A critical analysis of studies on Sustainable Development

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Abstract

An attempt has been made to discuss about the review of related literature and researches carried out in the area of sustainable development. Literatures from various sources were reviewed to study the trend in the area. The reviewed literature and researches are categorized into i) studies on Environemental Education (EE) - one of the components of Education for Sustainable Development (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. From the studies, it was found that there is a huge gap between the theory and practice of sustainable development.

INTRODUCTION

Sustainable development is the development, which meets the needs of the present without compromising the needs of the future generations to meet their own needs (Brundtland Commission, 1987). Education for sustainable development is educating the various stakeholders that include all human beings in every nook and corner of the world about sustainable development. Education for Sustainable development (ESD) helps in preparing the individuals to decide for themselves the activities that help in attaining sustainability. It is the part of each and every individual to practice those actions that helps in attaining sustainability. Sustainability helps in attaining that quality of life whereby all individuals enjoy the nature and its resources equally based on their needs. There is a need for developing those methods and tools for creating critical reflection and greater awareness on areas pertaining to sustainability. The involvement, responsibility and commitment of every individual are very essential for attaining this sustainability. It is high time that we start to act on the various aspects of sustainable development for a future which can sustain all the living beings. Education for sustainable development caters to social, economic and environmental aspects of development that need to sustain.

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 dimensions of ESD. 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 her 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 is the classroom teaching and the media exposure; the rural children are deprived of these facilities for improving their mental horizon. 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 in 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 is 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 schoolteachers. 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 & Manjula (2008) found out Maldivian secondary school teachers have a moderate awareness regarding environmental problems and issues with a positive attitude towards conserving the environment. Also, there was a relationship between environmental awareness and environmental attitude with environmental awareness predicting the environmental attitude of Maldivian Secondary school teachers. Lakshmi &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 attitude rewards EE were conducted by Mallika (1984), Sharma (1996), Sharma (1998), Radha (2005) shows 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 is observed that studies are carried out in Environmental Education among students with different subject backgrounds. Kumar & 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 & Kadhirvanan (2007) conducted a study on the influence of personality on the environmental awareness ability of college students and found out that it is affected by demographic variables like subject specialization, residential area, parental income and parent's level of education. But gender does not affect them.

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. Since teachers were more favorable than females and there was increase in attitude score with increase in socio economic condition. 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 under studies on environmental education, it is concluded that, there are innumerable studies related to awareness and attitude on EE at school level. There were no difference among gender on 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.

STUDIES RELATED TO ISSUES ON ESD:

Studies pertaining to various issues related to ESD such as 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. 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 & 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 & 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 counties 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.

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.

The exercise of review pertaining to issues on sustainable development 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 have given 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.

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. 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 & health; sanitation and drinking water; alcohol; child care; education; literacy and numeracy; culture, leisure & time; family; social relationship and participation; international cooperation; housing; child living conditions; services & 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.

Archibong (2007) conducted a study on the problems related to the issues of climate extremes, Nigeria's experiences in air safety and air accident, contribution of the meteorological agency to extremes in weather and safer air transport. Wazed & 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 & 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.

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 & 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. Since teachers were more favorable than females and there was increase in attitude score with increase in socio economic condition. 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. Mitchell (1994) conducted a study on Sustainable Development at the Village Level in Bali, Indonesia indicating 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 & Songer (2008) has 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 whereas socio cultural themes may include parent relationships, citizenships, human values, gender equality, religious beliefs, freedom, environmental conservation, children relationships and civil rights.

York & 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 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.

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) has 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) inorder to provide a holistic picture of environment to the students. 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 is concluded that the infused material is creating incoherence in the curriculum, and the attempts to remove this incoherence are further creating confusion. It is 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 is 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.

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.

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 & 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.

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; imparte 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 Eco village 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.

The studies reviewed on ESD and curriculum 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.

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

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' (CEA) 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.

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 ie. 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.

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. 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. 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.

Dass & 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. Santi, Troy & 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 2380people 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.

Mohd Nor & Assanarkutty (2007) conducted a study about the moral reasoning on environmental issues with emphasis on the well being of wildlife in Malaysia. The study focused 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 are presented in the textbook show that it adheres more to an anthro pocentric 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 should be its central focus. 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. Hence, 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.

DISCUSSION:

The literature review on ESD 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 Environemental education was a compulsory subject of study in many education systems, there were quite a number of studies pertaining to environemental 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 environemental awareness and attitude. Many studies found out that the rural children had better environmental awareness than their urban counterparts. Environmental education is slowly giving way for 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.

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 gave 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 needs to 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 relevent to their locality should be done while transacting ESD in classroom. UNESCO has also listed out several areas to be addressed under sustainable development. 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 in different 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. The studies reviewed on ESD and curriculum mainly focused 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 revealed 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 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. 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. 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.

It is high time that all the countries initiate practices for attaining sustainability with focus on their context. Issue based curriculum which focus on practicing sustainable activities needs to be a part of school and higher education curriculum which need to be trained

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