Research Review Article

Research Trends in Environmental Education

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ABSTRACT

With a global concern on education for sustainable development, during last few decades, different policy documents have highlighted the need to address it through education from time to time. In India, an important milestone in this direction is the judgment of the Honourable Supreme Court in 2003, which made environmental education mandatory at all levels. Following this, various educational bodies at the national and state levels took measures in this direction; be it development of curriculum, resource material, undertaking researches, extension, training or any other activities. This report is a systematic review of the researches conducted during 2000–2016 in India related to environmental education. It includes M.Ed. and doctoral theses, research articles, conference reports and research projects by different institutions and agencies. Divided into six broad themes, namely awareness and attitude of students and teachers, curricular framework and material such as syllabi, textbooks and teaching-learning materials (TLM), teaching-learning process, teacher development including teacher education curriculum and training, policy and systemic issues; each theme explores the trends of research in the area over the last one and a half decade. The research survey also highlights the gaps in studies under each theme and provides suggestions for future research on environmental education.

Introduction

Environmental consciousness has been a major theme of global discussions and deliberations. It is accepted that consciousness about the environment should prevail as a crucial imperative. In India, the first key step towards integrating environment and development was the establishment of National Council of

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Environmental Planning and Coordination, after the historic 'Conference on Human Environment', held at Stockholm in 1972. Subsequently, the Department of Environment was set up which was converted to a full-fledged Ministry. Various laws and regulations made from 1972 onwards provided the legal framework for environment protection. Later, the landmark National Forest Policy of 1988 was developed.

The five basic gross elements or the *panch mahabhoota* of nature: *akash* or firmament, *vayu* or air, *agni* or fire, *apah* or water, and *prithvi* or earth are considered auspicious since the ancient times in India. People were careful to refrain from activities that could cause harm to nature and its bounties. It was understood that the well-being of the Mother Earth depended on the preservation and sustenance of the environment. Mahatma Gandhi's Basic Education Scheme incorporated the elements of environmental consciousness and protection. Further initiatives included recommendations by the Education Commission (1964–66), the *National Policy on Education*, 1986 and POA 1992, emphasising on the need of addressing and including environmental concerns at all levels of schooling. The *National Policy on Education* (1986) states, *"There is a paramount need to create a consciousness of the environment. It must permeate all ages and sections of society, beginning with the child. Environmental consciousness should inform teaching in schools and colleges. This aspect will be integrated in the entire educational process"*. Consequently, Environmental Education (EE) has been one of the priority areas of concern in all the school curriculum development programmes at the NCERT (1975, 1988, 2000, and 2005). The Honourable Supreme Court of India, in its historic judgment of 18 December 2003, also directed that Environmental Education (EE) should be an integral and compulsory part of the school curriculum from Classes I to XII. The *National Curriculum Framework 2005* endorsed the infused and integrated approach to (EE) laying great emphasis on habitat of students and its relation with learning. It states *"…today formal education has largely become alienated from the habitat of the students. But the environmental degradation proceeds at an unprecedented pace. We are beginning to realise the importance of taking good care of our habitat. Humankind must therefore make an attempt to comprehend its roots, to re-establish links with its habitat, and to understand and take good care of it. In substance and spirit, then the theme, 'Habitat and Learning' is equivalent to EE"*.

International Scenario

In 1992 the Rio Earth Summit took cognizance of the need to take action in 'every area in which human impacts on the environment'. Efforts to bring about a shift in 'educating about the environment' to 'educating for sustainability' were reflected in the World Summit on Sustainable Development (WSSD) in Johannesburg in 2002. This brought a shift in the international climate of thinking about Sustainable Development as *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'*. It led the urgent need for everyone to be sensitised about continuous and over exploitation of our natural resources in the name of development that brought the future of humanity and of this planet at stake. Ensuring environmental sustainability was also one of the eight international development goals that 191 nations and 22 international organisations committed to help achieve by 2015.

Recognising education as a critical means to achieve sustainability, the United Nations launched the 'Decade of Education for Sustainable Development (DESD)' in 2005. The goal of the decade (2005–2014) was to integrate the principles, values and practices of Sustainable Development into all aspects of education and learning in order to encourage behaviour that will create a more sustainable future in terms of environmental integrity, economic viability and a just society for present and future generations (UNESCO, 2005). A key objective of the UNDESD was to foster better quality teaching and learning for Education for Sustainable Development (ESD). This calls for a reorientation of thinking and practice of formal education—including curriculum's teaching-learning approaches and assessment.

The end of the decade was marked by the UNESCO World Conference on Education for Sustainable Development (ESD) in 2014 which proposed Aichi-Nagoya Declaration on Education for Sustainable Development, inviting governments *'to reinforce the integration of ESD into education, training, and sustainable development policies'* with UNESCO as the lead agency. As official follow-up to the DESD, UNESCO launched the Global Action Programme (GAP) for ESD to scale up action on ESD worldwide. It was intended to reorient education and learning so that everyone has the opportunity to acquire the values, skills and knowledge that empower them to contribute to sustainable development; and emphasise it in all relevant agendas, programmes and activities

that promote sustainable development. Thus, accomplishing the objectives through empowerment and mobilisation of the youth, public awareness initiatives for people of all ages and building capacities of educators and trainers by transforming learning and training environments with policy reforms, GAP aims to help individuals understand, devise and implement sustainable solutions for solving the complex problems presented by climate change solutions at local levels.

In August 2015, 193 countries agreed on 17 Sustainable Development Goals (SDGs) in which ESD is explicitly recognised in the Sustainable Development Goals as part of Target 4.7 which states *"By 2030, ensure that all learners acquire knowledge and skills needed to promote sustainable development, including, among others"*. Thus, ESD is an essential tool to develop sustainability competencies in learners as specific cognitive, socio-emotional and behavioural learning outcomes to enable them contribute to sustainable development through societal, economic and political change as well as by transforming their own behaviour and thus accomplish the SDGs. Such an education goes beyond the formal curriculum to provide holistic experiences that are not confined to the classroom but are part of the learning in the school and the community of the students. The learning is linked to real life, and activities require application of knowledge and skills in real situations. Such an education requires leadership that places sustainability at the heart of policy planning and practice, and that engenders democratic and participatory decision-making process.

The Present Review

The six educational research surveys conducted in the past did not focus much on this area except the fifth survey, which too concluded that researches conducted on Environmental Education (EE) are inadequate and recommended their promotion across all levels and regions. It suggested apportionment of content at all levels in education and implementation of a well-planned national programme in this direction.

The present report is based on researches from 2000–2016, predominantly relating to the Indian context. It includes doctoral theses, research articles, conference reports, and research projects undertaken by different institutions and agencies besides M.Ed. dissertations submitted to universities. Data collection process included web surfing, correspondence to all the central and some state

universities through letters, fax messages and emails. The list and addresses of the universities were procured from the UGC website. Field visits to the libraries of different institutions, universities in Delhi and outside were made during October-November 2016. These were NCERT, NEUPA, Delhi University, Jamia Millia Islamia, Jawaharlal Nehru University, B.R. Ambedkar University, Centre of Science and Environment, Teri University and Indraprastha University in Delhi. Besides this, visits to CEE, Ahmedabad, MS University of Baroda, Central University of Gujarat and Gujarat University were also made. Collection of articles, research papers, conference proceedings, M.Phil. Dissertations, Ph.D. theses, etc., was carried out during these visits. Correspondence through letters and emails also enabled to gather details from the universities and other research institutes. A detailed survey of literature, primarily Indian studies, through internet using search engines/sites, *viz.* Sodhganga, Economic and Political Weekly, Google Scholar, JStor, Mendley, Sage Journals, Academic.edu, Elsevier, Scrib, Taylor and Francis, Research Gate, books and journals was conducted and a number of articles, research papers on Environmental Education conducted during 2000 to 2016 were collected. Key words such as environment, environmental education, curriculum, awareness and attitude, policy and programmes, education for sustainable development, learning of/for/through environment projects, classroom processes, India, etc., were used. Articles were selected as per the following criteria: (a) the articles related to the environmental education; (b) the articles addressing issues related to environmental challenges and promoting environmental education; (c) the curriculum and policy and programmes on environmental education used in India; and (d) the articles on studies of environmental education at the school level. The material collected was systematically listed.

Data analysis began in the month of December 2016 and six broad themes; (1) Environmental Awareness, Attitude and Sensitivity among Students; (2) Curriculum Framework, Curricular Material and School Environment; (3) Teaching Learning in EE; (4) Awareness and Attitude of Teachers and Teacher Educators; (5) Teacher Development and (6) Policy and Systemic issues were identified. These were further classified into sub-themes and the data collected was segregated and classified into these categories.

The research articles, reports and M.Phil. and Ph.D. theses were carefully examined and a gist was prepared. Relevant sections

were highlighted using colour coding for segregation of qualitative data into these categories. Finally the report was compiled so that the succeeding sections deal with the trends of researches on EE and its related areas from 2000–2016. There are six broad themes, which were categorised into sub-themes. The sections have been organised in a bottom-up approach, i.e., starting with the Awareness and Attitude of students, moving on to Curriculum/Curricular Framework and Curricular Material such as Syllabus, Textbooks and Teaching-Learning Materials (TLM), then assessing the transactional aspect of the curriculum, i.e., the Teaching-Learning Process, further moving on to the Awareness and Attitude of the Teacher, then looking at Teacher Development which includes Teacher Training and Teacher Education Curriculum and lastly evaluating the top-level perspectives —Policy and Systemic Issues. Each thematic sub-section explored the trends of the EE researches, which have been analysed with regard to how they are connected or related to one another in terms of being similar or different. Further, an attempt was made to look at the recommendations of the researches under each sub-theme and also to point out the gaps therein. The research review concludes by pointing out the overall gaps in the studies and giving suggestions for future research on Environmental Education.

Environmental Awareness, Attitude and Sensitivity among Students

One of the fundamental goals of Environmental Education (EE) is to equip students with the skills to enable them to make more thoughtful decisions on environmental issues (Arvai et al., 2004). Children display sensitivity to protection of the living beings besides participating in their conservation and protection activities. Being tomorrow's leaders, they not only constitute an important audience for environmental education but can influence parents and community too. Sensitivity, knowledge, behaviour and action are crucial to establishing sound basis for Environmental Education in schools (Jeronen and Kaikkonen, 2002). Transformation of awareness and knowledge into right attitudes, values and behaviour is a long-term process that requires sustained interventions for a long time (Sampath and Sundaramoorthy, 2014). There is a positive relationship between environmental awareness and environmental attitude. Abraham and Arjunan, (2005) observed a highly positive and significant correlation between environmental interest and

environmental attitude whereas Schmidt's (2007) experimental study found a positive correlation between attitude and behaviour. Negev et al. (2008) conducted a national survey on 6th and 12th grade students in Israel for environmental knowledge, attitudes, and behaviour, and found no significant correlation between knowledge and behaviour. The researchers also found that the presence of an adult who mediated children's relation to nature was strongly related to environmental attitude and behaviour formation.

Most of the studies reflect a good level of environmental awareness among the students, except Chaudhary (2004) who found that the factual and conceptual environmental knowledge among the secondary school students of Vadodara was average. Sudhir (2013) found that the students in Tamil Nadu were aware of the environmental issues and participated in environmental programmes. Sahaya and Paul (2005) observed that students, in general, had an above average level of environmental awareness. Shair and Akhter (2012) found that in the state of Jammu and Kashmir, environmental awareness was far below in adolescents as compared to the students enrolled in higher education, who exhibited satisfactory environmental knowledge and skills. Shobeiri and Prahallada's (2006) comparative study on environmental awareness among secondary school students in India and Iran found significant difference in the levels of environmental awareness of the students of the two countries. The study concluded that the number of students with average level of environmental awareness in India (44%) is more than their counterparts in Iran (14.9%), whereas the number of Iranian students with high level of environmental awareness (85.10%) is more than that of Indian students (56%). Raina (2015) revealed that senior secondary level students were environmentally more aware than high school level students, whereas Kaur and Kaur (2009) found no difference in the level of awareness among secondary and senior secondary students.

Studies reveal significant correlation between the effect of socio-economic factors and environmental awareness, attitude and behaviour. Negev et al. (2008) study on 6th and 12th grade students in Israel observed associations with demographic and experiential data, and concluded that ethnic and socio-economic characteristics were moderately associated with environmental literacy. Khan (2013) found that socio-economic factors such as demographic change, social change, gender and divisions of labour, health, education, knowledge and information, poverty,

economic change, technological change have a positive impact on environmental management. Sahaya and Paul (2005) also reported that factors like locality of school, caste of the students within the group influenced the environmental awareness among the students. Chethana (2003), however, found that different levels of socio-economic status and locality of school did not account for significant difference in the environmental awareness and attitude of secondary school students. Indupalli et al. (2015) reported significant linkage between literacy status of mother and students' environmental awareness. Although Bharambe (2013) observed that parents' qualification did not affect the level of awareness but found children of farmers were environmentally more aware than others. Sahaya and Paul (2005) found no impact of religion, family and its size and observed that these factors have no effect on the environmental awareness among students. Most studies found urban students and those studying in private schools having better awareness as compared to the rural children and those studying in government schools (Abraham and Arjunan, 2005; Rout and Agarwal, 2006; Raina, 2015). Rathore (2000) compared the achievement of urban and rural children at the primary level from non-formal education centres and formal primary centres of Khandwa district in the subject Environmental Studies, and found that boys and urban students outperformed girls and their rural counterparts.

There are contradictory findings with respect to the influence of gender on environmental awareness. While a set of studies (Abraham and Arjunan, 2005; Tripathi, 2000; Rathore, 2000) found boys in schools having more environmental awareness as compared to their female counterparts, Raina (2015) reported that girls at the high school demonstrate better environmental awareness than boys at the same level, which is in consonance with Shobeiri's (2005) study in the context of Iran and India. A few studies (Bharambe, 2013; Kaur and Kaur, 2009; Larson, 2010; Rout and Agarwal, 2006; Sahaya and Paul, 2005), however, revealed no effect of gender on environmental awareness.

With regard to the subject background, there were contrary findings. Rout and Agarwal (2006) reported that science stream students have better environmental awareness and environmental attitude in comparison to the students of non-science stream. Another study (Kumar and Patil, 2007) on postgraduate students also revealed the same results, thereby showing that subject

stream influences the awareness and attitude of the students towards environmental issues. However, a study by Tripathi (2000) gave contradictory findings as it revealed arts students had higher environmental awareness than science students. There was no difference in environmental awareness of students between central schools and other schools. Sahaya and Paul (2005) observed that medium of instruction also influenced the environmental awareness among the students, and the domination of English medium over Urdu and Kannada medium was observed by Indupalli et al. (2015) for enhancing environmental awareness of students from Gulbarga in Karnataka state.

Shobeiri (2005) and Chaudhary (2004) found that environmental attitude of secondary school students of Vadodara were average. A year later, a comparative study between India and Iran by Shobeiri (2005) concluded that in both India and Iran students studying in Class X exhibited more favourable environmental attitude than Class IX students wherein girls showed better environmental attitude than boys in both the countries. Also secondary students of Iranian government school exhibited enhanced environmental attitude than private school students, whereas Indian private school students were better as compared to those from the government schools. Regarding type of school management and its effect on environmental attitude of school students, Shobeiri (2005) revealed that it affects Environmental Attitude of students, which was opposite to the findings of Chethana (2003) study that found no significant effect of type of school management on the environmental attitude of secondary school students.

Several quantitative studies across disciplines have investigated children's knowledge and attitudes (Strife, 2012) about environmental problems and few examined children's feelings and even fewer focused on children's point of view. Sinha and Taneja (2012) revealed that primary school students with internal locus of control exhibited better environmental sensitivity than those with external locus of control. Exploring children's feelings, Strife (2012) found that majority of children expressed fear, sadness and anger on environmental problems. Majority of them shared apocalyptic and pessimistic feelings about the future state of the planet. The eco phobia among children may have serious implications for their participation in environmental stewardship and conservation efforts.

Sudhir (2013) found that the students in Tamil Nadu were aware of the environmental issues. However, there is a huge gap between

awareness and action for environment protection and conservation in schools. With respect to gender, Sinha and Taneja (2012) found girls exhibiting better environmental sensitivity and responsible behaviour than the boys. Except Rathore (2000) and Kumar and Patil (2007), all the studies were conducted on students from high school to those at the higher secondary stage.

In summary, largely the studies have examined the students' environmental awareness and attitude at the secondary level. Little attempt has been made to study the environmental awareness among children at the primary stage. Quite a good number of the researchers studied the impact of socio-economic and demographic variables on environmental awareness and attitude of students whereas only one study analysed the correlation between environmental awareness, attitude and behavioural aspects among students. Hardly any efforts to understand the development of environmental skills among children at various stages are made. More studies involving children at the early grades and primary stage can help understand the young minds to address the issue at the foundation level.

Curriculum Framework, Curricular Material and School Environment

The knowledge, skills and dispositions that students acquire are largely picked up from the milieu, which includes their home, school and society. A huge onus is on school education and therefore, the curriculum needs to be such that it provides scope and capacity to transform children into responsible global citizens. This section evaluates and analyses the studies centered on curriculum and curricular materials such as syllabi, textbooks and other teaching-learning materials (TLM), school infrastructure and school environment in the area of environmental education.

Curriculum

A sizeable number of studies have analysed the curriculum (Dutta, 2013; Iyengar and Bajaj, 2011). Some studies compared the curriculum of different states in India with the one at the national level, whereas others compared the Indian curriculum with those from other countries. Highlighting the curricular burden on young children at the primary stage, Kaur and Sharma (2016) noticed that environmental studies (EVS) was perceived as science whereas social science was being taught as a separate subject in Delhi

state government schools. The approach was against the *National Curriculum Framework 2005*, which envisages Environmental Studies, a separate subject integrating science and social science. However, Thakur (2007) disagreed with the integrated or infused approach to EE and states that contents of EE get diluted when these are infused with the rigid concepts of science and social science in textbooks and curricular materials. Pynae (2006) states that in the light of the fact that individuals, teachers, researchers and schools actively construct and give meaning to human–environment interactions and relations, a humanly constructive approach (by bringing real authentic life into the process of learning) to reflexive inquiries is a creative, practical, enabling and non idealistic solution that curriculum theorists now need to consider for education for the environment.

Iyengar and Bajaj (2011) observed a large gap between the environmental education in Madhya Pradesh State curriculum and that recommended by the NCERT at the national level across all grades in terms of contextual linkages and interdisciplinary aspects. Dutta (2013) too noticed gaps in Assam State school curriculum for Environmental Studies in Barak Valley and found that environmental studies at national level includes more social science dimensions but the state curriculum does not give sufficient attention towards this. Studies by Jerath (2005) and Tapasya (2014) looked at the curriculum from a comparative perspective. Tapasya (2014) compared the environmental education curriculum at primary level in India against the Finland curriculum (considered of high quality as per the OECD) and found that India's EVS curriculum is not at par with it. It considered the Finland EVS curriculum to be superior in terms of making students both aware and responsible towards environment, whereas the Indian curriculum lacked clarity in aims, content, pedagogy and assessment. Jerath (2005) examined the general framework of EE in Technical Vocational Education (TVE) system at the secondary school level in five countries – China, India, Indonesia, Malaysia, and the Philippines and found that EE had not been adequately addressed and there were gaps in the current structure.

Some studies put forward an international perspective for countries ranging from Singapore (Kwan and Stimpson, 2003), Poland (Domka, 2004) and New Zealand (Chapman, 2011). Kwan and Stimpson (2003) found three underlying themes: a pragmatic utilitarian concern for the urban environment of Singapore; a

school and examination system that is still largely focused towards traditional disciplinary knowledge; and the overriding influence of government and the balance that it priorities between environment, economic development, social stability, nation building and external image as the context variables that helped shape the environmental curriculum in the schools of Singapore. Both Domka (2004) and Chapman (2011) presented unsatisfactory state of EE curriculum in Poland and New Zealand respectively. On emergence of EE in the curriculum discourse in New Zealand, Chapman (2011) observed that the curriculum, by itself, provides little concrete guidance for teachers.

As per the NCERT studies (2011–12, 2012–13 and 2013–14) on monitoring the EE implementation, three-fourth of the stakeholders agree that the school curriculum addresses the environmental concerns. Vishvasrao (2005) suggests that to bridge the gaps in environmental awareness and environmental education, the science education curriculum needs to focus on naturalistic view than creationism; help students develop a holistic understanding of environment with eco-friendly habit inculcation right from the early stages of school.

Textbooks

A number of studies (Banerjee, 2005; Gopal and Anand, 2005; Kaur and Sharma, 2016; Prakash, 2008; Rani, 2016; Saini, 2012; Shrivastava, 2007; Varghese, 2008) analysed the NCERT textbooks for EE at different stages. Almost all the studies found NCERT textbooks in consonance with the ethos of EE. Varghese (2008) found that the content of NCERT EVS textbooks for Classes III–V incorporates the objectives of EVS curriculum under NCF 2005, identified by a good EVS programme. Saini (2012) too observed them in accordance with the Piaget and Vygotsky theories for which contextual teaching-learning can realise the intended curricular objectives. Kaur and Sharma (2016) mentions that in spite of the EVS textbooks being in tune with the EE principles, as per the textbook writers' opinion, the teachers teaching EVS are unable to locate the social sensitivities embedded in NCERT EVS textbooks at the primary stage. Teachers also felt the EVS syllabus to be bulky with lengthy chapters that lack relevant content. However, for the NCERT science textbooks of Class IX and Class X, Rani (2016) did not give a satisfactory picture and observed that scientific concepts linked with environmental issues and concerns have been dealt with in a very limited way.

Some studies gave the perspective of textbooks from different States whereas others provided their comparative view with that of the textbooks of NCERT at the national level. Gopal and Anand (2005) concluded that national level and school textbooks of different states treated EE as secondary to other scholastic areas, which is against the recommendations of the *National Curriculum Framework 2005*. A comparative analysis of the EVS textbooks on Classes III–V of NCERT and SCERT, Delhi for the consistency of content and its organisation by Shrivastava (2007) found that both are based on Vygotsky's assumptions of learning. The textbooks of Rajasthan (EVS textbooks) although included environmental concepts but lacked on several important themes both at the primary and the upper primary levels (Science textbooks) (Prakash, 2008). However, Singh (2011) did not notice gaps in the content of Class VII, General Science textbooks of Rajasthan Board of Education and found it to be environment oriented, thus, aiming to develop basic awareness and understanding of the environment among learners. Additionally, Jaiswal (2006) found that the content of the textbook of environmental science of Class IV Gujarat State Education Board textbooks was not in accordance with the abilities and interest of the students. The study by Banerjee (2005) specifically looked at the inclusion of disaster education in Indian school curriculum and found that it was introduced as part of the educational reforms in 2000, before India's experience with Tsunami. However, greater impetus to disaster education in school curriculum was given post tsunami experience.

TLM and School Infrastructure

A number of studies have examined Teaching Learning Materials (TLM), which varies from cartoon and comics based multimedia package (Kaptan, 2001), instructional package (Pillai, 2012; Sharma, 2005) computer assisted instruction (Aivazidis et al., 2006) and folk music (Dey, 2014). These materials were effective in enhancing achievement (Kaptan, 2001; Pillai, 2012) of students as well as promotion of understanding and sensitivity towards environment among children at upper primary stage (Sharma, 2005). Aivazidis et al. (2006) found that students who received computer assisted instruction outscored their peers who were taught traditionally on knowledge and attitude of environmental issues.

Assessing the status of school environment and sanitation in rural Indian schools for appropriateness and adequacy of various

attributes, Majra and Gur (2010), indicated that one fourth of the schools were sited at inappropriate places and only half of the schools had appropriate and adequate structure. On drinking water availability (90%) and cleanliness (80%) of the school compound the schools were good, whereas for natural light (70%), ventilation (60%) and separate toilets for boys and girls (60%), the performance was satisfactory and performed badly on Liquid (30%) and solid waste disposal (40%) and hand-washing with soap (10%). There were no separate rooms for serving the midday meals in any of the schools under study and many (90%) of the schools were overcrowded.

Several studies made recommendations with regard to curriculum framework, curriculum materials and TLMs. Some of these are general in nature while some others are very specific. A couple of studies made recommendations with regard to state level curricula and related materials. Gopal and Anand (2005) advocates redesigning the curriculum and the curricular material so as to address the anomaly of EE being treated secondary to other scholastic areas. Domka (2004) proposes redesigning the curriculum and provision and usage of appropriate TLM to improve EE. Rani (2016) suggests that the science curriculum be transformed to include the emerging issues of the environment. Ranganathan (2005) proposes that indigenous knowledge should be placed at the heart of the process of education for sustainable development (ESD) and the same may be facilitated through Information and Communication Technologies.

Some state specific studies recommend inclusion of more concepts, Dutta (2013) advocated for relating human relationships with environment in the Assam State curriculum, and Prakash (2008) sought improvement in environmental concepts in the existing EVS textbooks at primary stage in Rajasthan. Redesigning of curriculum of EE at the international level has been suggested (Jerath, 2005). Jerath (2005) further seeks UNESCO like organisations to take lead to develop policy guidelines and standardised core curriculum, to ensure uniformity internationally.

A good number of studies examined the curricula, textbooks and other Teaching Learning Material (TLM) for the EE component. Some of them compared the State curricular material with that at the national level and others compared it across different countries. There are mixed observations on the EE curricula and material, some showing consonance and others depicting deviations from

the ethos of EE. Overall, the studies recommended a pragmatic, rational and utilitarian approach to EE in school curriculum, which is guided by EE principles at its core and rooted in the contexts.

Teaching-learning in Environmental Education

Curricular intentions can only be realised if its transaction occurs in a desired manner, which depends largely on teachers' understanding of the curriculum and its objectives, the processes of teaching-learning employed by them including the availability and usage of appropriate resources through meaningful strategies or practices in an apt school and the classroom environment. There is a need for stressing the importance of environmental awareness in an educational setting in order to benefit both student knowledge and future welfare of the greater population (Schdmit, 2007). Covitt et al. (2009) established that interconnections between different domains of the environment (e.g., between physical and the natural environment) need to be built in order to achieve the curricular goals of EE. This section covers the studies on teachers' perceptions and their understanding of EE curriculum, diverse pedagogical approaches on transaction of EE curriculum, role of physical setting and school architecture.

Teacher's Perceptions and Understanding of the EE Curriculum

In order to ensure implementation of EE Curriculum it is important that the teachers understand the curricular intentions as envisaged in the curriculum framework. The teachers' perceptions on environmental education also play a key role on how students learn, retain and apply the knowledge, attitudes and skills in changing their perceptions of their environment. However, Sharma (2016) reported a limited understanding of EE with regard to curriculum transaction among different stakeholders implementing EE. Paul (2008) too observed the same in a public school in Texas, USA. Sharma and Devi (2012) found teachers teaching early grades lack an understanding of integrated approach to teaching-learning of EVS as suggested by the *National Curriculum Framework 2005,* although all of them believed that integrated approach will address the curriculum load and help children in learning. Thakur (2007) mentioned that subject specialisation of the teachers influenced their views to a great extent in the teaching of EE. Primary school teachers with science as subject background are more competent in

teaching EVS in primary grades than the teachers having language or other subjects as their subject background. It has been reported that primary teachers across schools lacked in their understanding of EVS curriculum (Kaur and Sharma, 2016; Sharma and Devi, 2012). However, the factors affecting the pedagogic practices of teachers are rooted in the understanding they possess for the subject of EVS.

Teaching-learning Approaches and Physical Settings

Strife (2010) considers it necessary to reflect on the pedagogical practices, and mentions that EE pedagogies are not 'one size fits for all', thereby calls for humanisation of environmental education discourse and pedagogical practices. Kopnina (2014) explores a number of questions about visions of the future and their implications for EE. It discusses EE/ESD approaches for three future scenarios; the limits of growth, sustainable development and ecological modernisation and advocates education for deep ecology in order to address the ethical implications. Joy (2005) recommends scientific education about techniques and skills needed to protect the environment rather than merely creating environmental awareness and providing information about the same. In general, the studies reflect dominance of teacher centric classrooms and subject specialisation of the teacher influenced their views to a great extent in the teaching of EE (Kaur and Sharma, 2016; Sharma, 2011; Thakur, 2007). Most teachers from both government and private secondary schools use lecture and discussion methods for teaching environmental topics with very less or no inclusion of activity or project based methods. Sharma (2011) and Kaur and Sharma (2016) observed poor pedagogic practices, as classroom teaching-learning was restricted to reading out the text either by the teacher or by students with teachers explaining its literal meaning. They further mentioned that no planning and preparation for the transaction of the textbook chapters as per the curricular objectives is ever made. A similar trend across the pre-schools of Poland by Domka (2004) was observed, where unsatisfactory state of the form of environmental education taking into account children's achievements was witnessed. Sharma (2011) found that most teachers do not use innovative and activity based pedagogical methods for teaching environmental education in class; lecture cum discussion methods for teaching environmental topics is used with very less or no inclusion of activity or project based

methods. Researchers attribute this to the inability of the teachers to understand and use contextual methodologies. It has also been pointed out that the ineffective transaction is due to transfer of concepts and methodologies of EE from the developed countries.

a. Whole School Approach

Judicious use of all school resources both physical and natural (school building and energy resources), adopting collaborative means to involve the entire human resource (staff, students, their parents/guardians and community) and directing the teaching-learning practices for environmental sustainability are envisaged under whole school approach. Nemati (2008) discusses ways through which environmental education could enter schools, and school curriculum in Iran using whole school approach in organisational principles, operational principles and physical surroundings of school. Sharma (2016) suggests the same in the Indian context through a case study of two green schools. However, she observed that green practices lack a holistic vision and hence reflect a poor understanding of the Education for Sustainable Development (ESD) among different stakeholders in school education. A case study by Schelley et al. (2012) of a US public high school illustrates that charismatic and role model leaders, and effective communication among multiple aspects of modeling helps to create synergistic relationship between conservation efforts and EE.

b. Integrated Approach

A few studies have examined the effectiveness of integrated approach in implementing EE in schools. Sharma (2009) highlights the scope and issues of Environmental Education for the approaches of infusion, integration and a separate subject against the nature of EE for the multidisciplinary and interdisciplinary aspects. Sharma (2013) through examples in language and mathematics demonstrated how integrated approach to EVS in early grades can help address the curriculum load without compromising with environmental concerns as mandated under NCF, 2005. Sharma and Devi (2012) observed that Kendriya Vidyalaya primary teachers teaching early grades believe that integrated approach can address the curriculum load and help children learn EE better. Studies (Beth, 2008; Wammer et al., 2010) also observed that by integrating environmental focus to chemistry course the students gained knowledge of general chemistry and exhibited greater

concern for the environment. Schdmit's (2007) experimental study found that a separate introductory environmental course increased pro-environmental attitudes and behaviour of university students enrolled for it as compared to the students who were not enrolled.

c. Field Based Approach

A number of studies (Carrier, 2009; Paul, 2008; Farmer et al., 2007; Larson, 2010; Mehra and Kaur, 2012; Vaske and Katherine, 2001) support the idea that EE teaching-learning is effective in outdoor, natural and field-based open settings as compared to that in the conventional classroom situations. Mehra and Kaur (2012) found that teaching environmental education by outdoor programme enhanced responsible environmental behaviour of Class V students as compared to students taught by traditional method. Carrier (2009) observed significant gain in scores of primary students provided with outdoor EE lessons in schoolyard as compared to those in traditional classroom settings. Farmer et al. (2007) established that school field trips help children retain environmental knowledge gained and also build pro-environmental attitudes, behaviour and values among elementary students. The environmental education programmes conducted in local natural settings built an individual's emotional connect to a natural environment and helped them realise that their actions can make a positive difference in their own community which facilitates the development of environmentally responsible behaviour (Vaske and Ketherine, 2001). Mehrotra (2015) seeks involvement of community and creating public awareness to understand the local environmental problems and devise solutions accordingly.

d. Inquiry Approach

Joy (2005) states that scientific education about techniques and skills needed to protect the environment is crucial rather than merely creating environmental awareness and providing information about the same. The use of questioning in environmental science classrooms was effective in enhancing thinking skills among primary students (Dutta, 2002). Further, the inquiry based constructivist approach facilitates students better for developing understanding of environmental concepts, issues and concerns (Rajendran, 2012).

e. Settings and School Architecture

The studies establish that the school building and its architectural aspects play a significant role in EE teaching-learning, where students not only prefer an open plan setting but also enjoy their time in comparison to those who attended conventional classrooms. Gislason (2009) observes that a school with open plan architecture facilitates collaborative, multidisciplinary teaching practices suited to the environmental studies curriculum, and positively contribute to the social climate as it enables better peer interaction than would be possible in a more enclosed environment. Findings of Vaske and Katherine (2001) also support the same. Riordan and Klein (2010) established that professional development; immersion into real world tasks, inquiry based learning, ongoing support at school and connection to a broader world through authentic action are key aspects of Expeditionary Learning (EL) under environmentally sustainable school practices. However, lack of awareness and obstacles prevent teachers from employing outdoor field exploration methods (Paul, 2008). Eilam and Trop (2011) found that the EE/ESD programmes implemented in Israel school education elicited pro-environmental behavioural changes regardless of the differences in programmes of the four pedagogical essentials, namely 1) traditional academic style of teaching and learning: non natural learning 2) multidisciplinary learning (inter and/or cross disciplinary) 3) multidimensional learning and 4) emotional learning, were co implemented.

f. Going Beyond the Textbooks

In addition to field based experiences and organising teaching-learning in open settings, studies also advocate to go beyond the textbooks to help children connect and learn through their experiences in daily lives (Sharma, 2013). Using innovative approaches with focus on environment action within educational institutions deepens the understanding of environment and opens the minds of students that no bookish knowledge could do (Gopal et al., 2008). Lalam's (2008) experimental study on Class VII students in Andhra Pradesh endorses inculcation of environmental values through co-curricular activities. However, Kaur and Sharma (2016) hardly witnessed any efforts by the teachers in the classrooms to go beyond the textbook and observed that any activities beyond reading and writing were barely encouraged.

g. TLM and its Use

In their study, Kaur and Sharma (2016) found that the teachers felt that the textbooks lacked content, and opined that they contained only social messages. However, when asked, they could not even locate the social sensitivities embedded in the textbooks. Saini (2012) and Bokolia (2012) analysed the NCERT EVS books and found the teacher's role to be that of a facilitator, who needs to focus on the processes of learning to enable children to think, compare, classify, estimate, observe, hypothesise, debate, discuss, explore and engage in hands on activities and interact and communicate with the environment.

A variety of teaching-learning material besides textbooks has been found to be effective. Folk music and folk songs helped students to acquaint with their own culture and be sensitised for the environmental issues (Dey, 2014). Cartoon based learning material enhanced achievement of the students in environmental science in comparison to the traditional method of teaching (Aivazidis et al., 2006; Kaptan, 2001; Pillai, 2012). A similar trend was observed for student teachers (Shamsha, 2011), and the use of cartoon analysis task enabled them to think beyond the textual information that led them to think, discuss, question and observe during the entire session enabling their active participation in class.

Studies (Ramkumar, 2003; Sharma, 2005; Suneetha, 2000) that looked into the effectiveness of instructional packages in environmental studies found the packages to be effective in facilitating the teacher in enhancing teacher-pupil interactions for the acquisition of process skills and promoting better awareness and attitude towards environment besides increasing sensitivity among primary and upper primary students. Sandraanne (2007) established participation in the activities conducted during the environmental education programme led to development of connection, caring and concern for other species. Interventions lead to knowledge enhancement and have a desirable impact on students but that should be of short duration and must be accompanied with appropriate training (Sampath and Sundaramoorthy, 2014). However, Kaur and Sharma (2016) did not find usage of any material except blackboard and chalk for teaching-learning of EVS in the primary classrooms. Bharucha (2005) recommended that materials other than the textbook be used for teaching-learning about the environment. Mehra and Kaur (2012) recommend using outdoor programmes for environmental education especially

during primary stage as young children are active learners and they learn best using hands-on and through interactive play and self-discovery. Dogra (2013) recommended that science teachers across the country should use observation, analysis, interpretation, explanation and finally making broader generalisations in their classroom pedagogy to provide every student with optimal learning environment. Domka (2004) sought improvement in pedagogical approaches in EE in Poland.

Overall, the studies advocate adoption of a variety of pedagogical approaches that encourage students to use different resources beyond classroom that are located in their real life situations. However, for the school settings and architecture, more studies are required in the Indian context. Further, more studies on teacher perceptions and understandings of the EE curriculum and pedagogies can provide better insights for innovations in teaching-learning.

Awareness and Attitude of Teachers and Teacher Educators

Environmental awareness and attitude of teachers have a direct bearing on their teaching-learning practices thus influencing the development of awareness and attitude among the students. Pro-active teachers with good awareness and a positive environmental attitude can guide and motivate their students into the right direction with regard to protection and conservation of the environment.

Studies, however, show low environmental awareness and understanding of the related issues among majority of teachers and teacher educators in India and abroad (Bhumika, 2013; Rosaline, 2008; Sharma, 2011). Dola (2008) found that although pre-service teacher trainees were highly aware of the environmental problems they lacked a clear understanding of the related issues. Barthwal and Mathur (2012) reported average to moderate level of awareness among Ladakh school teachers about local biodiversity, wildlife and conservation. Khalid (2001) found that majority of pre-service elementary teachers had an array of incorrect notions about the nature, causes and effects of ozone depletion, acid rain and greenhouse effect. In spite of the lack of necessary subject knowledge, the pre-service teachers enrolled for a course in Turkey were not only willing to integrate environmental issues into their teaching practice but also exhibited high sensitivity for environmental protection. However, Kumar (2015) observed

a good understanding of environmental awareness amongst the pre-service graduate teachers.

In contrast to awareness, the environmental attitude exhibited was observed quite favorable as indicated by different studies for both the teachers (both pre-service and in-service) and the teacher educators (Barthwal and Mathur, 2012; Indu and Suryalatha, 2008; Radha, 2005). Shobeiri (2005) even mentioned that Indian teachers were having higher environmental attitude than Iranian teachers.

Large number of studies (Kumar, 2015; Sharma, 2014; Rosaline, 2008) reported gender based variation in environmental awareness among pre-service teachers (Bhumika, 2013; Dhillon and Sandhu, 2005). Sharma (2014) showed that the environmental awareness of pre-service teachers was moderately positive in case of males and slightly positive for females. On the contrary, Kumar (2015) supported female teachers having more environmental awareness than the male counterparts in all the four domains (knowledge, attitude, skill and behaviour) of environment. Regarding environmental attitude, two studies reported contrasting results. While Shobeiri (2005) observed female teachers showing better environmental attitude than male teachers in both India and Iran, Shaila (2003) found no significant difference in the environmental attitude of male and female secondary school teachers in Bangalore.

A careful analysis of the studies shows that teachers are at different levels of awareness, which vary according to their educational and socio-economic background. The following paras show the differences in the level of awareness.

a. Government versus Private Schools

Few studies have made attempts to identify the extent of environmental awareness among the government and private school teachers. Sharma (2011) found that majority of both government and private secondary school teachers had a limited understanding of environmental education with little clarity on the significance and role of environmental education. In contrast, Dinakara (2000) reported that the private elementary school teachers of Mysuru district were significantly better than government school teachers in their environmental awareness. In another study (Katoch and Kumari, 2010), it was found that private school teachers have better environmental attitude than government school teachers.

Sharma (2014) reported that gender had an effect on environmental awareness and emotional intelligence. It showed

that the environmental awareness of male and female pre-service teachers was found to be slightly positive but not significantly correlated with emotional intelligence. The environmental awareness of male in-service teachers was found to be moderately positive and significantly correlated with their emotional intelligence. On the other hand, the environmental awareness of in-service female teachers was found to be slightly positive but not significantly correlated with their emotional intelligence.

b. Educational Qualification and Locality

Indu and Suryalatha (2008) observed that background or the educational qualification did not contribute significantly towards the knowledge scores on environmental awareness of the student teachers. Katoch and Kumari (2010) mentioned that higher education helps in developing awareness of teachers positively towards environment. Studies comparing the environmental awareness of teachers on the basis of their educational qualifications, such as B.Ed. students with D.T.Ed. students (Lalitha, 2008) and postgraduate teachers against graduate teachers (Kumar, 2015) confirm that teachers with higher education show better environmental awareness. Similar results have been reported with respect to the environmental attitude of teachers in India and Iran (Katoch and Kumari, 2010; Shobeiri, 2005).

Teachers from science stream have higher levels of environmental awareness and attitude and are more competent to teach EE in comparison to social science, arts, commerce and language teachers (Bhumika, 2013; Dhillon and Sandhu, 2005; Kumar, 2015; Lalitha, 2008; Paul, 2008; Radha, 2005; Rosaline, 2008; Shobeiri, 2005). The trend was valid for both pre-service and in service teachers. Paul (2008) and Shobeiri (2005) reflected the international scenario in the contexts of America and Iran respectively. Studies by Bhumika, (2013) and Kumar (2015) observed the environmental awareness of pre-service teachers from science, commerce and arts streams in declining order with those from arts stream at the minimum level. Shaila (2003) found no significant difference in the environmental attitude of science and arts school teachers at secondary level. Indu and Suryalatha (2008) observed the physical science student teachers to have a favorable attitude towards environmental protection in comparison to their life science counterparts.

c. Urban/Rural Background

Highlighting that residential background affects the environmental education awareness of the school teachers, the research studies (Dinakara, 2000; Dhillon and Sandhu, 2005; Katoch and Kumari, 2010; Rosaline, 2008) reported that the urban teachers were more environmentally aware than their rural counterparts. Katoch and Kumari (2010) concluded that the performance of teachers in private schools was better due to greater accountability, monitoring and adopting measures for discipline and reward. In the context of the US, Desjean-Perrotta et al. (2008) revealed that the pre-service teachers did not possess the knowledge required to be environmentally literate. However, the ethnicity and their residential background did not have a significant effect on their environmental perceptions.

As regards environmental attitude, the findings are inconclusive. While a few studies (Dinakara, 2000; Shaila, 2003) found no significant difference in the environmental attitude of rural and urban secondary school teachers, Katoch and Kumari (2010) not only found that urban school teachers have better environmental attitude than rural school teachers but also appeared to be more concerned about the protection and conservation of environment. The marital status (Shaila, 2003) and type of school management (Shobeiri, 2005) had no influence on environmental attitude of teachers. It has been further reported that age and length of experience had no influence on environmental attitude of teachers of Iran and India (Shobeiri, 2005). Dola (2008) found that participation of pre-service teacher trainees to solve environmental problems was very low.

Teacher Development

In order to understand the lack of environmental awareness and understanding of related issues predominantly among teachers, it is crucial to look into different aspects of teacher education. In this context, the curriculum and training assume greater significance. The gaps in any of these two are responsible for ineffective implementation of EE in schools.

i. Teacher Education Curriculum

Only a few studies focused on teacher education curriculum but these provided some valuable insights that can have significant implications for the policy, planning and implementation of EE.

Poor understanding of teachers about EE confirm Jaiswal's (2006) observation that very few primary teachers teaching environmental science had studied environmental education in their pre-service education of B.Ed. This draws attention towards addressing the issue of EE in teacher education curriculum. Nemati (2008) also highlights the dearth of quality curriculum in EE and also mentions that nature of EE curriculum may vary at different levels as per the contexts, nature of subject and available resources.

Prachi (2011) substantiates the integrated approach to EE by showing the enhanced awareness of pre-service science teachers on environmental issues when they were trained on a programme on teaching of chemistry integrated with EE. Tali (2010) observed similar trend when pre-service teachers' from Israel were trained on EE through a separate programme and not through an integrated or infused approach. It also observed substantial improvement in environmental awareness with mild change towards pro-environmental behaviour after the teachers underwent a three-year course in environment. Mehrotra (2015) states that EE requires creative teachers who can go across disciplines and specialised courses while teaching sustainability. Gupta (2005) concludes that transformational educators can make the concept of ESD become a reality. Such educators can see beyond, think beyond and act beyond and are not mere preachers but true followers and promoters of ESD. They imbibe ESD in their daily lives and reflect it in their teaching approach.

ii. Teacher Qualification and Experience

Besides curriculum, teacher qualification, subject background and in-service professional development are very important. According to Jaiswal (2006) most of the primary teachers of environmental science had minimum academic qualification or professional training to be a teacher and only very few teachers studied environmental education in their pre-service education at B.Ed. Majority of the teachers had undergone in-service education in environmental science and most of them had their training in the methodologies of curriculum transaction of environmental science. A similar trend was reported in the NCERT reports (2011–12, 2012–13 and 2013–14) on monitoring the EE implementation in States and UTs in India. As per these reports, 60% of teachers reported that they were well versed with skills required to transact environment related activities and about 48% agreed that they have received

training. However, many teachers from different States and UTs expressed the need for special training on EE. Most of the primary teachers taught other subjects, in addition to environmental science (Jaiswal, 2006). The teachers with science background were more competent in teaching EVS at primary grades than the teachers from language or other subject backgrounds.

iii. Curricular Materials and Classroom Transaction on EE in Teacher Education

In a study, Kaur and Sharma (2016) focused in depth on classroom teaching-learning of EVS at the primary level. They reported that classroom teaching-learning was restricted to reading out the text by the teacher or students and teachers explaining its literal meaning. There were hardly any efforts to go beyond the textbook and activities beyond reading and writing. The classroom environment was primarily teacher-centric and children had rare opportunities to ask questions. Further, no usage of any material except blackboard and chalk was witnessed. It also found that teachers hardly carried out planning and preparation for the transaction of the textbook chapters and lack of motivation for the same was apparent among them. Pedagogic practices of primary school teachers are affected by their knowledge of EVS subject. Jaiswal (2006) highlighted that large number of primary teachers referred to newspapers, books, and encyclopedia of school library, magazines, and television to update their knowledge of environmental science.

The study on curricular intentions, classroom transaction of contemporary EVS textbooks of the NCERT by Kaur and Sharma (2016) gathered the opinion of experts and textbook writers who highlighted that the textbooks included finely nuanced understandings for building sensitivities for various social and environmental issues, development of the scientific temper among learners and contextualising the learning opportunities. However, when asked, the teachers were unable to locate the social sensitivities embedded in the textbooks. They felt that the textbooks lacked content and contained only social messages. The teachers across schools were not found working on building sensitivities for various social and environmental issues, and the development of the scientific temper. In another study (Jaiswal, 2006) on Gujarat State Education Board (GSEB) environmental science textbooks, it was observed that most of the teachers were satisfied and with the textbooks. However, few teachers opined that

the content of the textbook of environmental science of Class IV was not meaningful and relevant to the present context and it lacked sufficient information, explanation, illustration. According to Kaur and Sharma (2016) almost all teachers expressed a concern for the large syllabus and lengthy chapters in NCERT EVS textbooks, which needs to be carefully considered and appropriately addressed.

iv. Teacher Training

Patel (2007) found that teachers have clarity about the objectives and accordingly they prepared themselves in advance for attending in-service training programmes. Teachers felt that time and duration for in-service training programmes was adequate for the attainment of objectives of the programmes and in-service training programmes were able to cope with emerging trends of education. Rajendran (2012) found that pre-service teachers trained through constructivist approach were found to facilitate their students better for developing understanding of environmental concepts, issues and concerns. Another study (Sampath and Sundaramoorthy, 2014) reported desirable impact of interventions on elementary teachers and recorded their knowledge enhancement. Parasnis and Bahulikar (2005) found the teaching material (modules, CDs and transparencies) were effective in generating interest and interaction among student teachers. A few EE teacher educators integrate learning technologies into their instructional ventures to enhance cognition and learning. Concern has also been raised that technology might have negative consequences on student connection to the natural environment (Peffer, Bodzin and Smith, 2013). Riordan and Klein (2010) observed that environmentally sustainable school practices through Expeditionary Learning (EL) provide teachers' professional development to promote environmental education aiming to impact student experience and work.

A number of factors facilitate teachers to adopt pro-environmental behaviours (Pruneau, 2006). Included among the factors are participation in a community of change, construction of knowledge of climate change, a solo activity in nature, and a continuum of values. Organisational skills, personal advantages, and ease of chosen actions were also noted as facilitating factors. Limiting factors included lack of time and lack of awareness of people around them and the difficulty of affirming one's differences. Shamsha (2011) found that the use of cartoons to evaluate the

environmental concepts enabled active participation of student teachers by making them think beyond the textual information, discuss, question and observe during the entire session. About 95 per cent of the student teachers opined that the cartoon analysis task helped them to think creatively about the situations and begin the process of restructuring their understanding. Bharucha (2005) suggests that initiatives may be adopted in India to enable teachers to use materials other than the textbooks for teaching-learning of the environmental aspects.

There is a need for undertaking intensive pre-service and in-service environmental education programmes to spread conservation awareness (Barthwal and Mathur, 2012), and thus strengthening the teacher education programmes. Studies (Kaur and Sharma, 2016; Rosaline, 2008) call for reorienting the pre-service and in-service programmes with scope for knowledge updation of teachers, encourage them to undertake planning, preparation and sharing of knowledge for teaching-learning. They further state that mechanisms need to be evolved that could encourage and empower teachers to transact the EVS textbooks meaningfully which requires building their understanding on learner centric pedagogy, besides addressing their concerns carefully and appropriately for the curriculum, syllabus and textbooks. Sharma and Devi (2012) recommended steps to build capacity of teachers to understand integrated approach and design appropriate learning tasks through appropriate pre-service and in-service teacher education curriculum, teaching-learning material and training. Besides introduction of EVS as an additional subject to science and social science at the primary level, Kaur and Sharma (2016) mention it as a major systemic issue that needs to be addressed.

According to Sampath and Sundaramoorthy (2014), knowledge enhancement of EE among teachers can be achieved in short durations with appropriate training, but transformation of knowledge into right attitudes, values and behaviour is a long process and requires sustained interventions. It is in consonance with Tali (2010), who recommends prolonged and sustained efforts towards EE to bring the desirable changes in environmental behaviour of pre-service teachers' of Israel.

Policy and Systemic Issues

In order to understand all aspects of planning and implementation, it is crucial to look into the policies that help shape ideas and also

give direction. The studies on policy dimensions provide evidences to concertise these ideas that help to introduce, replicate or scale up the micro level curricular reforms to macro level and design or reframe the policies. This section includes studies that look into the implementation aspects of EE.

i. Policy Issues

The preceding sections indicate a limited understanding of EE with regard to teaching-learning approach, teacher development and curriculum transaction. Sharma's (2015–16) study points towards scattered efforts being done under Education for Sustainable Development which lack a cohesive and holistic vision and coordination among different agencies and stakeholders, and thus being ineffective at the ground level. It demands adopting appropriate measures at the policy level, planning and implementation levels and also ensuring better coordination among different agencies that deal with ESD. Singh (2008) emphasises on proper communication amongst the policy makers especially between the Centre and the State, and coordination among their agencies to enhance community participation in the decision-making process with regard to EE. Strife (2010) concludes that given the proliferating sustainability movement with emphasis on relocalising individual and community behaviour, EE may have a special place in localising education by teaching for local environments and people, and accordingly, we need to rethink the way EE discourse frames education and the approach we use to achieve a more environmentally engaged and active citizenry. Jerath (2005) recommends that better understanding of environmental issues needs to be promoted through appropriate curriculum modifications and also that UNESCO like organisations develop policy guidelines and standardised core curriculum, to ensure uniformity internationally. Examining the role of ESD, Pant (2005) points out that while EE can be envisaged as formal and informal education, the latter is more relevant to ESD. Batra (2005) seeks to locate the agency of the school teacher in the process of curriculum design and development, policy perspectives and teacher education practices and envisions transformation of teacher education in India. It cautions that radical change in the school curriculum under NCF–2005 can do little to alter educational processes and outcomes in Indian classrooms without changing the central reality of teachers.

A few studies have focused towards the policy issues on introduction of EE, especially in the early stages. Emphasising the approaches of infusion, integration or as a separate subject at different levels for EE in school education. Sharma (2009) highlights the scope, issues and policy dimensions of environmental education for multidisciplinary and interdisciplinary aspects. The multidisciplinary aspect and integrated approach to EE is further validated through examples of integration of environmental component with language and mathematics (Sharma, 2013), where it shows how the issue of curriculum load can be addressed without compromising environmental concerns as mandated under NCF–2005 and the *National Policy on Education.* As per the NCERT studies (2011–12, 2012–13 and 2013–14) on monitoring of EE implementation, the State representatives on EE reported that EE is implemented in an infused model across India and a maximum of two periods (30–35 minutes each) are allotted per week to environmental activities in schools all over India. Overall the studies recommend synchronous, comprehensive and holistic efforts for involvement and coordination amongst multiple agencies and stakeholders in school education for policy framing and its implementation. However, studies in this area are lacking.

ii. Role of Agencies

a. Non-governmental Sector and Community

Spreading awareness about the environment and making efforts to improve the same requires multi-pronged efforts by multiple stakeholders wherein public participation through non-governmental sector and other initiatives are equally important. However, this requires effective coordination and networking with different agencies such as motivated and dedicated voluntary organisations (Agarwal, 2008). Volunteers and educators who work in or with schools and other educational institutions can have a tremendous impact from increasing awareness and knowledge, to helping them form attitudes and facilitate action projects on environment.

Many studies advocate for adoption of effective measures at policy, planning and implementation levels and also ensuring better coordination among different agencies that deal with ESD (Agarwal, 2008; Batra, 2005; Sharma, 2015–16; Singh, 2008). Attempts (Preetna, 2000; Shukla, 2005; Srivastava and Paliwal,

2013) have been made to document good practices by some agencies, especially the NGOs, for their proactive role towards raising awareness, spreading environmental education and work for environment protection by involving the public at large in various EE activities. Considering non-governmental organisations as influential tool for accomplishment of the goals of ESD, Agarwal (2008) highlights the increase in size and number of NGOs and discusses their role in promoting EE especially in the areas where the state has not reached or its presence is inadequate. Srivastava and Paliwal (2013) observed that the NGOs help to build a symbiotic relationship between the environment and the society through a holistic approach. Singh (2008) examined the evolution of the symbiotic relationship between the indigenous community and conservation of the environment and suggests creating awareness through environment education for enhancing community participation. However, Joy (2005) recommends going beyond creating awareness and giving information and offering scientific education for inculcating techniques and skills which are needed to protect the environment. Shukla (2005) suggests that socially critical EE will be more useful as approaches like biodiversity contests, and community-based plant diversity register, as implemented by environmental NGOs and local communities do help to create a platform to remove constraints in establishing effective communication with the underprivileged and disadvantaged groups of children, women and tribal communities.

Analysing the goals and broad objectives of seven non-governmental organisations in the field of environmental education, Preetna (2000) found that improvement of the prevailing environment in the city through initiatives focused on school children was a common element among all. Citing the success of Eco-club partnership programmes of schools with non-governmental organisations, Roberts (2009) recommends directing different agencies to work cohesively towards programme success, clarifying the future vision of National Green Corps (NGC) programme and addressing existing operational shortcomings.

b. Government and Corporate Sector

Envisaging the role of the institutions of higher education for EE, Singh (2005) suggests universities to take a lead to frame suitable initiatives in the area of EE. Khan (2013) assessed the functioning of various organisations associated with preservation

and restoration of environment and found that socio-economic factors such as demographic change, social change, gender and divisions of labour, health, education, knowledge and information, poverty, economic change and technological change have a positive impact on environmental management. Ardoin and Bowers (2012) investigated the role of US based foundations, which are one of the largest sources of support for environmental efforts. It found reasons behind the paucity of EE funding and concluded that despite public support, environmental education (EE) is rarely a priority for funders. Causes for the low level of EE support included definitional complexity, uncertainty about efficacy, and inclusion of EE funding within issue-specific grants, such as those focused on climate change. Hannam (2010) examined the role of a government agency, i.e., the Indian Forest Service in environmental management in India, and found that it has responded well to the key challenges, namely economic liberalisation; political manipulation and corruption; social changes and their impact on recruitment on the Indian Forest Service in the last 20 years. It concluded that in spite of these challenges, the Indian Forest Service is remarkably resilient and remains the most powerful agent in rural India.

Environmental Education thus requires coordinated and cooperative efforts amongst various agencies such as the government and its institutions, NGOs, Corporate Sector Organisations (CSOs), donors and foundations, schools and the community. It also indicates overlapping and intersection of various variables like those of social, cultural, demographic, economic, and political factors. Undoubtedly, NGOs are playing a positive role in terms of EE and ESD but more surveys and studies of critical nature are needed to arrive at a holistic view.

Epilogue

The preceding discussion clearly indicates that a large number of quantitative studies across disciplines, not just in India but across the globe, have investigated only children's knowledge and attitudes towards environmental problems. Only a few studies examined children's feelings and even fewer focused on children's point of view. Many studies investigated environmental awareness and attitude of students and teachers. Most of them focused on students from high school onwards. There is a correlation between environmental awareness and attitude, and further the environmental attitude has been found to correlate with behaviour. However, a direct

correlation between environmental knowledge and behaviour has not been observed. It may be concluded that environmental awareness enhances with age as children mature developmentally from high to higher secondary stages in schools and later towards the stage of higher education. Children from private schools were found to be better aware than those from the government schools. Although, with regard to gender there were mixed findings as more studies were in favour of boys showing better awareness than girls. One study mentions that adult interaction greatly influences environmental attitude and behavioural formation. There are studies that attempted to find the effect of factors such as religion, parents' qualification, family size, background, etc., and found no significant impact of these variables on environmental awareness among the students. There were contrary findings with respect to the subject background (science versus non-science). However, there was no difference in awareness of students from central schools and other schools. Students from India and Iran did not differ as regards their environmental attitude. At the international level, children expressed apocalyptic and pessimistic feelings about the future state of the planet. The ecophobia prevalent among children may have serious implications for their participation in environmental stewardship and conservation efforts.

The EE is implemented as an infused model across India and a maximum of one hour per week is allotted to environmental activities in schools. There were mixed opinions towards integrated approach to EE curriculum with some in favour and others against it. Gaps in EE curriculum of some states and their deviation from that given by NCERT at the national level have been pointed out. An unsatisfactory state of EE curriculum was also witnessed by some studies in Poland and New Zealand besides EE curriculum of technical vocational education of many other countries like China, Malaysia, Indonesia, and Philippians including India. Indian curriculum was found to be inferior to that of Finland regarding EE component. A pragmatic utilitarian concern for environment, focus on traditional disciplinary knowledge and the government influence on prioritisation of economic development over environment are the key themes to shape the environmental curriculum. Many studies analysed the NCERT textbooks at different levels for EE and found them in consonance with the EE principles. In spite of the textbooks reflecting EE, the teachers are unable to transact them in the desired manner. Except Delhi and

Rajasthan, the studies analysing the state textbooks observed gaps for environmental component in the textbooks. Schools performed well on the indicators of drinking water availability and cleanliness of compound, performed average on light and ventilation and availability of toilets, and poorly on waste disposal and hand wash. Majority of schools were overcrowded.

Teachers had a limited understanding of EE and similar trends are visible in US schools although many of them admitted to have studied EE. Some studies show that subject specialisation affects teacher competency on EE and teachers with science background are better at it. Most of the teachers across government and private schools use conventional teacher centric modes in their classroom with hardly any attempt to use activity, project or any other innovative ways of teaching-learning. Transformational educators, who think beyond and act beyond and who are not mere preachers but true followers and promoters of ESD, who imbibed ESD into their daily lives, which is reflected in their teaching approach and style can make the concept of ESD become a reality. Teachers who go across disciplines and teach in an interdisciplinary manner are role models of ESD practices. Few EE teacher educators integrate learning technologies into their instructional venues to enhance cognition and learning as there was concern that technology might have negative consequences on student connection to the natural environment. Participation in a community of change, construction of knowledge of climate change, activity in nature, and a continuum of values are factors that facilitate teachers to adopt environmental behaviours.

The studies support holistic approach when teaching-learning goes beyond the textbooks and occurs in open and in real life settings using integrated or multidisciplinary approach to EE curriculum. It enhances pro-environmental attitude and behaviour as it helps build emotional connect with environment, besides facilitating knowledge retention. In addition, the inquiry approach facilitates development of skills especially thinking skills. A variety of TLM other than textbooks such as cartoon based package comics, multimedia packages, etc., were found to be effective for enhancing environmental understanding and sensitivity. However, the teachers are found to be using only traditional modes of teaching-learning. A study highlighted a link between understanding of the subject and pedagogic practices adopted by teacher.

A large number of studies mapped the awareness and attitude of teachers but very few studies focused on teacher educators. Largely the studies report a lack of environmental awareness and related issues among majority of teachers and teacher educators. The studies also mention the misconceptions about the environment and related issues and problems. The environmental attitude, however, has been found quite favourable in a number of studies, which include both pre-service and in-service teachers. Studies also depict gender-based variation in environmental awareness and attitude of the teachers. There is a trend of higher environmental awareness among teachers with increasing level of education, which has also been observed for teachers in countries other than India. Some studies comparing the awareness in EE, based on the residential background, age, length of experience and type of school management observed that there was no variation based on any of these variable except that the teachers from urban background reported to be better placed as compared to those from rural areas. The studies show that it takes prolonged and sustained efforts for changing the environmental behaviour in contrast to environmental awareness and attitude.

The studies indicate lack of quality teacher education curriculum with regard to EE and call attention to its adaptation as per the context, nature of subject and available resources and implementation. Very few primary teachers teaching EVS studied environmental education in their pre-service education at B.Ed. Most of the studies demand reorientation of both pre-service and in-service teacher education programmes in the country. Some seek active involvement of teachers in teacher education curriculum design. The studies indicate that poor teacher preparation for EE both at the pre-service and in-service trainings needs to be addressed. The lack of experience and training of teachers for EE are some of the major reasons for its ineffective implementation.

Further, teachers trained through constructivist approach were found to facilitate their students better for developing understanding of environmental concepts, issues and concerns. The classroom teaching-learning is highly teacher-centered as conventional approaches of reading out the text or using chalk and blackboard are witnessed. Although teachers expressed their interest there is lack of planning and preparation by teachers for teaching-learning under EE. Teachers did not have the pedagogical understanding of EE. The teachers from some states even had

concerns with the load of syllabus and text. The studies reflected contrasting findings for the availability and use of resources for EE. The studies reported a positive impact of TLM other than textbooks on knowledge enhancement under EE, and suggested strengthening the teacher education programmes at the national and state level to build the capacity of teachers for development and use of TLM.

Studies point out the lack of vision and seek adoption of effective measures at policy, planning and implementation levels for better coordination among different agencies and stakeholders that deal with ESD. Emphasis on EE is needed right from the early stages at both national and international levels, and the studies demand transforming the teacher education while executing any radical reforms in school education. Some studies attribute ineffective EE implementation to adopting methodologies used in other countries without giving a careful thought to contextualisation. Almost all the studies either recommend for adopting the whole school approach to EE or adopting the approach of infusion or integration thus highlighting the multidisciplinary and the interdisciplinary approach. Overall, the studies recommend synchronous, comprehensive and holistic efforts for involvement and coordination amongst multiple agencies and stakeholders in school education for policy framing and its implementation. However, studies are lacking in this area.

The research is mainly focused on mapping environmental awareness and attitude of teachers and students. Although there are studies that analysed the school education and teacher education curricula in India and even compared it with the curricula of other countries, more work needs to be done to arrive at precise conclusions. The systemic issues and role of other agencies also need to be studied besides understanding the classroom practices and processes qualitatively in order to suggest policy reform measures. Though suggestions for a teacher education reform are witnessed, however, systematic and empirical studies in this direction can suggest some concrete and workable solutions. Overall, environmental education is such a crucial component and needs immediate attention of the research fraternity to come up with tangible suggestions for the policy planners, implementers and the beneficiaries for accomplishment of the Sustainable Development Goals.

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