ENVIRONMENTAL EDUCATION IN INDIA: ANALYSIS OF NATIONAL CURRICULUM AND PEDAGOGICAL APPROACHES

by

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ABSTRACT

India, being a fast-growing major world economy and home to one-sixth of the world's population, has a significant impact on the consumption of natural resources. As a result, it produces a huge amount of carbon emissions even though per capita emissions are low in the country. Hence, it is very important that current and future Indian generations not only understand the value of sustainable development but also incorporate it into their daily life. Education has a key role in developing that understanding and, therefore, it becomes important that pedagogical approaches commonly employed in Indian schools align well with the country's development agenda and its sustainability goals.

The curriculum documents are important in providing direction to the teaching practices and guiding educators to provide students with the best learning opportunities. This study examines the position of SDGs within the Indian environmental education curriculum and effective pedagogical approaches that enhance understanding in young minds and help enable them to follow and adopt the path of sustainable development. The study involves a two-stage evaluation design involving document analysis and critical literature review. Findings of the study reveal that the EE curriculum consists of concepts that provide knowledge about some SDGs at the elementary level, however, several SDGs are not well represented in the curriculum. The concept of sustainable development needs to be more deeply placed within the curriculum.

Findings from the analysis of the literature review show that EE is implemented through three pedagogical approaches: infusion, separate subject, and extra-curricular activities in Indian schools. It is also clear from the findings that many Indian scholars believe that schools in India should adopt EE pedagogical approaches that involve practical, experiential, and activity-based

learning as these are successful in helping students to develop pro-environmental attitudes, behaviours, understanding, and skills. Scholars also believe that courses offering knowledge about local issues, the presence of eco-clubs and support from environmental NGO's also significantly improve the learning experience of students. It is also emphasized by scholars that use of multi-media and social media technologies can bring more fruitful results in EE by making learning easily comprehensible, effective, efficient, resourceful, applicable, and economical.

However, research findings from the analysis of the curriculum demonstrate that teaching about climate action needs to be stronger within the Indian school curriculum. Pedagogical approaches and effective practices that improve the learning experience of students about sustainability and climate solutions should be encouraged through EE in Indian schools. More theoretical pedagogical approaches are being currently used in EE than practical approaches in schools across Indian. Therefore, this gap must be filled through providing more experiential learning opportunities to the students.

FOREWORD

This major paper is being submitted to partially fulfil MES degree requirements. My Major Paper is the final element of my Plan of Study where I explore in detail three components of my area of concentration: Environmental Education, Sustainable Development, and Climate Change. My area of concentration has allowed me to have an in-depth understanding of environmental education, sustainable development, and climate change and how deeply they are inter-connected. My major paper explores the approach of Environmental Education curriculum in India towards providing sustainable development-related knowledge and fostering understanding of climate solutions in schools.

My previous experience of working with schools in India on the implementation of environmental and climate change education programs is the inspiration behind my selection of Indian curriculum as the focus of my major paper. My decision to explore the existing environmental education curriculum in India has emerged as a natural extension of my interests and passions in school education, environmental issues, climate change solutions and education for sustainable development. I hope that through my research I will be able to bring a better understanding amongst educators and planners about the focus on sustainable development in the existing EE curriculum in India.

My MES graduate coursework, field experiences, and research have focused on integrating my understanding of environmental education, sustainable development, and climate change, which are the three components of my Plan of Study. I have fulfilled my learning objectives through coursework; field experiences; independent directed studies and research by exploring components of environmental education; pedagogical approaches in environmental education;

climate change issues & solutions and effective pedagogical approaches for sustainable development.

Environmental Education plays a key role in providing knowledge & understanding of sustainable development as well as climate change issues and their solutions. It is the focus area of my 'Plan of Study' and 'Major Paper'. Hence, it fulfils my requirement for the Diploma in Environmental/ Sustainability Education.

ACKNOWLEDGEMENT

My research work and paper are dedicated to the cause of efforts being made all over the world towards creating awareness about gradual environmental degradation and exploring scientific ways & means to not only check but also seek reversal of this disastrous trend so that this terra firma, Mother Earth retains its congenial features for the harmonious living & growth of not only we human beings but the entire flora & fauna as well.

I have a deep feeling of gratitude towards all those persons, who have extended me all sort of assistance in conducting this research and preparation of my paper. To start with I express my sincere thanks to my Supervisor, Professor Don Dippo for his constant & consistent guidance starting proposal writing till the submission of my paper. I have no hesitation in saying that he, by sharing his extensive knowledge & experience in the field of Environment Education, was like a torchbearer to me.

I am equally thankful to my Advisor, Professor Jose Etcheverry for his unique skills in deciphering my aptitudes and extending unstinted co-operation in the pursuits of fields of my choice. In particular, I thank him for supporting and motivating me to conduct an independent study about Environmental Education in India, where the path leading towards my research was clearer.

Finally, not the least I am obliged to my colleagues in the faculty and above all the University campus as a whole, where I got a very congenial atmosphere for interacting with others and passionately pursuing my studies.

Back home, I am thankful to my husband, little daughter & other family members for their encouragement and keeping my spirits high in the pursuance of very meaningful & useful studies.

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LIST OF ABBREVIATIONS

AHPL – Art of Healthy & Productive Living

CBSE - Centra Board of Secondary Education

CEE - Centre for Environment Education

CISCE - Council for the Indian School Certificate Examinations

EE - Environmental Education

ESD - Education for Sustainable Development

MHRD - Ministry of Human Resource and Development

MoEFCC- Ministry of Environment, Forests & Climate Change

NCERT - National Council for Educational Research and Training

NCF-2005 – National Curriculum Framework-2005

NGC - National Green Corps

NPE – National Policy on Education

PM – Paryavaran Mitra

SDGs - Sustainable Development Goals

UN - United Nations

UNESCO - United Nations Educational, Scientific and Cultural Organisation

US – United States

UT – Union Territory

Chapter 1

INTRODUCTION

Development of the education system in the post-independence era in India

After the independence of India in 1947, the Government of India appointed the following three important Commissions focusing on educational reforms in the country.

1. **University Education Commission (1948-49) –** also known as Radhakrishnan Commission in 1948, it was the first committee established in independent India to report about the status of Indian universities and provide suggestions for improving university education which could cater needs of the future.

   This Commission made valuable recommendations about the restructuring of the existing courses; emphasized on training and research; development of higher education in rural areas; upgrading evaluation techniques; appointment of teachers; improvement in media of instruction and better student services (Modern Education, n.d.; Education -The post-independence period in India, 2019; "Indian Education System After Independence | Latest Education Articles," 2017).

2. **Secondary Education Commission (1952–53) –** this Commission was popularly known as Mudaliar Commission and focused mainly on secondary and teacher education. The Commission played a very significant role in the development of secondary education in Independent India. It stressed on the need to provide training on a democratic way of life to the Indian students. The major recommendations of this Commission were to develop a sense of democratic citizenship in students; personality development; education for

leadership development; improvement of vocational capability and efficiency, the concept of world citizenship ("Indian Education System After Independence | Latest Education Articles," 2017; Secondary Education Commission(1952-53)—WikiEducator, n.d.)

3. **Education Commission (1964–66)** – also known as Kothari Commission, it was set up by the Government of India to make a comprehensive review of all aspects of the education sector in India. This Commission provided advice to the Government on guidelines and policies for the development of education at all stages in India. The recommendations of the Kothari commission included the following:

- equal opportunity for education for all people without discrimination

- education as the most powerful instrument in national development

- a new educational pattern of 10+2+3

- introduction of work- experience in education

- promotion of science and technology at all levels of education

The Commission's report led to a resolution on a national policy for education, formally issued by the government of India in July 1968 (Bapna & Sharma, 2015).

National Policy on Education (NPE) - Based on the report and recommendations of the Kothari Commission (1964-1966), Government of India announced the first National Policy on Education in 1968 which aimed for "radical reconstruction" of education for cultural and economic development as well as for national integration. This policy covers education from the elementary level to the college level in both rural and urban India. All education boards in India like the CISCE and CBSE are based on this policy.

Some of the important features of NPE 1968 were:

- free and compulsory education for all children up to the age of 14

- status, emoluments, and education of teachers

- the development of languages

- education for agriculture and industry

- science education and research

- reform in the examination system

- part-time education and correspondence curriculum

- expansion of literacy and adult education

The second NPE came in 1986 which was further reviewed and modified in 1992. Recently, in 2019, the Ministry of Human Resource Development, Government of India released a Draft for the new Education Policy, 2019 for public consultation (Bapna & Sharma, 2015; National Policy on Education, 1968).

In 1961, the Government of India established the National Council of Educational Research and Training (NCERT) as an autonomous organization. The primary role of NCERT is to provide academic support to the Governments, both at Centre and States level. It is the academic adviser to the Ministry of Human Resource Development (MHRD) under the Government of India, who assists in the formulation and implementation of their policies for education, especially to bring about qualitative changes in school education and teacher training.

The current education system in India mainly comprises of primary (elementary) education, secondary education, senior secondary education, and higher education. Elementary education (grade 1-8) consists of eight years of education, whereas each of secondary (grade 9-10) and senior secondary education (grade 11-12) consists of two years of education. Higher education in India starts once the higher secondary education or the 12th standard is completed.

Environmental Education in India

History of Environmental Education

India is a land of diverse ecosystems such as terrestrial, grassland, mountains, forests, deserts, wetlands, estuaries, oceans, islands and is home to a rich variety of diversified flora and fauna. It strongly believes in protecting and promoting these ecosystems or environments as a whole and evidence about the same can be found in ancient traditional philosophy and classical Hindu texts. India is one of the countries that have shown deep respect for the natural elements since ancient times by strongly connecting them with religious beliefs and ideologies. The five elements of nature: Water, Earth, Fire, Sky and Air are known as 'panchabhutas' in Hindu philosophy and are considered the basis of all life forms (Rao, 2015).

More recently, India has come up with certain policies and actions to give a unified legal structure to the protection of the environment in the whole country. The Indian Forest Act 1927 was implemented in India before the independence and after independence, India came up with several important laws about environmental conservation and protection. However, international development and discussions focusing on environmental conservation and protection greatly influenced as well as encouraged India to initiate its emphasis on formal environmental education (EE) in the country (Fan, 2017). The United Nations Conference on Human Environment held in Stockholm (1972), which drew the attention of the world on environmental concerns, also helped in boosting the emergence of environmental education movements. It provided encouragement as well as recommended all the countries to recognise and promote EE (Alexandar, 2012).

The UN conference also had a major impact on the environmental movement in India as the motivation taken from it led to the adoption of the 42nd Amendment to the Constitution of India in

1976. Through this amendment, 'Environment' was made part of the Indian Constitution and environmental improvement and protection became a directive principle for the Government as well as a fundamental duty for all Indian citizens. India further developed its environmental strategy by creating the Ministry of Environment & Forests currently known as Ministry of Environment, Forests & Climate Change (MOEFCC) in 1985. This Ministry helped in boosting environmental education in the country by setting up centres of excellence for promoting EE since EE was recognised as an important component of India's overall environment and development strategy. The Centre for Environment Education (CEE) was established in 1984 and CPR Environmental Education Centre in 1988 with a focus on improving environmental awareness and consciousness in the country (Sarabhai, et.al., 1999).

Environmental Education in the formal education system

Further, EE became a widespread reality within the Indian education system in 1986 with the formulation of National Policy on Education (NPE 1986), by the Ministry of Human Resource Development (MHRD), which stated that "there is a paramount need to create a consciousness of the environment…. Environmental consciousness should inform teaching in schools and colleges. This aspect will be integrated into the entire educational process" (NEP, 1986: 8.15). The National Curriculum for Elementary and Secondary Education, 1988 was based on the recommendations of NPE 1986. The curriculum strongly suggested that EE was to be implemented through the "infusion" approach in schools. The subsequent curriculum frameworks brought out by NCERT also reiterate the significance of EE in the education system. NCERT has adopted different approaches in implementing EE at different levels of the education system: at the primary level 'Environment' is offered as a composite subject; at the middle and secondary school levels, EE is

imparted through infusion into the science, social science and language syllabi and at the higher secondary (+2) level, the syllabi of biology, chemistry, physics, geography, economics, sociology and political science have concepts related to environment and development incorporated into it (Chhokar and Chandrasekharan, 2006). This approach was based on the rationale that 'Environment' is not a separate entity rather it is deeply bonded with all the aspects of society and therefore tools from various disciplines are required to fully understand it (Fan, 2017).

Even though NPE 1986 greatly emphasised on the importance of EE, it was not taught as a compulsory subject in the formal education system until a significant and far-reaching event happened that enabled environmental education to be more deeply integrated into the formal education system in India (Chhokar and Chandrasekharan, 2006; Sonowal, 2009). In 1991, environmentalist M.C. Mehta filed a Civil Writ Petition on the need to make the people of India aware of the environmental issues and responsible citizens who are environmentally sensitive. To fulfil this purpose, it was argued environmental education be made compulsory in all schools and colleges in India (Fan, 2017; Iyengar and Bajaj, 2011). The court accepted in principle that environmental awareness and negative effects of environmental pollution should be demonstrated through the medium of education and taught as a compulsory subject (Kumar, 2013). The Supreme court directed that "We would require every State Government and every Education Board connected with education up to the matriculation stage or stage even up to intermediate colleges to immediately take steps to enforce compulsory education on the environment in a "graded way" (Chhokar and Chandrasekharan, 2006).

Environmental Education Curriculum-NCERT

After the landmark judgement, methods of imparting EE in schools did not resemble throughout the country as no specific structure or methodology was being adopted or agreed upon at the

national level (Sonowal, 2009). Further, in 2003 the Supreme Court made EE compulsory at all stages of education throughout the country and directed the National Council of Educational Research and Training (NCERT) to "prepare a Model Syllabus of Environmental Education (EE) for being implemented uniformly throughout the country" (Formal Environment Education, 2012; Kumar, 2016). After several discussions and debates held between various stakeholders which primarily focused on whether EE should be taught as a separate subject or infused into other subjects, NCERT explained that EE had to be included in the compulsory curriculum, but it was not necessary to make it a separate subject and therefore infusion approach would be followed to teach EE in schools (Iyengar and Bajaj, 2011; Kumar, 2016; NCERT, 2010).

In the year 2005, NCERT published the most recent National Curriculum Framework (NCF), which highlighted that for environmental validity of the science curriculum it is required that "science be placed in the wider context of the learner's environment, local and global, enabling him/her to appreciate the issues at the interface of science, technology & society and equipping him/her with the requisite knowledge and skills to enter the world of work" (NCF, 2005). In the 2005 NCF document, environmental issues were covered under both the life sciences and the social sciences and a more exclusive thrust area, "habitat and learning" was created which stressed on the need for EE to proceed towards sustainable development (Iyengar and Bajaj, 2011; Ravindranath, 2012). A more holistic model of Education for Sustainable Development was presented through NCF 2005, which promotes global citizenship as well addresses various environmental issues through the engagement of concepts such as judicious use of natural resources; socio-economic factors; local cultural perspectives; psycho-emotional influences; global and national peace and economic development (Iyengar and Bajaj, 2011). (Fan, 2017; Kumar, 2016) It was decided to implement EE in schools of India in the following manner:

i. **For classes I and II:** Through activities.

ii. **For classes III to V:** Taught through a subject "Environmental Studies".

iii. **For classes VI to X:** Infuse awareness of and sensitivity towards environment-related concerns into science, social studies, language, and other subjects wherever feasible.

iv. **For classes XI and XII:** Apart from infusing environmental content into as many elective subjects as feasible, environmental education will be a compulsory separate subject for all students irrespective of the stream, wherein they will be engaged into project-based activities.

NCERT develops frameworks which allow flexibility to the states in the implementation of curriculum, instead of providing instructions on what should be done in the classroom, the NCERT provides a structural framework which facilitates states in decision making (Dhankar, 2006; Iyengar and Bajaj, 2011). There are three options available to the states for complying with the guidelines of NCERT concerning EE curriculum; firstly, states may adopt the NCERT framework completely; secondly, states may develop their syllabus that addresses all the environmental issues and concerns specific to the state and lastly, states may provide a broad framework for EE to their schools and let the schools design their detailed syllabi as well as determine the pedagogical approach (Fan, 2017; Iyengar and Bajaj, 2011).

United Nations Sustainable Development Goals and their importance

As a next step to the Millennium Development Goals set in 2000, in September 2015, all the 193 Member States of United Nations adopted the 2030 Agenda for Sustainable Development where 17 Sustainable Development Goals (SDGs) are focused to save the planet; eradicate poverty and ensure prosperity and peace for everyone by 2030. (Annan-Diab and Molinari, 2017; United Nations, 2015). The SDGs demand an urgent action from all the countries through global

partnerships between developing and developed countries to deal with global issues such as poverty, inequality, health, climate change, sustainable consumption, innovation and importance of peace and justice (Annan-Diab and Molinari, 2017; *Sustainable Development Goals*, n.d.).

Figure 1: The Sustainable Development Goals (SDGs) (United Nations, n.d.)

The SDGs also referred as global goals are based on five 'areas of critical importance'; sometimes known as the 5 'P's - these are People, Planet, Prosperity, Peace and Partnerships and actions targeting these areas by all countries for all people are essential to meet the goals. Development and levelling up are the keys to measure advancement towards reaching the goals by 2030 as implied by the fundamental promise of the Agenda 2030 which states "Ensuring that no-one is left behind" (Morton et al., 2017). These goals are important from many perspectives; firstly, the goals are interconnected or linked to each other; progress towards one goal can help in achieving other goals as well, which is crucial in developing a framework or road-map to achieve these goals. Secondly, these goals are for everyone: governments, the private sector, civil society, and every

human being across the world and therefore everyone needs to contribute and do their bit to ensure that goals are reached (UNESCO, 2017).

As all the 193 Member States of United Nations adopted the SDGs and committed to working in the direction to achieve these goals by 2030, it is also interesting to understand that how these nations describe SDGs and their importance to the people of their respective country. There is a possibility that developed and developing nations undertake different approaches to represent SDGs to their countrymen. An important means of creating awareness and understanding about SDGs is through formal education systems. In the recent years, Environmental Education and Global Learning have aligned their concepts towards sustainability as a result of growing awareness about the challenges that are caused by an ever-changing global situation of ecological problems, poverty and human rights violations (Schreiber and Siege, 2016).

Education has a critical role in achieving all these goals and particularly Goal 4 is solely dedicated to education, which aims to "ensure inclusive and equitable quality education and promote life-long learning opportunities for all" (UNESCO, 2017). Individuals are required to turn into sustainability change-makers to build a more sustainable world which requires them to involve in sustainability-related issues as defined in the SDGs and therefore they need knowledge, skills, values and attitudes that will empower them to contribute to sustainable development (UNESCO, 2017). Thus, education has a key role in achieving SDGs. Education for sustainable development aims at improving abilities of people that encourage them to take responsibility of their actions considering their present as well as future social, economic, cultural and environmental impacts, from both regional and global angle (UNESCO, 2017).

Summary

This chapter brings to light the important educational reforms in India after its independence in 1947. India has continuously worked in the direction of improving and upgrading the educational systems to provide quality education to the people of the country. Setting up of education commissions; formulation and amendment of the NPE; and establishment of NCERT have a significant contribution to the development of the current education system in India. However, the EE movement gained momentum in India around 1972, after the Stockholm Conference. Through an amendment in the Indian Constitution, 'Environment' was made a part of it and environmental improvement and protection became a directive principle for the Government as well as a fundamental duty for all Indian citizens. Further the NPE, 1986 strongly advocated for EE and a Supreme Court judgment in 2003 made EE compulsory at all level of education throughout the country. Currently, EE is mainly taught through infusion approach in schools across India.

The Sustainable Development Goals (SDGs) came into existence in 2015 with the focus to save the planet; eradicate poverty and ensure prosperity & peace for everyone by 2030. Formal education has a major role in creating awareness and understanding about SDGs as well as education holds a central position within the SDGs.

Further, the next chapter will provide an overview of what other scholars think about EE, ESD, SDGs in education, and best practices in EE in the global and Indian context.

Chapter 2

REVIEW OF LITERATURE

The purpose of the literature review that follows is to identify ideas, findings, opinions, and thoughts of other researchers about the implementation of environmental education in schools with reference to SDGs, sustainable development and climate change education in the global and Indian context. It will also highlight what other researchers think about the approaches to ESD as well as what they recommend about the learning outcomes of ESD. Further, the section will explore in detail into the ideas, views, opinions and research of other scholars on some of the effective environmental education practices adopted in schools, especially relevant to Indian schools that allow students to develop a better understanding of sustainability issues.

Environmental Education

Environmental Education is an ever-growing and ever-changing discipline, which is still evolving, and, in the process, it introduces new theories, concepts, pedagogies and practices to the learners. From the early stages of introducing environmental education in the formal education system, researchers believed that to introduce environment-related issues into the educational system, which intends to create change in behaviour, the system must be more than "awareness" or "knowledge" and besides, the learners are provided with a favourable chance to grow the feeling of "ownership" and "empowerment" towards the environment which leads them towards becoming a responsible and sensitive citizen (Hungerford and Volk, 1990). Generally, the goals and objectives of environmental education revolve around providing students with an ability to make informed decisions as mentioned by Arvai et al. the goals of environmental education (EE)

generally focus on training students with the necessary skills so that they can make appropriate decisions related to a few environmental issues (2004).

According to Godwell and Ekpe(2011), and Zorpas, Voukkali, and Loizia (2017) the key objectives of environmental education include developing eco-citizens, who are aware of and understand nature as a whole and interact with the environment whilst being aware of the challenges with a solution-forward mindset. Besides, it also includes measures that will support individuals in identifying environmental problems and conducting research to find solutions and take conscious decisions. Help in making environmentally friendly decisions and actions can be sought through EE which tries to provide facts, knowledge, solutions, views or skills related to it (Chowdhury, 2014). It is also believed that the environment-related knowledge that young generation gains through formal education will help in developing pro-environmental attitudes and behaviours amongst them (Uhuo, 2007). Environmental education programs when integrated with a variety of dimensions help in crediting different ways in which locales, communities and cultures can structure our life stories (Ardoin, 2006).

Previous studies mention that even after the huge environmental movement throughout the world, still there is a lack of general environmental knowledge amongst the people (Pooley and O'Connor, 2000). Scholars have provided many different explanations for this lack of knowledge among students. According to a study conducted on environmental education in Macedonian schools, it was found that rather than motivating students to understand the complexity and inter-connectedness of environmental issues, students were encouraged to memorize facts in every grade. The students were not provided with a chance to give their reflection and therefore did not get many opportunities to understand their duties towards the environment as well as take accountability for their actions (Srbinovski, 2013). Further, Hoang and Kato stressed in their study

that in Southeast Asian countries due to a higher number of dropouts from schools at secondary and higher education level in comparison to primary level, imparting EE at elementary schools is a more successful method of creating awareness related to sustainability (2016). Assessment of EE school curricula at the elementary level in the USA revealed that the basic focus of EE programs was on ground-level targets related to environmental consciousness and knowledge (Pomerantz, 1991). Moreover, environmental experts and educators have constantly emphasized the importance of environmental awareness and an appropriate understanding of it. This understanding needs to be embedded within each level of the education system to provide a solution to the environmental crisis (Sukumar, 2005; Shobeiri et al. 2007; Singh, Kumari, and Singh, 2014).

Education for Sustainable Development (ESD)

ESD for school education is defined as "Education for sustainable development, which enables people to develop knowledge, values and skills to participate in decisions; about the way we do things individually and collectively, both locally and globally, that will improve the quality of life now without damaging the planet for the future" (Sterling, 1988). Unlike the previous environmental education approaches, the recent environmental education for sustainability approaches gives more emphasis on creating suitable connections between environmental quality, ecology, socio-economic factors and the political factors that have an impact on it (Tilbury, 1995). Moreover, as ESD has a complex and integrated approach in the curricula, it is extensively used in the context of environmental education in all the disciplines at each level of education (Albareda-Tiana, et. al., 2019).

"The success of environmental education for sustainability depends on the effective development of critical educational goals" (Tilbury, 1995, p. 210). Therefore, ESD which is targeted towards

"the new generation" is no longer focused solely on providing knowledge about the environment, its components, characteristics, and it no longer concentrates only on the protection of nature (Uzelac and Pejčić, 2004). Further, creating behavioural changes both at individual and community level that improves climate change understanding as well as strengthens environmental resilience is one of the most important contributions that education will make towards sustainable development (Bangay, 2016).

Researchers have made a lot of contribution towards what should be and how it should be included in ESD. Vodopivec stressed that in addition to focusing on environmental issues, educators must put a strong emphasis on the improper use of natural resources. Nature itself has no problems; due to the humans as well as their desire to exploit natural resources for better economic development, various environmental catastrophes have emerged which endanger current and future generations. (2011). Different strategies must be adopted for imparting ESD at different levels of education, for example, at primary level children should learn about their environment, biodiversity, ecosystems, waste management etc. through their experiences (Gadotti, 2010). Also, interdisciplinary pedagogy is crucial if educators are hoping to impart sustainability challenges through vital actions in the course of a student's everyday life (Annan-Diab and Molinari, 2017). Participatory teaching and learning techniques that motivate learners to alter their attitude are necessary for education for sustainable development (Velempini, 2017). Further, sustainable education is planned in a way that it helps in developing a lifestyle as well as a behaviour of production and consumption that can be sustained by the earth (Vodopivec, 2011). In recent years, modern environmental education has become more interdisciplinary to lead students towards a sense of global citizenship through experiential learning; students should gain skills of adaptability and good decision-making with this approach (Chowdhury, 2014).

As proposed by Sterling (1998) and further emphasised by Keith et al. (2009), learning outcomes of ESD at upper primary level should involve the following key concepts:

i. **Interdependence** - an in-depth understanding of the working of human systems, their inter-relationships with living and non-living systems with reference to inputs, outputs, sources, sinks and flows.

ii. **Citizenship and stewardship** - understanding their responsibilities at the local, national, and global level for improved sustainable management of resources in areas such as a house, school, and community.

iii. **Needs and rights of future generations**- recognising their basic needs; appreciating what they have; understanding their resource consumption, how it impacts the environment as well as the availability of resources for future generations and realizing as well as accepting that they have responsibilities towards the future generations, both as an individual and as a member of the society

iv. **Diversity**- understanding biodiversity in local and global contexts and why it is important to maintain it. Also identifying relationships between biodiversity and sustainability, and natural and human systems. Knowing the factors that impact the size and diversity of the species and understanding the importance of sustainable consumption in maintaining global biodiversity.

v. **Quality of life, equity, and justice**- understanding the basic human needs and what holds value for them in life as well as that these are universal. Able to distinguish between needs and wants. Be aware that inequality, exclusion, and injustice persist within and between societies. Understanding why social justice and equity is important and how can they contribute towards it.

vi. **Sustainable change**- understanding that natural resources are limited, and environmental systems have a carrying capacity; political and economic factors drive the use and management of these resources and cultural & social beliefs influence how resources are valued. Recognizing the importance of sustainable consumption at the individual and national level.

vii. **Uncertainty and precaution in action**- understanding that different actions have different consequences and people have a varied response and understanding of sustainability issues. Being informed of the challenges associated with sustainability. Developing a critical, systemic, and creative approach to sustainable development.

Vodopivec mentioned in his research about ESD in kindergarten that young children learn through experiences and direct experience is a key component in ESD throughout a child's learning process. Learning through all the senses (sight, hear, smell, touch, and taste), emotions, values, social experiences, and environmental activities in the classroom and/or surroundings is given more importance in ESD at kindergarten (2011). But issues associated with the development of ESD curriculum can impact the ability of the young generation to find solutions to sustainability issues. According to Kennelly, et al., teaching decisions are formulated based on a government-mandated curriculum where sustainability education does not hold a strong position. Sustainability is seen as insignificant, which means that young minds will not be equipped with the skills and knowledge needed to solve environmental and social challenges (2011).

SDGs in Education

Education holds a very special position within the SDG's as well as will play a key role in accomplishing these goals. After the adoption of SDGs in 2015, the development of strategies to achieve these goals is being carried out and education has been identified as one of the goals with

the highest priority, besides it is also recognised as a means of achieving other SDGs (Praveen and Nasreen, 2016). Education will hold the key to how these goals are perceived and realised. Quality education should include procedures or methods which will improve the young generation's ability to predict and cope with climate change in the coming future (McKeown and Hopkins, 2010).

Action for climate change is an important goal and interconnected to many other SDG's and therefore suitable climate knowledge must be provided to students at schools. Environmental education is the main source of knowledge, awareness, attitudes and skills that are essential for fighting impacts of climate change (Teodorescu and Oros, 2010). Providing climate change knowledge to students helps them to understand various factors that lead to climate change and also, helps provoke behavioural changes in them through conscious decisions and environment-friendly choices (Feierabend, Jokmin, and Eilks, 2011; Karpudewan and Mohd Ali Khan, 2017). Stern mentioned in his research paper that "Educating those currently at school about climate change will help shape and sustain future policymaking, and a broad public and international debate will support today's policy-makers in taking strong action now" (2007).

The required skills, knowledge and change in behaviour required for climate change adaptation and mitigation can be attained through education as it plays a vital role in making individuals as well as communities' responsible decision-makers so that they can take necessary actions to become climate resilient (Anderson, 2010). McKeown and Hopkins believe that education for climate change will differ from region to region depending on factors such as geographic location, local environment, social, cultural and political aspects and their effect on the locality (2010). Certain researchers believe that education sector is itself threatened by climate change but still it is a source of untapped possibilities which can assist in combating climate change (Anderson, 2012). Education tends to face a considerable number of challenges due to climate change, but

education also offers powerful tools in developing ways in which these challenges can be addressed (Bangay, 2016). It is a challenge to impart effective climate knowledge and education to the coming generations (Milér et al., 2012).

Many reports and studies have indicated that the dynamic nature of climate change and its solutions as a key challenge related to climate change education. Arndt and LaDue highlight that scientific knowledge of climate change and to gain an understanding of it is an ever-changing target (2008). A recent study in the US found that the current EE frameworks are not adequate to prepare students for the dynamic nature of climate change challenges and renewable energy transitions as they lack appropriate guidelines needed for it (Jorgenson et al., 2019).

Best Practices in Environmental Education around the Globe

Imparting EE in schools involves the application of several teaching-learning practices or strategies. The effectiveness of these practices is very crucial in the successful implementation of EE. Some of the practices are found to be more effective than other methods. There are various factors which determine the successful application, effectiveness, and productivity of these practices. Pooley and O'Connor suggested through their research conducted in Australia that the source of information to design environmental programs should be based on environmental attitudes, emotions and beliefs if environmental educators aim at changing them rather than using knowledge as the basis of information (2000)**.** Experiential methods have been found successful in Malaysian schools in imparting climate change education to students as it improves their knowledge and increases their motivation level (Karpudewan and Mohd Ali Khan, 2017). A study conducted by Tucker and Izadpanahi in primary schools in Australia showed that the environmental attitudes and behaviours of students were positively impacted by the sustainable design of the schools (2017). Therefore, it suggests that pedagogies involved in teaching

environmental education should be designed in a way that direct student engagement with sustainable design features becomes an essential part of the learning process.

Further, Jorgenson et al. through their research provided recommendations that would be significant for EE in countries highly dependent on fossil fuels for their energy requirements. Firstly, they recommended that environmental educators and researchers must go beyond pro-environmental behaviour to make it the basis for action for climate change and change in attitude. Secondly, they suggested educating children and youth for collective political engagement or careers in the renewable energy sector as it would be very effective in the case of energy transitioning (2019).

Teachers play a very critical role in EE, on many occasions, they act as role models for their students and hence their attitude and behaviour towards environmental issues greatly impact the understanding of their students toward these issues. It is important to have teachers who are environmentally educated to facilitate change in attitudes, values and actions which will assist in building sustainable social and environmental relations within generations as well as between generations (Davis, 1998). If formal education could enable teachers to impact behavioural changes, it would make a significant change towards environmental issues, especially when teachers are provided with an adequate opportunity through the curriculum and pedagogical training (Boyes et al., 2014). Educational material as well teachers play a key role in influencing the student discussions related to environmental issues of national importance (Cars and West, 2015). The scientific and environmental knowledge, interests, understanding, attitudes, awareness, behaviours and responses of students are impacted constructively when environmental attitudes, as well as actions of teachers, present a suitable model for them (Littledyke, 2008; Zorpas et al., 2017).

Implementation of Environmental Education in schools in India

India is at a greater risk to environmental and climate change challenges and their impacts due to combination of various factors such as geographical location; the large size of its population; rain-dependent agriculture systems, poverty; fast-paced urban growth and lack of a well-established physical as well as financial risk mitigation system (Bangay, 2016). An underlying reason to impart environmental education in Indian schools is to create environmental awareness in children to make them responsible citizens who are environmentally conscious as well as sensitive to environmental risks (Roberts, 2009). Bangay and Blum highlighted that Indian education system must emphasise on creating environmental awareness related to both 'causes and consequences' as well as prepare students to face the likely environmental and climate change shocks they will encounter in the near future (2010). It is very likely that the people of India will face environment and climate-related impacts in the coming years and thus, imparting education in a way that it becomes environment change 'resilient' (e.g. buildings and systems) is very important (Bangay, 2016).

It is important to understand how formal education at school level deals with EE. The pedagogical approaches that are employed and how they are employed at various levels of school education to provide useful learning experiences to students. The curriculum and pedagogical approaches both play a critical role in EE and for developing better understanding in students, environmental education curriculums should be based on issue-centric learning (socio-cultural aspects) that take local education into account. (Nair, 2010). Further, the EE syllabus provides guidance to the schools in planning all the teaching and learning for the students (Iyengar and Bajaj, 2011).

There are three main pedagogical approaches to EE which are adopted by schools in India; the infusion approach, the separate subject approach and the extracurricular approach (Pande, 2001).

Gopal and Anand (2006) have described in detail in their research about the pedagogical approaches to EE in Indian schools. At primary level (I to IV) EE is taught in the form of EVS, the environmental concepts are introduced through language and mathematics to classes I and II whereas, for classes III and IV separate EVS textbooks are available. Textbooks at primary level aim at creating awareness and sensitising students about various environmental issues and to provide a meaningful experience to students. The importance is also given to regional environmental concerns and indigenous knowledge. They further highlighted that the textbooks also offer guidance on organizing environmental activities both inside and outside the classroom. But the researchers feel that there should be an addition of new activities into EE which not only lead to awareness but also bring positive behavioural changes. At the upper primary level, the textbooks provide students with more detailed information on concepts already introduced to them at the primary level. In most of the states, environmental concepts at upper primary level are embedded in the textbooks of science and social science. The researchers further emphasise that in addition to concepts, it is essential to incorporate individual and group activities for better learning opportunities for students (Gopal and Anand, 2006).

It is also important to understand the way the EE concepts are introduced to children. Sharma and Devi have stressed that as recommended by NCF-2005, at grade I and II environmental concepts are introduced to students through the discipline of Language and Mathematics and therefore it becomes important that these disciplines are taught in a manner which is joyful, value-based and practical, to develop a sense of concern and responsibility in learners towards their environment (2012).

Researchers have provided suggestions on improving the effectiveness of EE in Indian schools. Pande (2001) through her study highlighted the important aspects of EE that Indian schools should consider while designing EE courses:

- EE should be holistic and embedded within the regular school curriculum

- Behavioural and attitudinal changes guided through EE should be assessed through various evaluation methods

- Experiential learning and learning by doing must be important components of EE. Local communities must be a part of EE, to provide students with the opportunity to interact and learn from them

- General EE courses are not enough, region-specific EE courses tend to be more successful

Another recent research study conducted by Sharma et. al. (2019), emphasises that positive environmental attitudes, behaviours, emotions, values, knowledge, understanding and skills should be inculcated from the primary stage of education to make students environmentally responsible citizens. They further provided some important suggestions related to pedagogical approaches for improving environmental awareness at primary level in India:

- EE curriculum should be activity-based to provide practical experience to students and pedagogical approaches should be modified as per the need of the topic

- Environmental activities should be conducted regularly such as the celebration of environmental days and camps should be held with a focus to create environmental awareness

- Eco-clubs should be formed in each school to conduct various activities and competitions related to the environment

- The focus should be given on the development of "Enviro Schools" and resource material for improving teaching and learning experiences (Sharma et al., 2019).

EE should also focus on providing all the essential learning to the students about sustainable development. A report published by the British Council states that India has incorporated Sustainable Development Goals (SDG's) into its educational initiatives. There is a higher focus on providing quality education through current programs as well as by providing financial support for new programs (2019). But the level of awareness related to sustainable development is different amongst rural and urban students in India (Mondal and Mete, 2010; Patra and Panda, 2018). Factors such as the category of school (public or private), the medium of instruction (English, Urdu, and other), educational qualification of parents influence the level of environmental awareness amongst the school students (Indupalli et al., 2015). It is realised that one of the important goals of ESD in India as well as other parts of the world is to encourage students to safeguard the local biodiversity, which could be achieved through biodiversity education, that focuses on providing knowledge as well developing important skills necessary for solving regional biodiversity issues (Ramadoss and Poyya Moli, 2011). However, Iyengar and Bajaj highlighted that the educational agencies in India have adopted a more science-based methodology for EE, which considers the physical aspects of the issues but lacks a more comprehensive approach required, even the lack of inter-linking of real-life socio-economic and environmental problems with an educational approach to ESD is quite evident (2011).

Best practices in Environmental Education in India

Ravindranath (2007) in his study mentioned that in India, to promote EE in schools a lot of work has been done both at national and state level with the help of Department of Education and various NGO's that enthusiastically function in this direction. Efforts have been made to incorporate

environmental concepts into the teaching of other disciplines, provide teachers with pre-service and in-service training to acquaint them with the concepts as well as various pedagogical approaches involved in EE and create and distribute high standard resource materials related to EE. Various types training has been provided to teachers to teach EE in schools and Centre for Environmental Education (CEE) has played an important role in conducting various environmental education programs as well as created regional centres which helped schools, students and educators by acting as resource centres for them (Almeida and Cutter-Mackenzie, 2011). Also, to provide educators with a resource on environmental activities, NCERT with the help of Centre for Environmental Education, Ahmedabad (CEE) published a handbook for teachers entitled "Joy of learning" which aims to make EE a joyful learning experience for learners (Gopal and Anand, 2006). In a study conducted on schools in Kerala, it was found that a special programme named SEED (Student Empowerment for Environmental Development), aimed at creating environmental awareness among students, was introduced by a leading newspaper of the state in association with a major bank and it was very effective in creating environmental awareness amongst school students (T. Ram and Pereira, 2014).

In a study where Indian students showed more willingness to act in a pro-environmental manner in comparison to European and Australian equivalents, it was found that one of the important factors that contributed to their pro-environmental attitude was the presence of Eco-clubs, environmental displays and environmentally orientated assemblies in their schools which were focused on imparting non-formal environmental education to the students (Chhokar et al., 2011). Another study showed that the presence of a National Park near the school did not make much difference in the knowledge of students regarding wildlife conservation, but conducting regular awareness programs focused on wildlife conservation such as lectures, nature trails, camps,

wildlife movie screening, game shows, and provision of educational material greatly improved the knowledge of students about conservation (Kidwai, 2018).

Moreover, active biodiversity education programs conducted in urban and suburban schools were found to be effective in enhancing the knowledge, interest and skills of students related to the protection and conservation of local biodiversity and natural resources. (Ramadoss and Poyya Moli, 2011). Alexandar and Poyya Moli through their research involving students of VIII and XI standard found that field-based educational programs, such as field trips are very important teaching tool in EE as they help in improving the relationship of students with their local environment. These programs develop a sense of curiosity, compassion and willingness in students and provide them with an opportunity to explore and engage with their environment as well as create a positive attitude towards biodiversity conservation (2012).

Patil (2006) in a review of research studies on methods of teaching in EE referred to studies by Indubala and Kidwai, which concluded that video films and fields trips as a medium of instruction were found to be effective in teaching EE. She found that Sen in his study concluded that encouraging classroom environment, method and quality of instruction and feedback methodology impacted the learning outcomes in students. Further, she referred to the studies of Sunnetha, Tomar and Modak, who respectively found multidisciplinary approach; activity-based instruction and EE club activities to help develop a positive attitude in students towards the environment (Patil, 2006).

Bangay (2016) highlighted in his research about two important national EE programs in India. He further stated that the Centre for Environmental Education (CEE), is an environmental NGO in India, which plays a crucial role of a catalyst in most of ESD in India. The NGO is supported by Ministry of Environment, Forest and Climate Change, India (MoEFCC) as well as other external funding agencies and is involved in the outreach of two key national ESD programmes targeting

school students: the Paryavaran Mitra (PM) 'friend of the environment' programme and the MOEFCC's National Green Corp programme (NGC). Both the programmes are based on different approaches: NGC is an action-based initiative for secondary students which encourages community involvement through extra-curricular activities focusing on key sustainability issues such as water and energy conservation, biodiversity protection, resource and waste management and land use planning. Whereas PM is based on the whole-school approach and works towards incorporating sustainability concepts in the curricula of VI to VIII grade. The activities and resource material related to PM fall under the pedagogic framework of Explore, Discover, Think, Act and Share; covering five key themes: water and sanitation, energy, biodiversity and greening, waste management and culture & heritage.

Further, Roberts (2009) in his study to understand the impact of National Green Corps Eco-club program (NGC) on students found that the idea and outreach of the program are well established throughout the country with the target to bring behavioural changes by creating better environmental awareness amongst students. It also highlighted some of the key implementation issues faced by the program such as lack of efficiency, interest, enthusiasm, coordination, inefficient feedback methods and monitoring techniques. The study further suggested that to make the program more effective and achieve better results it is important that it functions in close association with NGO's that have prior experience in executing similar programs.

Nair (2010) in her research study on EE curriculum at the primary level suggested that additional concepts with a focus on localised environmental issues should be incorporated in the textbooks in the form of colourful illustrations such as pictures, photographs and diagrams. She further emphasised on the use of multimedia in the form of videos, movies, animations, documentaries showcasing past, present and future environmental problems as a very effective tool in teaching

environmental concepts to the primary grade students (2010). As a key teaching aid textbook holds an important place in the Indian education system and therefore there are numerous possibilities and an urgent need that efforts are made to transform textbooks of all the subjects into creative learning tools that have environmental and sustainability perspectives embedded into it (Praveen and Nasreen, 2016).

In a recent research study by Hanley et al. (2019), a special kind of exchange program designed to connect a few public schools in Kentucky and private schools in eastern India developed a year-long curriculum with online modules combined with field research opportunities on the availability, quality and usage of water. The research study had the following highlights:

- It promoted creativity and cooperation among students.

- Helped students to understand water-related issues at the global level as well as issues particular to their region and made a connection between water and culture.

- Provided flexibility to students to employ a variety of formats to represent their work (visualization of research data, visual or verbal representation, documentary film- making, other art forms, public theatre performances, workshops online videos, posters, podcasts, and brochures).

- There was an integration of all three domains of successful environmental education: system knowledge, action-related knowledge, and effectiveness knowledge because of student's accessibility to various formats for exhibiting their work (Frick et al. 2004).

- Promotion of cross-cultural environmental education and creating better communication between schools with the help of social media could be an effective approach (Dabbagh and Kitsanas, 2012).

- Online exchange programs like these could serve as a partial substitute for travelling.

Researchers have highlighted that more theoretical approaches are used in EE in India in comparison to practical approaches and there is need to change this scenario for providing better learning opportunities to children. Bhowmik and Verma (2019) in their research study highlighted that for improving environmental awareness in students and providing them with practical knowledge it is important that schools apart from imparting theoretical knowledge also provide opportunities for field trips; co-curricular activities; nature walk; the celebration of days related to environmental protection; create eco-clubs within the school; collaborate with NGO's and local communities and use multi-media technology for better understanding of environmental issues and their solutions.

Further, Saxena and Srivastava (2012) through their research study found that there is a lack of seriousness amongst students and teachers for the environment as a discipline and students merely learn the content to clear their exams and therefore several misconceptions exist amongst students concerning environmental concepts and as a result, they are unable to practically apply their knowledge. The researchers further emphasised that EE curriculum should be more practical based; methods of evaluation should be based on the practical application of knowledge gained by students; and there is a need for a more tightly knit network of teachers, planners, examiners and environmental organizations working towards promoting environmental consciousness in students.

In another study conducted by Maji and Sengupta (2015) on awareness related to waste management in school students, they have emphasised on the importance of teaching EE as a separate subject as well as proposed that in addition to theoretical knowledge, practical concepts should be incorporated where students could learn through their experience. It further, highlighted that conventional pedagogical approach to EE was insufficient as it though increased the awareness

of students but did not help in producing pro-environmental behaviour in them. Further, Ramadoss and Poyya Moli also stresses on broadening the current pedagogical approaches in Indian schools beyond the classroom and involving the immediate environment (natural/built) as a learning tool which will help in inculcating a culture of biodiversity conservation amongst the students (2011).

Summary

This chapter investigates research done in the field of EE, ESD and best practices in the field of EE generally, which then informs about Indian approaches involved in EE. Scholars believe that the main objective of EE is to provide environmental knowledge to students which helps them in developing pro-environmental attitudes and behaviours. EE also focuses on rendering students capable of making informed decisions through the development of environmental understanding, attitudes, and skills. Further, ESD approaches stress on creating suitable connections between environmental quality, ecology, socio-economic factors, and the political factors impacting them. Inter-disciplinary pedagogical approaches with experiential learning are important in imparting sustainable education. Moreover, experiential learning is found to be effective in EE, as besides providing motivation, it improves general understanding. Besides, knowledge and understanding of teachers about environmental issues and their attitude towards this aspect have a vital bearing on the understanding of students about these issues.

Researchers have further highlighted that Indian schools mainly employ three pedagogical approaches to impart EE at different levels of education. Textbooks guide in conducting environmental activities, both within and outside classrooms. Moreover, researchers have also provided suggestions on how and what should be included in EE to make it effective, easily comprehensible, and interesting for students. Studies have further highlighted that NGO's, eco-

clubs, experiential learning, textbooks, and region-specific courses are key to effective EE in Indian schools.

The next chapter will discuss the methodology adopted to conduct this research paper.

Chapter 3

METHODOLOGY

This research takes a qualitative approach for several reasons. First, the research conducted on EE in Indian schools is very limited and most of the studies use a quantitative approach to understand the level of environmental awareness amongst students or teachers. Secondly, there were only a few studies which focused on the research area of the EE curriculum in India. Therefore, through this research paper, I focused on understanding the EE curriculum and its implementation through qualitative research methods to fill this gap between quantitative and qualitative research work in this area.

The research involved a two-stage evaluation design (Creswell, 2003) consisting of two phases:

(1) Document review and analysis of environmental education curriculum of National Council for Educational Research and Training (NCERT) from Grade 1 to 8.

An analysis is conducted by investigating existing environmental education curriculum document in English by the NCERT from Grade 1 to 8. This analysis compared components, concepts, themes, topics in NCERT environmental education curriculum with the components and concepts recommended by UNESCO in the document "Sustainable Development Goals - Resources for Educators", for imparting knowledge about each SDG to students at primary level. The content material related to EE was studied thoroughly; focusing on topics, themes and concepts that refer to SDGs. During the analysis of the curriculum document, the emphasis was given to find out:

i. Which concepts, topics and themes are linked with learning about UN SDGs in the National Environmental Education curriculum in India?

ii. How are the goals embodied in the curriculum?

iii. How does the curriculum enable students of Grades 1 to 8 to acquire requisite knowledge and understanding of sustainability?

(2) Critical literature review on the implementation of the EE curriculum in Indian schools and some of the best/effective practices in EE.

In the literature review, I focused on the views and opinions of other researchers on the implementation of the EE curriculum in Indian schools especially at the primary stage of education. I also critically evaluated what other researchers around the globe have suggested the best pedagogical approaches to EE at primary level. Through literature review, I explored some of the effective practices in Indian schools related to environmental education. After the analysis of the literature, I further evaluated it to combine the academic theories and ideas thematically (Saunders and Rojon, 2011). Generally, thematic analysis is the most used qualitative approach to analyse qualitative data and this method is employed for identifying, analysing and detecting categories (themes) within the data (Braun and Clarke, 2006). This method allowed me to identify patterns in the opinions, ideas, and suggestions of other researchers on the implementation of EE. It further supported me in finding similarities as well as differences in the opinions, views, and ideas of different scholars in India and around the globe on the implementation of an environmental education curriculum in schools.

Summary

A qualitative approach is adopted to conduct this research study. It involves a two-stage evaluation design consisting of two phases: Document review as well as analysis of EE curriculum and critical literature review on the implementation of the EE curriculum.

The succeeding chapter undertakes an analysis of the EE curriculum to understand how UNSDG's are incorporated into it.

Chapter 4

ANALYSIS OF ENVIRONMENTAL EDUCATION CURRICULUM

This section will analyse the NCERT curriculum document to find how UNSDG's are incorporated into the environmental education curriculum and how these goals are presented to the students through different environmental concepts. The curriculum at primary (I-V) and upper primary (VI-VIII) stage is analysed to find out how various environmental learning themes are linked to various SDG's. For analysis of environmental education curriculum, NCERT document titled "Environmental Education as infused in NCERT Syllabus for Classes I to XII as per NCF 2005" has been used in the study.

Analysis of NCERT Environmental Education Curriculum

UNESCO has provided several resources which are designed for educators, education planners and practitioners to guide ways in which ESD can be incorporated into the teaching and learning. There are two key documents "Education for Sustainable Development Goals - Learning objectives" and "Sustainable Development Goals - Resources for Educators", which can be used to design pedagogical strategies to impart education for sustainable development goals in schools. The document "Sustainable Development Goals - Resources for Educators" guides about what and how concepts related to each SDG should be introduced to children from early childhood care through secondary education. In this chapter, this document will be used as a reference to see how Indian EE curriculum introduces SDGs at the primary education level. As recommended by UNESCO (2018) summary of concepts and learning objectives concerning each SDG at primary level are as follows:

1. **SDG1 - No Poverty:** Different concepts related to poverty and the actual impacts of 'living in poverty' are introduced to learners. They should also learn how and what can lead to a reduction in poverty with a strong belief that it is possible to remove extreme poverty within their lifespan.

2. **SDG2 - Zero Hunger:** Learners develop healthy dietary practices through gardening activities and consumption of self-grown food. It is also important that they develop an understanding of food labels and a list of ingredients. Besides, they should learn to recognise the value of indigenous and local knowledge about sustainable consumption of available resources.

3. **SDG3 - Good Health and Well-Being:** Learners gain awareness about basic concepts related to health, e. g., mental, emotional, sexual, and reproductive health as well as rights associated with them. They learn how to convey their feelings positively, manage stress, both emotional and physical and if needed, seek help. It is promoted that learners show respect, acceptance, tolerance and understanding towards other's 'differences and emotions'.

4. **SDG4 - Quality Education:** SDGs are introduced to learners as a set of targets aimed at eradicating poverty from the world and finding solutions to climate change-related issues. Learners should value quality education for everyone.

5. **SDG5 - Gender Equality:** Learners get acquainted with gender roles and their impact on the identity and rights of girls and boys. They should develop the ability to critically assess socially designated gender roles and stereotypes associated with them at workplaces and home. Thereby, they enable themselves to present a degendered understanding of these roles.

6. **SDG6 - Clean Water and Sanitation:** Learners get knowledge about not only the principle of water abundance but also understand that it is a finite resource. They become familiar with the aspect of physical and economic water scarcity. They develop an understanding of sustainable consumption of water.

7. **SDG7 - Affordable and Clean Energy:** Learners learn about various energy sources used in different geographies and contexts as well as associated technologies with them. They develop an understanding of ways to lead a more sustainable life through monitoring their energy use and bringing changes in their daily energy consumption pattern.

8. **SDG8 - Decent Work and Economic Growth**: Learners develop their understanding about the importance of work and relevance of equal access and opportunity of work for all. They also learn to appreciate the value of various kinds of work.

9. **SDG9 - Industry, Innovation, and Infrastructure**: Learners get introduced to the concepts of sustainability, industry, economic development, or human wellbeing. They develop the ability to assess different kinds of infrastructure and industry based on their sustainability value.

10. **SDG10 - Reduced Inequalities**: Learners become aware of how education is connected to inequality and the strong role it plays in promoting equity and improving income. They also learn how to provide their viewpoints on the harmful impacts of different inequalities and solutions for solving these issues.

11. **SDG11 - Sustainable Cities and Communities**: Learners learn about the basic human needs such as food, shelter, energy, transportation, and water, besides they become aware of the multi-cultural environment of the cities and towns and their components. They understand why sustaining their immediate natural environment is important.

12. **SDG12 - Responsible Consumption and Production**: Learners are introduced to the concept of ecological footprint and how it is calculated. Participation in activities such as recycling and composting help learners make informed decisions while buying products through analysis of the product's life cycle implications.

13. **SDG13 - Climate Action**: A basic understanding is developed in learners about climate-related concepts such as carbon cycles, green-house effect, and its impacts. They learn about climate vulnerability and understand the consequences of human activities on climate change.

14. **SDG14** - **Life below Water**: Concepts such as ocean zones and marine flora and fauna are introduced to learners. They develop the ability to critically analyse and investigate about endangered and threatened species. They learn to conduct surveys or interviews to better understand the challenges being faced by fishermen and become self-aware about sustainable practices.

15. **SDG15 - Life on Land:** Learners develop a basic understanding of the importance of biodiversity and threats faced by it such as habitat loss. The concepts of endangered species and ecosystem interdependence are introduced to them. Through the application of systems thinking method their awareness to conserve biodiversity is increased.

16. **SDG16** - **Peace, Justice and Strong Institutions**: Learners are exposed to diverse religious and ethnic identities, which help them to understand why mutual respect and understanding at the global level is important. They learn to appreciate wisdom from different sources and understand the responsible ways to participate in society.

17. **SDG17 - Partnerships for the Goals**: Teamwork can promote creative collaboration in learners. Teamwork on mini-projects enables learners to communicate their opinions and

listen to others, hence they become able to show respect to the feelings and needs of others'
(UNESCO, 2018).

NCERT Environmental Education curriculum

As per NCF-2005, EE in Indian schools is taught through an Infusion approach, where environmental concepts are infused within other disciplines. The EE curriculum is further based on:

- Learning about the environment;

- Learning through the environment; and,

- Learning for the environment.

NCF, 2005 acknowledges that the processes and strategies suggested for imparting EE would result in developing a deep sense of concern in students towards sustainable development (NCERT, n.d.).

Primary Stage (I- V)

For teaching EE at the primary stage three different approaches are followed by different States/UTs in India:

- integrated textbooks on environmental studies

- environmental concepts incorporated into the discipline of Mathematics and Language

- EVS has been branched as 'science' and 'society' for which independent textbooks-cum-work books have been prescribed (NCERT, n.d.).

In most states/UTs, the textbooks of science and the social sciences have environmental concepts embedded in them. For teaching EE in Classes, I—II as per NCERT curriculum, the teaching of

language and mathematics has been connected to the children's immediate environment and EE has been reinforced as a component of the Art of Healthy and Productive Living (AHPL). Whereas, in Classes III-V, EE is imparted through separate environmental studies textbooks (NCERT).

The analysis showing EE topics, themes and concepts as infused in various disciplines at primary level (NCERT, n.d.) and the corresponding SDG's to each topic or concept is shown in the tables below:

In Mathematics

Table 4.1: EE topics and concepts infused in Mathematics

Class	Topics and concepts	Relevant SDG
Class I	• Geometry (Shapes & Spatial Understanding) • Patterns • Measurement (Length) • Solids around us	
Class II	• 3-D and 2-D Shapes • Patterns	
Class III	• Patterns	
Class IV	• Geometry (Shapes & Spatial Understanding) • Numbers (Numbers and operations) • Measurements	
Class V	• Observes objects in the environment for their geometrical attributes	

In Environmental Studies

Table 4.2: Class III Topics and concepts in Environmental Studies

Topics and concepts	Relevant SDG
Plants – • Plants around us	SDG15
Animals – • Animals around us	SDG15

• Some creepy crawlies and flyers too • Birds	
Work and Play Games	SDG 8
Food – • Food from plants and animals • Cooking • Eating in the Family • What animals eat	SDG 2, 11, 15
Shelter- • Houses and houses • Decorating and cleaning our shelter • My family and other animals • Mapping my neighbourhood	SDG 11, 1, 6, 15
Water- • Water for my family • Do animals and plants need water? • Water Shortage • Water is our lives • Storing water	SDG 6, 11, 14, 15
Travel- • Ways to travel	SDG 11, 7
Things we make and do- • Pottery • Textiles	SDG 8, 12

Table 4.3: Class IV Topics and concepts in Environmental Studies

Topics and concepts	Relevant SDG
Plants – • Roots of Plants • Flowers • Whom trees belong to?	SDG15
Animals – • Animals and their friends • Who is attracted to flowers? • Long ears or short? • Birds	SDG15
Food –	SDG 2, 11, 12

• How we get our food	
Shelter-	SDG 1, 11, 12, 15
• Houses then and now	
• Garbage	
• Where animals live	
• When birds make nest	
Water-	SDG 6, 14
• Water fit for drinking	
• Water sources	
• Our river/sea	
• Water vanishes when heated?	
Travel-	SDG 7, 15
• Animals for transportation	
• Travel to another place	
Things we make and do-	SDG 8, 11
• Building materials and tools	

Table 4.4: Class V Topics and concepts in Environmental Studies

Topics and concepts	Relevant SDG
Clean Work- dirty work?	SDG 8, 10
Plants –	SDG11, 15
• Forests and forests people	
• Protected areas	
• Flowers	
• Plants that have come from far	
Animals –	SDG15, 12, 11
• How animals find their food?	
• What we take from animals?	
• Why is the Tiger in danger?	
• People who depend on animals	
Food –	SDG 1, 2, 15
• When food gets spoilt	
• Who produces the food we eat?	
• What did people grow earlier?	
• When people do not get food	
• Food for plants?	
Shelter-	SDG 1, 11, 13
• Why different houses	

• A shelter for everyone?	
• Ants live in colonies	
• Times of emergency	
Water-	SDG 3, 6, 11, 12, 14
• Water from where in earlier times	
• Water flow	
• Plants and animals in the water	
• Mosquitoes and malaria	
Travel-	SDG 13, 7
• Petrol or Diesel	
• Rough and Tough	
• Ride on a spacecraft	
Oldest Building	

In Language

Table 4.5: EE topics and concepts integrated into the Language course content

Topics and concepts	Relevant SDG
Environmental Issues	SDG 13, 14, 15
Conservation of Resources	SDG 6, 7, 12, 14
Population Concerns	SDG 1
Disaster Management	SDG 13
Forestry	SDG 12, 15
Animals and Plants	SDG 14, 15
Human Rights	SDG 4, 5, 8, 10
Safety Norms	
Sustainable Development	All SDGs
Self, Family, Home, Friends and Pets	SDG 15, 16
Neighbourhoods and Community at large	SDG 11
The Nation - diversity (socio-cultural, religious, and ethnic, as well as linguistic), heritage (myths/legends/folktales)	SDG 4, 10, 16
The World - India's neighbours and other countries (their cultures, literature, and customs)	SDG 4, 16, 17
Adventure and Imagination	
Sports	
Issues relating to Adolescence	SDG 3
Peace and Harmony	SDG 16
Travel and Tourism	SDG 7

Art and Culture	SDG 16
Health and Reproductive health	SDG 3

Upper Primary (VI-VIII)

For the upper primary stage environmental concepts have been incorporated in the course content of Science and Social Sciences. The analysis showing EE themes, sub-themes and concepts incorporated in science and social science course content at upper primary level (NCERT, n.d.) and the corresponding SDG's to each topic or concept is shown in the tables below:

Table 4.6: Class VI EE Themes in Science and Social Sciences

Sciences -Themes or sub-themes	Relevant SDG	Social Sciences- Themes or sub-themes	Relevant SDG
Food – • Sources of food • Components of food • Cleaning food	SDG 2, 12, 15	Our Pasts-I • The Earliest Societies • The First Farmers and Herders	SDG 8, 11
Materials- • Materials of daily use • Different kinds of material	SDG 12, 15	The Earth- Our Habitat • Planet • Globe • Four realms of the Earth • India in the world	SDG 13, 14, 15
The World of the living- • Things around us • The habitat of living • Plants-form and function • Animals- form and function	SDG 15	Our Environment • Environment in its totality • Natural Environment • Air • Water • Natural Vegetation and wildlife • Human Environment • Human-Environment Interaction	SDG 6, 12, 13, 14, 15,
Natural Phenomena- • Rain, thunder, and lightning	SDG 13	Diversity and Interdependence	SDG 10, 16

Sciences -Themes or sub-themes	Relevant SDG	Social Sciences- Themes or sub-themes	Relevant SDG
• Light		• Urban Local Government	
Natural Resources- • Importance of water • Importance of air • Waste	SDG 6, 12, 13		

Table 4.7: Class VII EE Themes in Science and Social Sciences

Sciences -Themes or sub-themes	Relevant SDG	Social Sciences- Themes or sub-themes	Relevant SDG
Food – • Food from where • Utilization of food	SDG 2, 11, 15	Our Pasts-II • Where, When, and how	SDG 4
The World of the living- • Surroundings affect the living • The breath of life • Movement of Substances • Multiplication in plants	SDG 13, 15	Democracy and Equality • State Government	SDG 5, 10, 16
Natural Phenomena- • Rain, thunder, and lightning	SDG 13		
Natural Resources- • Scarcity of water • Forests Products • Waste Management	SDG 6, 11, 12, 15		

Table 4.8: Class VIII EE Themes in Science and Social Sciences

Sciences -Themes or sub-themes	Relevant SDG	Social Sciences- Themes or sub-themes	Relevant SDG
Food – • Crop Production • Microorganisms	SDG 2, 8, 12, 15	Our Pasts-III • Crafts and Industries	SDG 8, 9
The World of the living- • Why conserve	SDG 11, 12 14, 15	Resources and Development • Resources • Natural resources • Agriculture	SDG 8, 9, 12, 14, 15

		• Industries	
		• Human Resources	
Natural Phenomena- • Rain, thunder, and lightning	SDG 13		
Natural Resources- • Man's intervention in the phenomena of nature • Pollution of air and water	SDG 7, 6, 12, 13		

Summary

This chapter provides insight into how UN SDG's are placed within the NCERT curriculum. The EE curriculum at primary (I-V) and upper primary (VI-VIII) stage is analysed to locate themes that are linked to various SDG's. The curriculum is compared with learning objectives at primary stage proposed by UNESCO for each SDG. Further, the EE concepts infused in the teaching of Mathematics, Language, Environmental Studies, Sciences and Social Sciences are analysed for their association with each SDG.

The following chapter will further discuss findings from the analysis of the EE curriculum as well as the literature review.

Chapter 5

FINDINGS AND DISCUSSION

This section highlights findings from the literature review and analysis of the EE curriculum. It includes differences and similarities in the ideas and views of researchers about the methods of implementation of environmental education curriculum in India and effective teaching-learning practices in environmental education. Findings from the literature review are divide into themes depending on the different ideas, opinions, views, suggestions that originated from the literature review. The section further discusses the findings from the analysis of the curriculum document and literature review. It also describes what these findings reveal about the implementation of environmental education in Indian schools as well as the role of the EE curriculum in imparting knowledge about SDGs.

Teaching about SDGs through EE curriculum in Indian schools at the primary level

Findings from the analysis of NCERT Environmental Education curriculum at primary level and upper primary level shows that contents, topics, concepts, themes for teaching EE in schools do impart knowledge about SDGs, rather certain SDGs have a better hold within the curriculum than other SDGs. The findings show that knowledge about SDGs is mostly imparted through EE concepts, themes and topics incorporated into the components of Environmental Studies, Language, and Sciences. Teaching about a few SDGs is done through Social Sciences also, but EE concepts infused in Mathematics for Classes I and II were found not directly linked to any of the SDG. Findings of each SDG is as follows:

1. **SDG1 - No Poverty:** Goal 1 is addressed in the curriculum mainly under the theme 'Shelter' for classes III to V and in teachings of language through the concept of 'Population

Concerns' and 'Sustainable Development'. For class V the goal is also touched upon under the theme 'Food' and sub-theme 'when people do not get food'. At the upper primary level, no concept is found to be linked to goal 1 in sciences and social sciences. The concept of poverty is not taught directly to the students but rather touched through the concept of food, shelter, and population.

2. **SDG2 - Zero Hunger:** Goal 2 is introduced to the learners through the theme 'Food' and taught regularly from class III to VIII. Besides, it is also taught through the concept of 'Sustainable Development' under the teachings of language. Most of the learning objectives proposed by UNESCO are well covered by the curriculum for Goal 2.

3. **SDG3 - Good Health and Well-Being:** Goal 3 is not found to have much weightage in curriculum and is catered mostly through the teaching of language under the concept of 'Issues relating to Adolescence' and 'Health and Reproductive health'. The concept of 'Sustainable Development' under language learning also provides some insight into this goal. Other than this the goal is only found in class V environmental studies theme, 'Water'; where it is indirectly covered under the sub-theme 'Mosquitoes and malaria'.

4. **SDG4 - Quality Education:** Goal 4 is addressed mainly through language learning through the concept of 'Sustainable Development'. Nowhere the curriculum introduces the SDGs and their associated targets to the learners as proposed by UNESCO. But students are introduced to the concept of Our Pasts, Human Rights, Diversity and Understanding the World, which can be considered as part of quality education to enable learners to develop a better understanding about the SDGs.

5. **SDG5 - Gender Equality:** Goal 5 is not found to hold many places in the curriculum. It is addressed through the concept of 'Human Rights' and 'Sustainable Development' under

language learning as well as faintly under the concept of 'Democracy and Equality' in Class VI social sciences.

6. **SDG6 - Clean Water and Sanitation:** Goal 6 is found to be holding a very strong place within the curriculum. Knowledge about it is imparted to almost all classes. From classes III - V, it is taught under the Theme, 'Water' and 'Shelter' in environmental studies; whereas for upper primary, it is taught under the theme, 'Natural Resources' in sciences and Class VIII, it is also taught under the theme 'Our Environment' in social sciences. Apart from this, language learning also imparts knowledge about goal 6 through 'Conservation of Resources' and 'Sustainable Development'. The learning objectives recommended by UNESCO for goal 6 are well covered in the curriculum.

7. **SDG7 - Affordable and Clean Energy:** Goal 7 is catered through the theme, 'Travel' in environmental studies from class III to V, where the concept of transportation and use of different energy sources for different modes of transportation is introduced to students. For class VIII, it is taught under the theme, 'Natural Resources'. Also, it is found under the concept of 'Conservation of Resources', 'Travel and Tourism' and 'Sustainable Development' in language learning.

8. **SDG8 - Decent Work and Economic Growth**: Goal 8 is presented to learners in many ways through the curriculum. It is introduced as the concept of 'Work and Play Games' and taught in Class III and IV under the theme, 'Things we make and do', where learners understand about the importance of different kinds of work. In Class V the topic, 'Clean Work- dirty work?' helps learners evaluate every kind of work. Further in class VI to VIII, it is covered under the theme, 'Food' in sciences where they learn about crop production and in social sciences under the theme, 'Our Pasts' and 'Resource Development'. Moreover,

in language, the concept of 'Human Rights' and 'Sustainable Development' also put some light on the goal.

9. **SDG9 - Industry, Innovation, and Infrastructure**: Goal 9 is found to be scarcely distributed in the curriculum. The only concepts found to be linked to goal 9 are in class VIII social sciences under the sub-themes, 'Crafts and Industries' and 'Industries'. Other than that, it is only covered under the concept of 'Sustainable Development' in language learning.

10. **SDG10 - Reduced Inequalities**: Goal 10 is mostly addressed through social sciences and language teachings. In class VI and VIII, it is incorporated under the theme, 'Diversity and Interdependence' and 'Democracy and Equality' in social sciences. Whereas in language, it is covered under the concept of 'Human Rights', 'The Nation-diversity' and 'Sustainable Development'. Moreover, it is also hidden in the concept of 'Clean Work - dirty work' in class V.

11. **SDG11 - Sustainable Cities and Communities**: Goal 11 is very well distributed within the curriculum and is taught through many different angles to provide learners with the best understanding. From class III to V, almost all the themes at some point provide learners with the knowledge about the goal. Moreover, from class VI to VIII; learning about the goal is distributed under the theme, 'Food', 'Natural Resources' and 'World of the Living' in sciences. In social sciences, it is found under 'Our Pasts' and in the language under 'Neighbourhoods and Community at large'.

12. **SDG12 - Responsible Consumption and Production**: Goal 12 is presented to students in almost every class through different disciplines and concepts such as 'Food', 'Shelter', 'Things we make and do', 'Water', 'Animals', Natural Resources', 'Conservation of

Resources', 'Forestry', 'Sustainable Development', 'Materials', 'Our Environment', 'The World of Living' and 'Resource and Development'. Although the concept of ecological footprint which is important for the understanding of goal 12, is missing in the curriculum.

13. **SDG13 - Climate Action**: Goal 13 is mainly taken care at the upper primary stage where it is covered under the theme, 'Natural Phenomena', Natural Resources' and 'The World of the living' in sciences. It is also covered in social sciences under the theme, 'The Earth - Our Habitat' and 'Our Environment'. It is also embedded in the language course content within the concept of 'Environmental Issues', 'Disaster Management' and 'Sustainable Development'.

14. **SDG14** - **Life Below Water**: Goal 14 is mainly covered under the theme, 'Water' for class III-V. Further for upper primary, it is incorporated in both sciences and social sciences under the theme, 'The World of the living', The Earth-Our Habitat' and 'Our Environment'. It is also included in language learning within the concept of 'Environmental Issues', 'Conservation of Resources', 'Animals and Plants' and Sustainable Development'.

15. **SDG15 - Life on Land:** Goal 15 is found to be the most strongly embedded SDG in the curriculum. It is taught in almost all the classes and covered under most of the themes. Moreover, it is addressed through all the disciplines.

16. **SDG16** - **Peace, Justice and Strong Institutions**: Goal 16 is incorporated in the course content of language and social sciences. Mainly concepts such as 'Self, Family, Home, Friends and Pets', 'The Nation- diversity', 'The World', 'Peace and Harmony', 'Art and Culture', 'Diversity and Interdependence' and Democracy and Equality' provide knowledge to learners about goal 16.

17. **SDG17 - Partnerships for the Goals**: Goal 17 is found to be the least communicated goal in the curriculum. It is only found to be conveyed through the theme, 'The World- India's neighbours and other countries'. As recommended by UNESCO, motivation to work in teams can be a good start to work towards this goal. There is a possibility that learners through their involvement in team projects in schools are able to develop a better understanding of this goal.

It is clear from the above findings that all the SDGs do not have the same status in the curriculum. Some of the SDGs hold a better position and are covered under various themes and concepts, whereas some other SDGs are weakly represented within the curriculum. Goal 3, 4, 5, 9, 17 do not cover the learning objectives proposed by UNESCO. These goals are mostly based on the social aspect of sustainability and lack a proper place in the curriculum. The findings also highlight that EE components incorporated in mathematics, in general, do not represent any SDG as well there are only a few EE concepts in social sciences that impart knowledge about SDGs. This could probably be another reason that the above-mentioned SDGs lack place in the curriculum as most of the concepts are taught through environmental studies or sciences and these SDGs are not covered by those concepts.

Talking about SDG 13 which deals with Climate Action, the findings from the analysis of the curriculum show that the concepts and topics are not enough for developing better understanding and skills needed for climate solutions. Moreover, the interrelationship between climate change and other SDGs also lacks appropriate demonstration in the curriculum. The basic focus of existing concepts is on providing knowledge about climate-related concepts. Delivering learners with the knowledge and experience about solutions to climate change is not adequately dealt with within the curriculum. More emphasise is required on presenting the climate solutions to the learners so

that they get equipped with the essential knowledge, understanding, and skills required to reverse the climate crisis.

Another reason why all SDGs do not have the same place within the curriculum could be because NCF- 2005 was formulated in 2005 and the SDGs came not existence in 2015. A lot has been changed and prioritized in the time frame of ten years in EE and ESD and as a result, there is a need to develop a more inclusive curriculum where knowledge related to each SDG is provided. As some SDGs within the curriculum fulfil almost all the learning objectives recommended by UNESCO, the resource material provided by UNESCO and other global agencies should be consulted to provide learners with better opportunities to understand the SDGs and work towards achieving the goals.

Implementation of EE curriculum and Best Practices in India

Findings from the literature review on the implementation of the EE curriculum in Indian schools and best practices in teaching EE highlighted some of the key things associated with EE in India. Scholars strongly believe that it is important to impart EE in India in a way that it prepares students to face the environmental challenges (Bangay and Blum, 2010; Bangay, 2016) as well as help them become environmentally responsible (Roberts, 2009). Currently, there are three major pedagogical approaches (infusion, separate subject and extracurricular) that Indian schools employ to impart environmental knowledge (Chhokar and Chandrashekharan, 2006; Gopal and Anand, 2006; Pande, 2011). The States/UTs have the flexibility to choose the approach that they find suitable to them and can also grant freedom to individual schools for determining the pedagogical approach that is best suited to them (Dhankar, 2006; Iyengar and Bajaj, 2011; Fan, 2017). At each level of school education (primary, upper primary, secondary, and senior secondary), the

pedagogical approach for EE is different (Gopal and Anand, 2006; Sharma and Devi, 2012; Kumar, 2013; Bangay, 2016; Fan, 2017).

Further, the findings illustrate that there are different practices and effective methodologies in EE which help students to enhance their understanding of various environmental issues. Most of these practices facilitate in improving the knowledge of students about climate change crisis and actions needed to combat it. National Green Corps Program (NGC) has emerged as a well-established EE program in the country, through which extra-curricular activities promote sustainability amongst students (Roberts, 2009; Bangay, 2016). This program is action-based and focuses on key climate solutions such as water and energy conservation and resource and waste management. This indicates that programs of this nature bring improved understanding, knowledge, and awareness in students through practical learning experiences.

Findings also highlight that NGO's have played a significant role in implementing EE in Indian schools and have collaborated with various educational authorities to create environmental awareness in schools throughout the country. They have been actively involved in promoting EE in schools through various activities such as conducting different EE programs, creating resource material, and providing training to teachers.

Further, findings from the literature review based on the ideas, opinions, views, suggestions of different researchers who worked on EE in Indian schools, are divided into eight themes as follows:

1. **Theme 1- Eco-clubs**: Formation of Eco-clubs in schools is found to be very effective in promoting environmental awareness and pro-environmental attitude in students. Researchers have suggested that schools should form eco-clubs and provide an opportunity to students to participate in various activities and competitions organised by eco-clubs

(Chhokar et al., 2011; Parveen and Nasreen, 2016; Patil, 2006; Roberts, 2009; Sharma et al., 2019).

2. **Theme 2- Practical, Experiential and Activity-based learning**: Researchers have advocated that experiential learning, activity-based learning, practical learning, action-based learning and field research are very effective in enhancing environmental attitude in students and should be an important component of EE (Gopal and Anand, 2006; Hanley et al., 2019; Maji and Sengupta, 2015; Pande, 2001; Patil, 2006; Ramadaoss and Poyya Moli, 2011; Saxena and Srivastava, 2010; Sharma and Devi, 2012; Sharma et al., 2019; T. Ram and Pereira, 2014).

3. **Theme 3- Local or Regional Education**: Scholars have emphasised that region or area-specific EE course are more successful in providing knowledge and developing skills in students (Hanley et al., 2019; Ramadoss and Poyya Moli, 2011). Therefore, they recommend that local environmental issues should be incorporated into textbooks (Nair, 2010). Some researchers also proposed that making local communities' part of EE will help students understand environmental issues and their respective solutions in a better way (Bhowmil and Verma, 2019; Pande, 2001).

4. **Theme 4- Regular Awareness Activities:** Researchers have found that conducting regular awareness activities, such as celebration of environment-related days, camps, nature walk, field trips, game shows, wildlife movie screening greatly improve students knowledge about environmental issues (Alexandar and Poyya Moli, 2012; Bhowmik and Verma, 2019; Kidwai, 2018; Sharma et al., 2019).

5. **Theme 5- NGOs**: NGOs have emerged as a key player in the implementation of EE in schools (Ravindranath, 2009). Researchers have emphasised that schools should work in

close association with environmental organizations that have prior experience to provide a better learning experience to students (Praveen and Nasreen, 2016; Roberts, 2009). Centre for Environment Education (CEE) has been highlighted as one of the major environmental organization working in India to impart EE in schools (Almeida and Cutter-Mackenzie, 2011; Bangay, 2016; Gopal and Anand, 2006).

6. **Theme 6- Textbooks:** It is very much evident from the literature review that textbooks or EE resource material are a key teaching aid in EE (Gopal and Anand, 2006; Kidwai, 2018; Praveen and Nasreen, 2016). The researchers have further suggested that to improve teaching and learning experience in EE, resource material or textbooks must be made more creative by including colourful illustrations on various EE themes (Nair, 2010; Praveen and Nasreen, 2016).

7. **Theme 7- Multi-media & Social Media**: Use of multi-media in the form of videos, movies, animations and other forms is found to be an effective tool in teaching environmental concepts to students especially at primary level (Bhowmik and Verma, 2019; Henley et al., 2019; Nair, 2010; Patil, 2006). Social media could be an effective teaching aid especially in cross-cultural environmental education programs (Henley et al., 2019).

The literature review also points out at some of the important issues with the current EE pedagogical approach. It is found that there is a gap between theoretical learning and practical application in the Indian education system, rendering the current curriculum unable to provide students with an understanding of the ways to solve various environmental problems (Bhowmik and Verma, 2019; Maji and Sengupta, 2015). Moreover, the methodology to teach EE is more science-based and lacks the social aspect to it (Iyengar and Bajaj, 2011). Researchers have further

suggested that broadening of the current approach to EE is necessary by incorporating practical concepts, socio-culture aspects, immediate environment as a learning tool and region-specific course material (Bhowmik and Verma, 2019; Maji and Sengupta, 2015; Nair, 2010; Pande, 2001; Ramadoss and Poyya Moli, 2011; Sharma et al., 2019). Another issue that has emerged from the review of literature is that the EE program and pedagogical approaches lack a proper evaluation technique and feedback mechanism (Roberts, 2009). It is stressed that behavioural and attitudinal changes in students should be evaluated through methods based on the practical application of knowledge gained by students (Pande, 2001; Saxena and Srivastava, 2012).

In general, theoretical pedagogical approaches are commonly used to impart EE in Indian schools but there are special programs funded by Ministries that go beyond the conventional teaching strategies and provide students with experiential learning opportunities. It is also important to understand that students not only need knowledge related to environment and sustainability issues, but they also require the skills and attitude to find solutions to these problems. A more practical approach to EE can help students in developing pro-environmental attitudes, behaviours, understanding and skills.

Summary

This chapter examines in detail the findings of the analysis of the EE curriculum and literature review. The analysis shows that though SDGs are incorporated in the EE curriculum at primary level, all the SDGs do not have the same status within the curriculum. Some SDGs are taught through different concepts, topics, and themes, whereas knowledge about other SDGs is imparted very scantly. The concepts and topics related to Goal 3, 4, 5, 9, 17 do not cover the learning objectives proposed by UNESCO.

Findings from the literature review show that three approaches: Infusion, Separate subject, and Co-curricular activity are used in implementation of EE in Indian schools. The States & UTs have the liberty to choose an approach which they deem suitable for their students. Moreover, it also highlights teaching & learning practices that are effective in EE in India: The association of environmental NGO's with schools; setting up of eco-clubs in schools; activity and experiential learning; local and community-focused learning; conducting regular awareness activities; creative resource material and, the use of multi-media & social media are some of the effective practices in imparting EE in Indian schools.

The last chapter will conclude what findings of this paper reveal about the implementation EE in Indian schools.

Chapter 6

CONCLUSIONS

This study investigated which concepts and topics in Indian national EE school curriculum and pedagogical approaches are meant to help learners to understand sustainability and climate change issues, as well as meant to prepare them to solve these issues. Findings from the analysis of the EE curriculum reveal that at primary level and upper primary level, students are provided with knowledge about SDGs through various topics, concepts, themes in different disciplines. However, all UNSDGs are not given equal importance in the curriculum. Some goals are poorly addressed in the curriculum and their connection with other goals is also not well represented through the existing concepts and themes in the curriculum. It is also evident that most SDGs are introduced through environmental studies and sciences and knowledge related to only a few goals is embedded in the discipline of social sciences. It is also interesting to see that the concept of 'Sustainable Development' is introduced to learners through the teachings of language and not through sciences or environmental studies.

Through the curriculum, goals are introduced to the learners as components of their immediate environment. Students are encouraged to understand the concepts as a part of the real-world, both natural and social. However, learners at this level need more and better understanding to explore solutions to issues surrounding these goals. There is a possibility that knowledge related to the achievement of these goals is imparted at a higher level of education, but this is something which needs to be explored through further research.

It is clear from the findings that there are only a few EE concepts in social sciences that impart knowledge about SDGs, thus more concepts must be incorporated into social science teaching that

talks about SDGs and their importance. Some goals are well represented in the curriculum, but students must learn about these as components of sustainable development. The concept of sustainable development needs to be more deeply placed within the curriculum. Apart from providing knowledge about each SDG, it is also important that the relevance of each SDG in achieving sustainable development is also explained to the learners.

Findings from the analysis of literature review show that EE is implemented through three pedagogical approaches: infusion, separate subject, and extra-curricular activities in Indian schools (Chhokar and Chandrashekharan, 2006; Gopal and Anand, 2006; Pande, 2011). Every state has the liberty to pick-up an approach that they consider is suitable for their students and schools. It is also interesting to see from the findings that different pedagogical approaches are adopted for EE at a different level of school education (primary, upper primary, secondary, and senior secondary). These findings highlight that theoretical approaches which mainly consists of teaching various environmental concepts through textbooks are the most common method of imparting EE to students (Gopal and Anand, 2006; Kidwai, 2018; Praveen and Nasreen, 2016). However, there are EE programs at the national level that provide students with practical learning opportunities (Roberts, 2009; Bangay, 2016).

It is also clear from the findings of the literature review that pedagogical approaches that involve practical learning are more effective in helping students in developing pro-environmental attitudes, behaviours, understanding and skills. Many researchers both in India and around the world have emphasised that activity-based learning and experiential learning are the most effective methods in EE (Gopal and Anand, 2006; Hanley et al., 2019; Karpudewan and Mohd Ali Khan, 2017; Maji and Sengupta, 2015; Pande, 2001; Patil, 2006; Ramadaoss and Poyya Moli, 2011; Saxena and Srivastava, 2010; Sharma and Devi, 2012; Sharma et al., 2019; T. Ram and Pereira, 2014; Tucker

and Izadpanahi, 2017). The presence of eco-clubs in schools offers students an opportunity to participate in co-curricular activities that effectively create awareness amongst them (Chhokar et al., 2011; Parveen and Nasreen, 2016; Patil, 2006; Roberts, 2009; Sharma et al., 2019). The need to have region-specific courses that involve learning about local issues is also stressed as these help students to understand environmental and social issues in their immediate surroundings (Hanley et al., 2019; Ramadoss and Poyya Moli, 2011). Moreover, involving local communities and providing indigenous knowledge to students is considered an effective approach to provide a better understanding of sustainability (Bhowmil and Verma, 2019; Pande, 2001).

It is also evident from the analysis of literature review that contribution of NGO's in imparting EE in schools across India is huge (Praveen and Nasreen, 2016; Ravindranath, 2009; Roberts, 2009). They have been involved in the implementation of EE at every step: planning, developing resources, training, guidance, execution, and evaluation. Many such NGOs with prior experience must be involved in the process to make learning more effective for students. Furthermore, the use of multi-media to disseminate environmental related knowledge is an effective technique which creates a better understanding among students about environmental-related issues at primary level (Bhowmik and Verma, 2019; Henley et al., 2019; Nair, 2010; Patil, 2006). Multi-media and social media also prove to be effective teaching aids for online EE courses, EE exchange programs and in scenarios where travelling is not possible (Henley et al., 2019).

The EE curriculum in India involves teaching that focuses on SDGs, but more concepts must be added to enhance the understanding of the students. Moreover, it is also important that the interrelationship between various SDGs is explained thoroughly to the students through the EE curriculum. The teaching about climate action also needs to be strengthened within the curriculum. Pedagogical approaches and effective practices that enrich the learning experience of students

about sustainability and climate solutions should be more aggressively applied in EE. The pedagogical approaches in EE are more theoretical than practical and this gap needs to be filled through providing more experiential learning opportunities to the students. Also, it is required that the concepts related to the social aspect of sustainability are also improved within the curriculum to provide students with a holistic understanding of the concept.

The research paper has enriched my understanding of EE in general and approaches in the implementation of EE in Indian schools, in particular. The research shows that learning of SDG's needs to be refined within the Indian curriculum, so as to provide learners with the ability and opportunity to make a meaningful contribution in achieving these goals. Moreover, it has also made me understand that current theoretical pedagogical approaches, which are being used in schools to teach environmental issues, are insufficient and as such these require periodic revision and up-gradation to make learning a more effective and joyful experience for learners. It has also provided me with a thought on how more research is needed to explore the potential of multi-media and social media in making EE a more effective tool for learners.

Chapter 7

RECOMMENDATIONS

This chapter will throw light on some of the recommendations for improving EE teaching and learning experience in general, as well as the Indian context, in particular. Based on the findings and discussions of the present study, the following recommendations are suggested:

- EE curriculum should be updated to include concepts and topics that provide a strong understanding of each SDG as well as their inter-relation.

- Existing topics and concepts of the EE curriculum should be imparted to the students with a focus to develop a better understanding of the association of these concepts with sustainability by deeply connecting them to their everyday life experiences.

- All three aspects of sustainability, i.e., environmental, social, and economic should be given equal importance within the curriculum.

- Improving and updating the existing theoretical pedagogical approaches involved in EE by involving more creative teaching and learning tools; involving students in the decision-making process, and motivating students to participate in questioning and discussions is essential for providing students with better and enhanced practical and experiential learning opportunities.

- There should be an increased application of multi-media and social media in teaching and learning of EE for creating an intensive as well as an extensive impact based on the analysis of the literature review. There is also a need to further investigate and explore the capacity and capability of multi-media & social media in creating effective learning opportunities for students in EE.

- Findings of the study call for further research on the concept of Environmental Education curriculum and its implementation at different levels of education, with reference to Sustainable Development and Climate Action.

In general, more research work is needed to analyse the EE curriculum at various levels of education to develop a comprehensive understanding of the role EE curriculum plays in imparting ESD to students.

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