management; recycling; (iv) Institutional-strategic implementation of SD,
environmental management and policy; morality and compliance; international institutions; science and technology; legal administration; SD networks; administration and management. Duck (2000) has proposed certain measures for SD for a country like India, which includes providing school education, sex education and prevention programmes to tackle the problem of population explosion. Education provides inspiration for true democratic, pluralistic and secular society, wide spread of knowledge by education for conserving natural resources like water, land, air and forest, use of ICT for spreading modern knowledge.

Preethi (1999) is of view that greenhouse gas emissions (CO₂ and CH₄) produced during the bacterial decomposition of flooded peat and forest biomass could be substantial in the case of large reservoirs as has been evident from early data relating to hydro-electric reservoirs in Canada. It is said that the Balbina dam in Brazil had 26 times more impact on Global warming than emissions from an equivalent coal fired station. The disturbance caused by the construction of a catchment area and the dam and its related components, the tremendous loss of biodiversity, displacement of people, the erasing of their cultural history and in some cases their distinctive identity caused by inundation of fertile cropland and ancient forests have been recorded in the cases of large dams around the world. The Balbina dam in Brazil inundated an area of 2750 square kms, the Srisailam project flooded 43,300 ha of farmland taking away the livelihood of 100,000 displaced farmers. And this is hardly the only instance where dams have impacted India. Sidhu (2007) opined that the consumption of energy is directly proportional to the progress of the mankind. With ever growing population, improvement in the living standard of the humanity, industrialization of the developing countries, the global demand for energy is expected to increase rather significantly in the near future. The primary source of energy is fossil fuel, however the finiteness of fossil fuel reserves and large scale environmental degradation caused by their widespread use, particularly global warming, urban air pollution and acid rain strongly suggests that harnessing of non conventional, renewable and environment friendly energy resources is vital for steering the global energy supplies towards a sustainable path. India must give more thrust to the research and development in
the field of non conventional energy sources not only to mitigate green house effect but also to lessen dependence on oil/ gas import.

Archibong (2007) conducted a study on the problems related to the issues of climate extremes, Nigerias experiences in air safety and air accident, contribution of the meteorological agency to extremes in weather and safer air transport. Wazed and Islam (2007) in their study on the design and fabrication of solar air heater, have constructed a solar air heater to make winter sunlight adequate for providing a significant portion of the heat for shelter. It was constructed so as to let sunlight in and prevent as much heat loss as possible. Dimitriou, Christidou and Hatzinikita (2007) conducted a study on pupils’ ideas about reducing air pollution and the results showed that pupils recognize practices and actions at both individual and societal level towards the reduction of air pollution, which also referred the sustainable and technology-based measures involving industrial prevention, land planning, transportation control, protection of forest, sustainable use of energy and waste management. Also public awareness is an important factor for effective participation towards the reduction of air pollution.

Shallcross et al (2006), in their study on promoting sustainable development through whole school approaches: on International, Intercultural Teacher Education Research and Development Project, focused on a British council funded Higher Education Link project involving three institutions-one in UK and two in South Africa. The link was a research and development project that has three main research strands: contextual profiting that will enable the applicability of a European teacher education project to the South African context, evaluative materials developed and piloting predicated on a respect for indigenous and contextual knowledge, and impact analysis that will examine the role of multidirectional intergenerational mentoring in disseminating messages about sustainable lifestyles.

Sharma (2007) found out that the density of white-backed vulture-Gyps bengalensis around the buffer zones of Corbett Tiger reserve forest was 74 individuals in 2005 as compared to 34 in year 2006, which indicates that some disturbances are responsible for it. Singha (2007) conducted a case study on
degrading wetlands-intervention for sustainable development; a case study of Silsako wetlands of Guwahati. Dash, Mishra and Satapathy (2008), conducted a study on the attitude of 450 secondary (243 pre-service and 207 in-service) school teachers from Orissa towards Sustainable development through a Likert type five point attitude scale and was found that both pre and in-service teachers had a positive attitude for sustainable development. Except low, middle and high socio-economic categories of Arts female in-service teachers, all categories had favorable attitude for sustainable development. Looking into the dimensions (economic efficiency, environmental harmony, resource conservation, local self reliance and equity and social justice) of the attitude scale, all pre service teachers and Science in-service teachers were found to have favorable attitude for all the five dimensions of attitude scale. However, in-service Arts teachers had positive attitude for economic efficiency and local self-reliance but not for environmental harmony, resource conservation and equity and social justice. Pre service teachers irrespective of their years of training showed positive attitude. Two years programme teachers were more favorable than 1 year and 4 year pre service teachers. Regarding the relationships between age, teaching experience and socio-economic status and attitude towards Sustainable development, it was noted that age and socio-economic status contributed more for the development of attitude towards sustainable development than teaching experience.

Maruyaa (2008) conducted a case study in Turkey on Education to enrich social capital for sustainable development. The study emphasized that through ESD, the fulfillment of the social aspect should also be emphasized. One need to emphasize creating good inter personal relations as well as networks that connect regions. From Educational point of view, ESD brings an opportunity to integrate local indigenous wisdom into modern education. The discussion focuses on the social and traditional factors that support the citizens’ activities among Turkish people. Pandey, Tyagi and Goel (2008), is of the opinion that ESD has connections with other programmes and concerns in education. They also opine that sustainable development requires a comprehensive, integrated approach. It is not a new programme but a call for a process to reorient educational policies, programmes and practices so that education plays its part in building the capacities
of all members of society to work together to build a sustainable future. Many teaching and learning strategies already used in school Geography encourage effective ESD. These includes approaches that: are learner centered, develop autonomous and critical thinking, develop skills of enquiry, creativity, imagination and collective decision making, use a range of text and media resources. These all contribute to the ability of students to envision the sort of future that they want for themselves and for society.

Mitchell (1994) conducted a study on sustainable development at the village level in Bali, Indonesia. Using a stress-capability framework, the problems and opportunities for sustainable development at the village level in Bali were examined. Balinese culture incorporates a traditional form of local government which emphasizes cooperation, consensus building, and balance. These aspects provide a strong foundation for sustainable development initiatives. At the same time, many decisions were taken external to the villages, and even to Bali which may lead to problems for development initiatives. The village study results associated with the Bali Sustainable Development Project indicate both encouraging and disturbing patterns on sustainable development. On the positive side, based on the experiences in Kesiman Kertalangu, Buahan, and Yeh Kuning, as well as in the other five villages, it appears that traditional ways of life based on agriculture are continuing, and that traditional culture and governance systems are flourishing. For many of the villages, especially those at a distance from the south where tourism accommodation is concentrated, the impact of tourism has been relatively minor. Since traditional Balinese culture emphasizes the importance of harmony among people, between people and their environment, and between people and their god, the prospects are good for balancing economic, environmental, and social considerations in development. Furthermore, traditional organization such as gotong royong (voluntary work groups), subaks (irrigation groups), and banjars (neighbourhood organizations) and the desa adat (traditional villages), all based on cooperation and consensus building, provide a strong foundation on which to implement sustainable development ideas. With reduction of agricultural land, village farmers are using Green Revolution technology to increase production. Increasing amounts of waste represent a growing problem in
Bali, especially in Denpasar. For these villages, waste disposal particularly metal and plastic containers, are becoming a problem. One outcome of the Bali Sustainable Development Project is anticipated to be some pilot initiatives related to waste management at the village level. A major concern for the villages is that many of the development decisions with the greatest potential impact are beyond their control.

Suda (2002) questions how the current global environmental movement is perceived and portrayed by news media. From a constructionist perspective, the news media have potential to help different groups to create and define issues in the global environmental movements through the process of news making. The study combines the conceptual frameworks of globalization and news construction together. The study examines news coverage of an environmental conflict over the World Bank sponsored hydro electric dam, the Pak Mun, in a northeastern province of Thailand. The subjects of the study are news stories printed in local news and feature sections in two Thai language newspapers which were aimed at a local level of readership both inside and outside Thailand. The period of study spans 12 years from 1989 to the first three months of 2001, covering the period from the beginning of construction on the Pak Mun dam to the month in which the Pak Mun dam gates were ordered opened by the Thai government to allow water to flow back to the Pak Mun river. The study explores four aspects of the Pak Mun news coverage: reporting frequencies, source dependencies, dominant news frames and differences in the construction of news meanings that may create connections between the local Pak Mun conflict and the global anti-large dam movement.

McDonald and Songer (2008) have examined two critical cases of teachers enacting a technology-rich curriculum focused on the development of complex reasoning about biodiversity for fifth graders. Two elements emerged that significantly impact teacher enactment-their conceptions of authenticity and their view of science. Bhattacharya (2007) is of the view that the pressures of the contemporary world to educate its citizens call for capacity building in pre and in service teacher training. It may require refocusing on the existing curriculum and training policies to create a vision for society that is not only environmentally
sustainable, but also one that is socially, economically and politically sustainable. Skills, knowledge, values and attitudes in teacher education programmes should be oriented towards this goal, eventually leading to capacity building in life skills, managing resources and community development. In order to make the teacher education programme realistic and practical oriented in nature, and to ensure a controlling role for Education for Sustainable Development (ESD), the curriculum may consist of personal development as well as socio cultural themes. Personal development themes may include self identity, courage, conscience, competence, fidelity, caring, love, decision making, self respect, compassion, sexuality, health and respect for others where as socio cultural themes may include parent relationships, citizenships, human values, gender equality, religious beliefs, freedom, environmental conservation, children relationships and civil rights.

York and Frank (2002) is of the view that growing evidence demonstrating clear threats to the sustainability of the human ecosystem has given rise to a variety of sociological theories from human ecology, political economy, neo classical economics, ecological modernization, reflective modernization, and world systems, addressing man-environment interactions. They assessed the anthropogenic factors driving the environmental impacts of sociology. The overall findings are supportive of the claims of human ecologists, political economists and contradict the claims of modernization theory. Consistent with the claims of human ecologists, climate affects the scale of anthropogenic environmental impacts. Consistent with the claims of political economists’ world systems theory, affluence monotonically increases the ecological footprint and urbanization further increases impacts. Contrary to the theory of neo classical economists and ecological modernization theorists, increase in technological efficiency does not markedly reduce impacts. Overall findings suggest that in order to achieve sustainability, societies will have to curtail both population and economic growth.

The above studies reflect that there has been number of case studies from different parts of the world that were assuring sustainability. These studies revealed that there are initiatives taking place at certain areas like impact of constructing dams, using alternative energy sources, biodiversity conservation, using ICT towards attaining sustainability and human ecosystem or impact of
human population on sustainability. These case studies and initiatives should be comprehensive in nature in order bring about sustainability. There is a need to bring such findings into the notice of the present generation. Hence the present study has attempted to incorporate issues related to sustainable development into the school curriculum.

2.5 STUDIES ON ESD AND CURRICULUM

In India, since the mid 1980s efforts have been made to bring the perspective of Environmental Education in formal education at all levels. The NCERT which is the prime organisation for improving the country’s education in India, has been an active body in making Environmental Education as a part of school curriculum. In 2000, the NCERT had recommended EE as a separate discipline to be introduced at elementary level. National Curriculum Framework (NCF 2000 & 2005) have considered Environmental Education to be given priority. The NCF 2005 in its National Focus Group Position Paper on ‘Habitat and Learning’ stressed the curriculum for Environmental Education for schools. Prior to this, in 1998 the National Curriculum Framework for elementary and secondary education had proposed ‘The Protection of Environment’ as one of the core components of school curriculum which has to be reflected in the textbooks at all levels. In 2003, the Honorable Supreme court of India directed that EE should be a compulsory subject at all levels of education. It further directed the National Council of Educational Research and Training (NCERT) to prepare a model syllabus for class I to XII, which shall be adopted by every state in their respective schools. Since it was felt to see environment in a holistic manner, it was started as Environmental Studies (EVS) in order to provide a holistic picture of environment to the students. On January 21, 2003, the UNEP launched state of the environment report for south Asia. It identified five key environmental issues-livelihood security, environmental disasters, industrialization, urbanization and diversity loss. The major recommendation of the international conference on eco-restoration (14-21 October, 2003) held at Dehradun was to express great concern at the rapid degradation of both terrestrial and aquatic ecosystems throughout the world that has caused loss of biodiversity and various goods and services of the
natural ecosystems and therefore to incorporate tools of environmental evaluation and to ensure community participation. Jackson (2001) pointed out that EE as introduced in school text books reveals many contradictions which cannot be removed without questioning the assumptions about current science and technology that school textbooks project. He was of the opinion that Environmental Education Strategy in India to date has been the infusion of environmental concerns into the existing curriculum. The paper attempted to assess student learning by an analysis of the NCERT model textbooks (NCERT, 1987-89). It concluded that the infused material was creating incoherence in the curriculum, and the attempts to remove this incoherence were further creating confusion. It suggested that to overcome this problem, changes may be required in the existing science syllabus. Also, it was stated that environmental problems are inadequately defined, probably with no clear ideas to students about who was responsible for creating them, who will solve them and how. There is thus a need to define the country’s environmental problems more realistically and rigorously and to change our approach to introducing these problems to students.

Vedamani and Exemmal (1988) in their study on developing and testing models of EE in Botany relevant for the socially disadvantaged children in the schools of Kerala, found out that from the point of content and approach, the Environmental Science textbook did not seem to have made a revolutionary break from what existed 50 years earlier or so at the primary level, but content boundaries were clearly maintained.

Howland and Becker (2002) were of the view that Global Learning and Observations to Benefit the Environment (GLOBE) is an international Science and Environmental Education program that enables school children to learn about the environment by taking scientific measurements of their natural surroundings and sharing their data with scientists via the internet. By carefully following protocols and using approved measurement devices, students around the world are developing an archive of standardized data that can also be used in professional research. GLOBE is divided into several separate “investigations,” each focused on a different aspect of the environment. They include land cover, soil, hydrology, phenology, haze, and the atmosphere. Each investigation has a team of scientists
who have worked with students and teachers to develop detailed protocols for the students to collect data. In addition, the scientists are exploring ways of using that data in their own research. Howland’s article is about the work of GLOBE scientists -with some students and teachers. It is intended to provide an overview of the scientists’ efforts to develop a meaningful learning experience around gathering environmental data for research.

Chung Ko and Lee (2003) conducted a study which was an exploratory study of Hong Kong secondary school integrated Science teachers’ perceptions of Environmental Education. In this study, the teachers were classified according to their scores of attitudes, perceived barriers, and current emphasis on teaching Environmental Education. It was found that Integrated Science teachers’ attitudes toward Environmental Education, skills of teaching Environmental Education, beliefs in the relevance of Integrated Science to Environmental Education, and intentions of teaching Environmental Education in Integrated Science classes were associated with their actual ways of teaching of Environmental Education. Teachers tended to teach better if they held more favorable attitudes toward Environmental Education, had more skills of teaching Environmental Education, believed more in the relevance of Integrated Science to Environmental Education, and would actually want to teach more Environmental Education in Integrated Science classes if there were fewer constraints. Moreover, variations in the teaching of Environmental Education were reflected by teachers’ emphasis on teaching Environmental Education, and their use of a variety of teaching methods and their regular practices of extracurricular activities on Environmental Education.

Pacific Education for Sustainable Development Framework (2006) have identified a priority area in formal education and training which focused on structured learning initiatives for improved knowledge and understanding to support implementation of sustainable practices where the objectives of promoting quality education in all member countries was given focus. It will be through development of education policies and strategies research and development of innovative models and resources that support ESD in pacific contexts, inclusion of learning outcomes that focus on sustainability, development of strategies to assess
student understanding of sustainability, development and identification of appropriate ESD resources to support this priority area using appropriate information and communication technology tools.

Kalimuthu (1991) in a study on developing a video programme on environmental pollution in Biology for higher secondary students found out that the higher secondary students taught through the video programme learnt more of the concepts on environmental pollution than those who were taught by the lecture method. Annakodi (2008) studied the effectiveness of an instructional package for Environmental Education on high school students and found that it was equally effective for all the schools irrespective of school types and the awareness on ‘environmental actions’ and environment friendly actions’ was significantly higher in experimental group than in the control group and the boys and girls were equally benefitted from the study. Exemmal (1980) conducted a study to find out the efficacy of environmental approach, in which it was found that the environmental approach was superior to the formal approach. It was also found that students of rural and low SES group were significantly better in profiting from such instruction than their counterparts in urban areas and coming from, high SES. Also the environmental approach stimulated cognitive growth in pupils.

Atkinson (2007) conducted a study in bringing practical environment and development education materials into the schools of transition countries, whereby the project was implemented within a wide group of stakeholders from national government, education institutes, environmental organizations, teachers, NGOs, filmmakers, designers and artists-the study focuses on the importance of partnership of stakeholders involved in adapting and integrating the materials nationally and the development of local ownership of the product to ensure sustainability and upgrading. The lessons used in the classroom from the package are also covered by showing the process of national dissemination and teacher training adopted to enable the use of the different multimedia elements and the new interactive approaches within the kit. Al-Bashaireh (2007) investigated the effect of a program on Environmental Education based on a systemic approach on the achievement of Educational Sciences students at Mu’tah University, Jordan. The study sample comprised of 113 students of first semester of the
Environmental Education course during the scholastic year 2006-2007. They were divided into two groups, one group was taught using a systemic approach program, while the other group was taught by the conventional method. The systemic approach program and achievement test was validated. The result showed that there was difference on the achievement of the students post test in favour of those who were taught by the systemic approach program. No differences were found attributed to students’ gender or educational level.

Tapas and Sunanda (2007) suggest that the climate issue dealt with in the textbooks of Bangladesh briefly compare to the present requirements. The Social Development Research Centre (SDRC) and Action Aid Bangladesh have developed a board game as part of a co curricular activity for the secondary level. The learning kit when utilized by communities can play an effective role as an entry point into the raising of awareness on climate challenges in general, and in demonstrating how risks can be addressed and managed in community specific contexts. Hyogo Framework for Action (HFA) has also suggested the introduction of the issue in the community in a non formal way. Bishnu (2007) found that institutional support is vital for the continuity of the projects in schools. Even the activities that involved all the students and teachers together with the community were found to ensure continuity of the projects. The involvement of the whole school and community in an environmental fair is a good way to arouse the interest of the people in new interventions. The goal of EE is to direct the change in human behavior towards natural resource management and consumption patterns. To achieve this goal, the EE intervention should be conducted in such a way that it elicits sustained effect. One single intervention in EE may not be sufficient to achieve the EE goal; thus institutionalization of EE is the most important aspect to be considered for ensuring that the goals of EE are achieved. Baharul (2007) presents an innovative ICT based Environment education Project (IEEP) being piloted in Assam that is primarily focused on using an institution’s surroundings and environment as a framework within which students can construct their own learning, guided by teachers and administrators using proven ICT driven educational practices. IEEP uses environment as the integrating context for learning, designates pedagogy that employs natural and socio cultural
environments as the context for learning, and shares some fundamental educational strategies.

Iyengar (2007) suggested that reorienting the education towards ESD is a proposal that is useful, but require careful consideration in each country and differently. One will have to consider whether ESD should become part of curriculum or it should be taught separately. There is a danger for instance that if it is incorporated in the curriculum then its teaching would be left to the whims and fancies of the teacher. Dharmani (2007) suggested that at the primary level, interdisciplinary approaches to be adopted and should be integrated into each subject area. Ahir Kinjal (2007) has conducted a study on the role of higher education in SD which is a case study of Ganghidham taluk. Nakum and Patel (2007) has stressed the importance of structuring and placing ESD in the curriculum.

Ismail, Karpudiwan, Mohamed (2007) conducted a study on integrated approach in Chemistry in teacher education program and found out that the integration of active learning and green chemistry experiments into the chemistry teaching methods course enabled students to be more aware of the environmental issues, which in turn brought about a change in values.

Munjanganja (2010) is of the view that a variety of approaches are employed to impart knowledge about ESD in TVET (Technical and Vocational Education and Training). Common among the approaches are the following: problem-solving, projects, demonstration, role-playing and role-modelling. Other methods are drama, dance, study tours, industrial placements, and ICT tutorials. In addition, there is wide use of conventional methods such as lectures, seminars and workshops.

Bacha (2006) studied the means of contributing to ESD through second language education; the author describes a university-level content-based English language curriculum that incorporates ESD into second language learning. The curriculum aims to build students’ language skills as they learn about topics related to Sustainable Development (SD), including culture, religion, international affairs, globalization, and the environment. Through experiential and interactive learning, curriculum methodology also promotes SD by encouraging respect for
personal and cultural values, raising awareness of global perspectives, and developing students’ critical and systemic thinking skills, all of which are essential for building and leading a sustainable livelihood. Within the discussion, the author provides suggestions for adapting ESD into second language curricula in primary and secondary education. Specific methodology is also highlighted which transcends subject matter and can be used to promote SD in other academic subjects. In conclusion, the author outlines the challenges and lessons learned in gaining departmental support for an ESD-related curriculum.

An Eco village Design Curriculum was developed by Global Ecovillage educators for a sustainable earth which provides the basis for a four week comprehensive course on the fundamentals of ecovillage design. This was a curriculum that has the endorsement of the United Nations Institute of Training and Research. The characteristics of this curriculum are: to have a thorough and objective assessment of the state of planet by regional, community and place based solutions; to empower individuals and communities with the knowledge for shaping their worlds to become self reliant; universal in scope but local in application, preserve precious cultural diversity; investigative theory followed by practical application; impart life skills; relevant to people in urban and rural regions; promote healthful planetary evolution along with well being and quality of life; explore and expand the limits of human potential; enable community based visions of a sustainable human civilization as well as the means to turn such vision into reality during the course of the 21st century.

Prahalad (2007) conducted a study using the Ecovillage Design Curriculum developed by Global Ecovillage educators for a sustainable earth, whereby Auroville which is an international spiritual and ecological community in Tamilnadu, India by conducting courses in Ecovillage Design Curriculum. The course shows how to incorporate sustainable values as one try to transit from a post industrial society to a unsustainable society. It encourages hands-on exercises to promote experiential learning within the local and Indian ecological and cultural context. Visits to various demonstration sites within Auroville in the fields of renewable energy (solar, wind, biogas), reforestation, natural building, organic
farming, rainwater harvesting, experiential education, comparative philosophies, deep ecology, healing and yoga are part of the curriculum.

Fadeeva and Mochizuki (2010) quotes that as its major contribution to the UNDESD, 2004-2014, the United Nations University (UNU) has promoted the establishment of Regional centres of expertise (RCE) on ESD and their networking to build innovative multi-stakeholder platforms for ESD locally and globally. In the first half of the UNDESD, UNU acknowledged 74 RCEs around the world. As an introduction to the special section on RCEs, their article highlights diverse roles that RCEs have taken and presents issues and challenges they have faced. It discusses RCEs as an engine for mobilising diverse stakeholders for ESD, a co coordinator and an intermediary support structure for local regional ESD activities and related initiatives in the region, and a facilitator of ‘social learning’. Glasser (2010) says that Grand Rapid is the first United Nations University (UNU) Regional Centre of expertise (RCE) on ESD in the United States. It builds on the regions long history and deep foundation in research, planning and problem-solving to build a sustainable future. His article explores the concept of RCEs as social learning for sustainability communities of practice in the context of experiences with creating the first flagship project, the city high/ middle centre for economicology. This model is used to broach the question of evaluation, indirectly by suggesting the importance of identifying early indicators of likely success. It closes with 6 ‘mediations’ that were used to guide the flagship project and which may have wider relevance to the global RCE community. These were, responding to SD challenges and enduring ways that can benefit from systems thinking; while the future can neither be foreseen exactly nor controlled perfectly, it can be envisioned and brought into being with love, care and respect; values, good intentions, basic knowledge and sincere commitments in support of SD goals; addressing the prevailing mood of criticism, creating the ‘motivation, will and vitality’ to effectively target the challenges; knowledge can be used to ‘enslave’ as well as ‘liberate’, creating continuous improvements in quality of life for all.

Hartungi (2010) analysed the strengths and constraints of various evaluation methods in SD projects with emphasis on participatory evaluation. An
international literature review is used to analyse the application of traditional and participatory approaches. The paper endeavours to be productively proactive as a catalyst for choosing the right evaluation methods. The results also shed light on important impediments to the performance of evaluations and on the role played by various stakeholders in the evaluation process. It was recommended that the participatory evaluation should be used in a complementary way with traditional evaluation. Ding and Shen (2010) is of opinion that existing environmental performance assessment approaches focus on the overall performance to reflect sustainability of built projects. However, the impacts caused by construction activities on the environment occur throughout a project’s life cycle which may be different at different stages. Similarly, the economic benefits and social impacts from implementing a construction project may also be different in different project stages. They present a model of the Sustainable Development-Value (SDV) which integrates sustainability assessment into the building process. SDV measures the significance of the concerned project to the attainment of SD value at different stages of a building life cycle and the SDV at each stage will be amalgamated into the model of SD Ability (SDA). SDA is used as a prototype to demonstrate the extent of sustainable performance to aid decision making. They present a methodological framework of SDV and SDA and the implementation was demonstrated using a case study.

Shamim (2007) says that An Organisation for Socio-Economic Development (AOSED) has implemented an awareness program for secondary school students in the south west coastal region of Bangladesh between March 2003 and March 2005. Under this project, two illustrated easy to read booklets, two flip charts for different levels and teacher guidelines were developed to support the teaching method. Awareness of climate change has been enhanced among 15,000 students of 65 schools and their families and neighbours through this initiative. Kholia et al (2010) in the article ‘International year of Biodiversity-revisiting curricula for conservation’, says that every year a large number of students are taken on educational excursions to biodiversity rich areas. These students, who are mostly untrained in proper field and herbarium techniques, tend to collect more and more plants of different species and live materials for
practical. They also remove/uproot several rare, endemic and endangered plants of that area which are unknown to them. Similarly in the curriculum of Zoology, Entomology and other related sciences, a large number of animals are dissected throughout the world. Considering the scale of these activities and their educational importance, the following points were suggested in order to achieve the targets of the International year of Biodiversity;

- During herbarium excursions, besides collecting, the practice of digital records (pictures), drawings and painting of live plants and flowers should be encouraged. At the time of practical exams/viva voce these should be assessed.
- Establishment of miniature Botanic gardens should be promoted at college and university levels. It should have representatives of all families, genera and species of the particular area.
- The dissection work at the school or college levels is not useful for many of the students who drop out or change stream at a later stage in pursuit of a suitable job. Therefore, in the wider interest, it is suggested that this type of destructive laboratory work may be reduced in the curriculum.
- If dissection is necessary at the graduate and Post graduate level, only those animals should be kept which are amenable to easy culture.

Bell and Morse (2007), opines that Problem Structuring Methods (PSMs) are widely applied across a range of variable but generally on small scale organizational contexts. However, it has been argued that they are seen and experienced less often in areas of wide ranging and highly complex human activity—specifically those relating to Sustainability, Environment, Democracy and Conflict (SEDC). In an attempt to plan, track and influence human activity in SEDC contexts, the authors make the theoretical case for a PSM, derived from various existing approaches. They show how it could make a contribution in a specific practical context—within sustainable coastal development projects around the Mediterranean which have utilized systemic and prospective sustainability analysis or, as it is now known, Imagine. The latter is itself a PSM but one which is ‘bounded’ within the limits of the project to help deliver the required ‘deliverables’ set out in the project blueprint. The authors argue that sustainable
development projects would benefit from a deconstruction of process by those engaged in the project and suggest one approach that could be taken—a breakout from a project-bounded PSM to an analysis that embraces the project itself. The paper illustrates the issues by grounding the debate within a set of projects facilitated by Blue plan of Mediterranean coastal zones. It also shows how the analytical framework could be applied and what insights might be generated.

The studies reviewed above focused on various interventions in the form of integrating Environmental Education in the existing curriculum or studying the effectiveness of an approach to Environmental Education such as environmental approach, ICT based approach or any other interventions. It also reveals that various approaches were tested to transact EE in schools, colleges and other educational institutions. It is observed that there are few countries that have taken effort either to incorporate EE or ESD into their curriculum. The Eco village Design Curriculum developed by Global eco village education for a sustainable earth is a notable one. The studies reveal the need for an integrated action at all levels, especially to have ESD embedded in science as a core subject in school and Teacher Education courses. Some countries have made efforts to include climate change, disaster management, biodiversity conservation etc. into their curriculum. Methodologies like Problem Structuring Methods were used for curriculum transaction. But there were no studies where a curriculum was made by integrating the various components of ESD. In India, no studies were found where there has been some initiative for integrating ESD into the curriculum.

2.6 STUDIES ON THE EFFECT OF PEDAGOGICAL APPROACHES OVER EDUCATION FOR SUSTAINABLE DEVELOPMENT

Much of today’s work in sustainable development can be traced back for several decades. Many milestones have marked the journey towards Sustainable development which include the ‘United Nations Conference on Human Environment’, Stockholm (1972) which led to the establishment of the organization-United Nations Environmental Programme (UNEP). The Brundtland Commission (1987) has first endorsed the concept of Sustainable Development. From then onwards the UN General assembly explored the parallel concept of
education to support sustainable development. From 1987-1992, the concept of sustainable development matured as committees discussed, negotiated and wrote the 40 chapters of Agenda 21. Thoughts concerning education and sustainability were initially captured in chapter 36 of Agenda 21 (Rio summit, 1992).

Chapter 36 of Agenda 21 has identified 4 major thrusts of education to support a sustainable future. They are; improving access to quality basic education, reorienting existing education programmes, developing public understanding and awareness of sustainability and providing training. In order to implement these and to move forward, the United Nations Decade of Education for Sustainable Development has suggested 7 strategies which are; vision building and advocacy, consultation and ownership, partnership and networks, capacity-building and training, research and innovation, use of information and communication technologies (ICTs), monitoring and evaluation.

Pellicer (2007) conducted a study for designing a methodology for developing critical thinking among young children to address air quality issues. He opines that awareness is not the only component of Environmental Education; there is also the need to develop knowledge, skills and attitudes towards current environmental issues. This can be attained by fostering critical thinking skills to emphasize the complexity of environmental problems, such as urban air quality. The study proposes a methodology based on the main steps of the scientific method and constructionist educational theories. The methodology is called ‘Constructing Environmental Understanding’ and it suggests generating an adequate learning environment in which children are able to observe their local environment, choose a specific problem related to air quality, study that problem through research and interaction with the physical environment, determine its causes and effects, and then construct personal ideas on how to address that problem. The methodology was implemented at a high school with 37 students from the 11th grade. The result shows that most of the children participating in the study have gained a deeper understanding of air quality issues and have been able to address those issues in a local context.

McDonald and Songer (2008) has viewed that translating written curricular materials into rich, complex, learning environment is an under theorized area in
Science Education. The study examines two critical cases of teachers enacting a technology-rich curriculum focused on the development of complex reasoning about biodiversity for fifth graders. Two elements emerged that significantly impact teacher enactment—their conceptions of authenticity (authentic learning/authentic science) and their view of science (descriptive/inferential). The results suggest that disentangling the common conflation of these two elements supports a broader definition of inquiry science teaching that is more sensitive to context and individual teacher enactment.

Atkinson (2007) conducted a study in bringing practical environment and development education materials into the schools through a multimedia package and interactive approaches on the process of national dissemination; which was adopted by teacher training institutions also. Al-Bashaireh (2007) investigated the effect of a program on Environmental Education based on a systemic approach on the achievement of Educational Sciences students at Mu'tah University, Jordan. The result showed that there was difference on the achievement of the students post test in favour of those who were taught by the systemic approach program.

Behara (2007) in a study on plea for sustainable learning through Vygotsky’s approach of constructivism suggested that teaching-learning process should be linked with the development of problem-solving, critical thinking, empathy, interpersonal relationships and communication skills which will help in SD. A sustainable development model was prepared by employing the five E’s i.e. engage, explore, explain, elaborate and evaluate. Pellicer (2007) developed a methodology called ‘constructing environmental understanding’ and it suggests generating an adequate learning environment in which children are able to observe their local environment; choose a specific problem related to air quality, study that problem through research and interaction with the physical environment, determine its causes and effects and then connect personal ideas on how to address that problem. Result shows that most of the children participating in the study have gained a deeper understanding of air quality issues and have been able to address those issues in local context.

Storhaug (2007) found that the storyline method in education for a sustainable future helps in building attitudes and empowering students for future
citizenship. Marie (2002) conducted a study to investigate the relationship of constructivist learning environment and standards-based teaching practices to student achievement and attitudes (self efficacy, intrinsic value and learning strategies) in Biology. The result provide a strong support for a positive relationship between constructivist learning environment and student attitudes, but little support for a direct relationship to student achievement. Multiple regression findings showed that neither overall constructivist learning environment nor standard based teaching practices predicted achievement in any of the content areas. Overall constructivist learning environment and standard based teaching practices were significant positive predictors of student intrinsic value and learning strategies, after controlling for student and classroom demographic variables. Standard based teaching practices was a significant positive predictor of student self efficacy in Biology. No specific dimensions of constructivist learning environment were consistently related to student achievement. However several dimensions of constructivist learning environments emerged as significant predictors of student attitudes, including personal relevance, shared control and student negotiation.

Binkley (2003) conducted a study on the frequency of use of constructivist teaching strategies and its effect on academic performance, student social behavior in relationship to class size. The findings indicated that there was no significant correlation between the use of constructivist teaching strategies and student academic performance as measured by each middle school’s grade (A, B, C, D and F) on the states mandated grading of schools scale. A small negative correlation between the use of constructivist teaching strategies and the number of student behavioral referrals indicated that higher the teachers use constructivist strategies, the lower the number of referrals per year. It was also determined that as class size decreased, the use of constructivist teaching strategies increased. Munjanganja (2010) is of the view that approaches employed to impart knowledge about ESD in TVET (Technical and Vocational Education and Training) are problem-solving, projects, demonstration, role-playing and role-modelling. Other methods are drama, dance, study tours, industrial placements, and ICT tutorials. In
addition, there is wide use of conventional methods such as lectures, seminars and workshops.

Ye Zhao (2003) analyzed the characteristics of environmental science and the teaching methods of Beijing Norman University and discussed how to use constructivist-teaching models in environmental science teaching. It was found that during teaching and learning in environmental science, both the concept map and mind map are useful tools to promote active learning and students’ abilities to integrate knowledge; and that problem based learning and the use of case studies can effectively motivate students’ learning curiosity and develop certain abilities. It was also found that constructivist teaching, models and perspectives can improve EE reform in Chinese Universities. James (2002) in the study on pursuing sustainable grassroots development in a Thai marginalized periphery looks at the question of sustainability in grassroots development which analyzed that there are many obstacles to grassroots development in rural area.

Petrov and Marina (2007) in their study on Vision of a new educational paradigm: meeting the goals of ESD, suggested the vision of new educational paradigm as the mechanism of socio-cultural continuity and development, the basis for reproduction of spiritual potential of the mankind and development of a person, a mechanism of reproduction and development of science and culture, a basis of preservation of historical and national-ethnic self identification of peoples; the historical-genetic basis on which the future of the mankind grows up. Andrew (2007) outlines the need and nature of education to cultivate ‘deep intelligence’. It involves consciously changing and transcending concepts, definitions, beliefs and patterns which limits how we perceive ourselves, others and the world. Such programmes go beyond cognition, into experience.

Samarapungavan, Mantzicopoulos and Patrick (2008) in their paper examine the nature of kindergarten students’ science learning from an inquiry unit. The results indicate that the students developed a functional understanding of scientific inquiry processes and life science concepts during their investigations. Analysis of Science Learning Assessment (SLA) data indicate that the intervention group showed significantly better understanding of scientific inquiry processes than the comparison group. Rogers, Abell (2008), conducted a study to understand
one case of undergraduate inquiry-based instruction through the words and actions of students and instructors. The data sources included field notes from 16 of 29 classes, two sets of student and instructor interviews (beginning and end of the semester), and a collection of artifacts, such as the laboratory manual, lecture handouts and the course syllabus. The participants for this study included four faculty instructors and two purposively selected student groups, with a total of eight students. They found the instructors’ two course goals, a) teaching students how scientists do science and b) using an interdisciplinary approach to develop students’ content knowledge of the big ideas in science, were consistent with their observations and the students’ descriptions of their experience in the course. However, they observed, and the students also noted, an important feature of the course that the instructors did not describe as a course goal was its reliance on the social nature of learning. This telling case demonstrates that inquiry based instruction is achievable in undergraduate Science Education.

Apedoe (2008) in his paper reports the synthesis of three case studies of students’ engagement in inquiry-based learning activities in an upper level undergraduate geology course. Details of how students engaged in scientific questions, gave priority to evidence, formulated explanations, evaluated explanations and communicated and justified their findings were presented. Data for the study included classroom observations and field notes of classroom practices, questionnaires, archival data (e.g. student work samples), and audiotapes and transcripts of interviews conducted with the student participants throughout the course. The findings suggest that although these students were able to successfully appropriate inquiry practices (e.g. giving priority evidence), it was not without its challenges (e.g. perceived lack of guidance). A detailed discussion of the ways in which students were successful, and where they had challenges engaging in inquiry is presented, with the goal of helping direct practitioners and researchers to strategies where by students’ inquiry experiences can be improved.

Hunter, Laursen, Seymour (2007), in an ethnographic study of summer Undergraduate Research (UR) experiences at liberal arts colleges, where faculty and students work collaboratively on a project of mutual interest in an apprenticeship of authentic science research work, analysis of the accounts of
faculty and student participants yields comparative insights into the structural elements of this form of UR program and its benefits for students. Comparison of the perspectives of faculty and their students revealed considerable agreement on the nature, range and extent of students’ UR gains. Specific student gains relating to the process of ‘becoming a scientist’ were described and illustrated by both groups. Faculty framed these gains as part of professional socialization into the sciences. In contrast, students emphasized their personal and intellectual development, with little awareness of their socialization into professional practice.

Findings through the lens of social constructivist learning theories demonstrates that the characteristics of these UR programs, how faculty practice UR in these colleges, and students’ outcome including cognitive and personal growth and the development of a professional identity-strongly exemplify many facets of these theories, particularly, student centered and situated learning as part of cognitive apprenticeship in a community of practice.

Dass and Deal (2007), reports that in the USA high school students are interestingly and actively involved in Environmental Education and conservation efforts in their community, they are engaged in special projects that involve researching a theme/ aspect of conservation for which they can take specific action, designing, conducting and reporting an original development and implementing an original action plan within the local community. Student have worked very diligently and found the project very rewarding. The Science-Technology-Society (STS) instructional approach, which has been characterized by the National Science teachers Association (NSTA) as the teaching and learning of science and technology in the context of human experience. The NSTA position statement on STS status: The bottom line in STS is the involvement of learners in experiences and issues which are directly related to their lives. STS develops students with skills which allow them to become active, responsible citizens by responding to issues which impact their lives. The experience of Science Education through STS strategies will create a scientifically literate citizenry for the twenty first century (NSTA, 1990-91:48). The STS approach calls for the students to ‘feel and act like scientists’.
Santi, Troy and Saysomdeth (2007) conducted a study on community outreach using radio for biodiversity conservation in Lao People’s Democratic Republic. To evaluate the programme success, staff members used structured interviewing technique to interview 2380 people in five provinces. Survey groups consisted of government officials, traders, rural villagers and urban dwellers. Qualitative indicators revealed that the listening audience gained new information from the program. They also found that 67% of the respondents listen to the radio; 18% of respondents listen to the Friends of wildlife program; and among the various demographic groups interviewed, rural villagers listened to it more than any other.

Murtezan et al (2007) conducted a study on the analysis of the new curriculum content of Macedonian high schools. The study consists of content analysis to examine the extent to which environment and sustainable development issues are addressed within the curricula. The analysis was fully comprehensive and investigated the entire curricula for all subjects and at all levels in the new secondary schools in the Republic of Macedonia. Results have shown a lot of weakness and gaps in the new curricula. Ecological concepts and principles for sustainability must be included in the curriculum in a thorough and comprehensive manner.

Mohd Nor and Assanarkutty (2007) conducted a study about the moral reasoning on environmental issues with emphasis on the well being of wildlife in Malaysia. The study focussed on 13 and 16 years old school children along the Perak river in the district of Perak Tengah in which the Bota Kanan River Terrapin Wildlife conservation centre run by the Department of Wildlife and National parks is located. Moral reasoning regarding wildlife provides a relevant locus for exploring pupils’ environmental ethic and in formulating Environmental Education in Malaysia. The results of a structured survey and open ended questions regarding wildlife dilemmas offered insights into the way the children react toward environmental issues. The study demonstrates that Malaysian children were more likely to choose a teocentric perspective in dealing with environmental issues compared to the anthropocentric or biocentric point of view. However an analysis of the way the environmental issues presented in the
textbook show that it adheres more to an anthropocentric view. The paper also argues to create an effective Environmental Education, it must be based on the actual way that pupils interpret their experiences, and their feelings towards environmental issues. The study hence concludes that Environmental Education in the Malaysian context should be presented through a teocentric approach to provide better and more effective results.

From the above studies, it may be concluded that various pedagogical approaches have been used in transacting certain issues related to ESD, out of which interdisciplinary, STS, constructivist approach and inquiry play a predominant role. Though these approaches were found effective in transacting certain contents related to ESD, it has been made use in the present study to transact the integrated ESD contents.

2.7 DISCUSSION

The purposive literature review made clear that there are number of gaps existing in the area of education for sustainable development. Looking back into the studies conducted, one can infer that it was Environmental Education that was given more priority in the earlier days. Since Environmental Education was a compulsory subject of study in many education systems, there were quite a number of studies pertaining to environmental awareness and environmental attitude. Such studies were conducted at school level, teacher education institutions and other higher educational institutions. Also there were studies on role of gender on environmental awareness and attitude. Even the rural children had better environmental awareness than their urban counterparts. From the studies, one can see that Environmental Education was slowly leading to sustainable development. Educating people about the concept of sustainable development is the scope of Education for Sustainable Development. Since ESD is an emerging area with one of the component as Environmental Education, it has been reviewed to know the trend. But since ESD is the need of the hour and none of the studies were found which caters to awareness or attitude towards ESD, the present study has attempted to explore the knowledge and values towards ESD as a result of an integrated approach to ESD.
There were few studies that cater to sustainable development which include the indicators of sustainability. Review of literature revealed that there have been studies undertaken on sustainable development in the areas of energy (production, demand and supply), poverty alleviation, agriculture, drought, soil erosion, deforestation, desertification, pollution etc. The studies give emphasis to specific areas that hinder sustainability or help in attaining sustainability. Many areas that need sustainability are yet to be explored and researched upon in order to solve issues related to sustainable development. Each country should adopt such sustainability practices that are geographically suitable for the place. Some case studies which are effective in some places may not suit another place. So selecting those case studies that are relevant to their locality should be done while transacting ESD in classroom. UNESCO has listed out the areas to be addressed under sustainable development. There were no much documents pertaining to the areas to be considered under sustainability, except for the document by UNESCO. Hence these areas were considered in the present study in order to incorporate the components of ESD into the Science and Social Science curriculum of VII standard.

The studies on sustainable development reflect that there has been number of case studies from different parts of the world that were assuring sustainability. These studies revealed that there are initiatives taking place at certain areas like impact of constructing dams, using alternative energy sources, biodiversity conservation, using ICT towards attaining sustainability and human ecosystem or impact of human population on sustainability. These case studies and initiatives should be comprehensive in nature in order bring about sustainability. There is a need to bring such findings into the notice of the present generation. Hence the present study has attempted to incorporate issues related to sustainable development into the school curriculum. Some of these case studies can be used in classroom interaction to make the students aware of the sustainability practices happening in the world.

The studies reviewed on ESD and curriculum mainly focussed on various curricular reforms in Environmental Education in the form of integrating Environmental Education in the existing curriculum. Effectiveness of various
approaches to Environmental Education such as environmental approach, ICT based approach on some variables was also reviewed. It also reveals that various approaches were experimented to transact EE in schools, colleges and other educational institutions. It was observed that there were few countries that have undertaken effort either to incorporate EE or ESD into their curriculum. The Eco village design curriculum developed by Global eco village education for a sustainable earth is a notable one. The studies reveal the need for an integrated action at all levels, especially to have ESD embedded in Science as a core subject in school and teacher education courses. Some countries have made efforts to include climate change, disaster management, biodiversity conservation etc. into their curriculum. Methodologies like Problem Structuring Methods were used for curriculum transaction. But there were no studies where a curriculum was made by integrating the various components of ESD. In India, no studies were found where there has been some initiative for integrating ESD into the curriculum.

It was also found from the studies reviewed, that various pedagogical approaches have been used in transacting certain issues related to ESD, out of which interdisciplinary, STS, constructivist approach and inquiry play a predominant role. Though these approaches were found effective in transacting certain contents related to ESD, it has been made use in the present study to transact the integrated ESD contents.

From the insights from chapter I and II, one can find the consequences of unsustainable development. It also discussed on the various components to be addressed in ESD, along with the dimensions of awareness, critical thinking, problem-solving and values towards sustainable development. These were adopted from the documents by various committees and commissions, because there were no research studies which have taken these dimensions in the light of ESD. Since there were no studies on an integrated curriculum for ESD in any country, it was unable to find any study related to ESD and other consequence variables like knowledge on sustainable development, critical thinking, problem-solving and value preference on sustainable development. Few studies also have shown the relationship between intelligence with critical thinking and problem-solving. So in order to minimise its effect on the experimental treatment, intelligence was
controlled statistically in the present study. Drawing insights from the review of studies, it was planned to consider some of the variables which were stated in the Earth Charter (1992) and Millennium Development Goals (2000) by UNESCO for research. The present study also attempted to look into the relationship among the variables taken in the study. The present study concentrated on integrating ESD components into the existing school curriculum along with appropriate pedagogical techniques to study its effectiveness on some of the selected variables like knowledge, critical thinking, problem-solving and value preference on sustainable development.

The methodology and analysis followed in the present study are given in the proceeding chapters.