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## **Sustainable Curriculum Mapping: Assessing the Alignment of NCERT Science Textbook with Green Skills among Students at Middle School Level**

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### **Abstract**

Green skills are an important prerequisite for transitions to sustainability. Development of green skills helps in establishing the framework for building a sustainable future. It further encourages learners to act and behave in a way that promotes sustainable development. Adaptation of analytical approaches to global environmental issues and their resolutions can only be achieved by developing green skills among learners. Including consciousness about environmental issues in the education system can be an aspect of promoting green skills and it can be achieved at the ground level by including related concepts in textbooks. New NCERT textbooks based on the recommendation of NEP 2020 and NCF-SE 2023 tries to capture the essence of education for sustainable development. Keeping the same in mind, this paper tries to identify teaching-learning material and platform provided by NCERT Science textbook of class 6<sup>th</sup> in order to develop green skills among students. Content analysis technique was used to fulfill the objective. Data obtained were analyzed by using thematic analysis technique and themes were identified. Key findings of the study suggested that new NCERT Science books is designed to facilitate a platform for instructions and hands-on activities that can help in the development of green skills among students

*Keywords:* Green skills, sustainability, development of skills, NCERT, science textbook, environment, content analysis

## **Introduction**

In order to achieve sustainable development goals it is important to shift the focus on more ecological and environment friendly production and consumption in developing countries like India. Orientation in this area required spreading awareness among the mass of the nation which further helps in the development of related attitudes and belief systems. NEP 2020 suggested that transformation is required in the manner we impart knowledge to make children more capable of using the available technologies sustainably. It also advocates prioritization in the area related to environmental preservation, green initiatives and sustainable practices like sustainable farming and so on. NEP 2020 promotes the inclusion of competencies, skills and abilities in curricula that might raise students' sensitivity to environmental preservation and sustainable development at the school level. According to the National Curriculum Framework for School Education (NCFSE, 2023), education should equip students with sustainable solutions that maintain the dynamic equilibrium between human well-being and the environment. Living in harmony with nature is the main goal of the Viksit Bharat Abhiyaan, which aims to be accomplished by 2047. In keeping with the objective of sustainable development, the Viksit Bharat Abhiyaan primarily debates how to coexist with the environment in the most beneficial manner. Developing green skills among individuals can be an action that might contribute to establishing a connection with nature and achieving sustainability.

## **Green Skills**

Green skills are thought to be a crucial prerequisite for sustainable shifts. But how one can conceptualize these green skills is important to understand. In simpler terms it can be understood as the knowledge, skills, beliefs, and attitudes required to live in, build, and support a society that lessens the adverse effects of human conduct, behavior and activities on the environment. It can be categorized as skills that are generic in nature on the one hand and technical in nature on the other. Generic green Skills are the abilities that increase efficient utilization of resources, promote consciousness regarding environmental activities and transition, modify present work habits, and promote sustainable citizenship. Technical green skills are the abilities that concentrate on putting standards and procedures into place to safeguard biodiversity and ecosystems, abilities to cut down on materials, energy, and water use, and highly specialized abilities to create and apply sustainable technologies (such as recycling, sewage treatment, renewable energy, and adaptation of current energies).

Cedefop (2014) called it as the knowledge, skills, beliefs, and attitudes required to live in, build, and support a society that lessens the impact of human activities on the environment. UNIDO (2021) explains green skills as the knowledge, skills, beliefs, and attitudes required to live in, create, and support a sustainable and resource-efficient society. The International Labour Organization (ILO, 2015) of the United Nations makes a clear connection between green skills and the idea of a "just transition" to ecologically sustainable businesses. The idea of green skills is incorporated into education by UNESCO International Centre for Technical and Vocational Education and Training (UNEVOC, 2014). According to it, green skills are the abilities that stakeholders are required in order to get assistance in adapting “products, services and processes” to the demands of the environment and climate change. In the green skill agreement of Australia

(2007), green skills are denoted as skills for sustainability. The organization defined them as vocational abilities, knowledge, beliefs, and attitudes required by personnel in order to create and promote sustainable social, economic, and environmental impacts on business, industry, and the community.

Available literature describe Green skills as "knowledge, skills, values, and attitudes" for sustainable environmental practices. It can be stated that the reduction of carbon footprint and the net-zero challenge are examples of green skills that inform relevant policy domains (such as industrial strategy and the environment) to promote environmentally friendly innovations for both economic development and environmental sustainability. Development of green skills among learners would make them competent so that they can reduce the environmental impact of their work. These skills are not limited only to improving resource efficiency, encouraging biodiversity, lessening environmental pollution and degradation, decreasing global warming, and minimizing carbon emissions. Green skills help in enhancing working conditions, lessen poverty, social inequality, and geographical differences, and encourage empowerment, co-determination, and involvement. Since it provided us with the information, beliefs, and abilities required navigating a world increasingly characterized by environmental issues and a shift to a sustainable economy, acquisition of green skills by the young members of society is extremely important. Further the main objective of Education for Sustainable Development (ESD) focuses on making the learners environmentally literate, responsible citizens, and prepared for future careers. It can be achieved by developing Green skills among learners.

### **Development of Skills**

Thinking about development of any skill required to answer *what* kind of skill required to inculcate. Here the answer is Green Skills. The next step is the kind of procedures required for it. The purpose of this paper restrict for identifying deep psychology behind the process of skill acquisition. It only discusses some teaching-learning strategies related to the development of green skill during the teaching-learning process. It included the following

1. Working in collaborative Projects with classmates (for example making compost using the process of vermicomposting)
2. Involving in mentorship program by the teacher and provide scaffolding to the students (helping students setting goals and working in the direction to reached to the expected outcome)
3. Attending training sessions and workshops (for example the kind of sustainable practices one can adopt in their life and so on)
4. Innovative approaches to problem based learning (like engaging in task like green audit for any particular area of school)
5. Providing proper stimulations that can be visual or auditory using content available in the form of textbooks.

Engaging in any kind of the above said strategies make student capable of developing skills deliberately. Further retention and modeling of the learned behavior allowed students to internalize the associated skills. As the individual start reproducing the same learnt behavior, the associated skills get acquired. On the basis of these associations one can conclude that textbooks plays a pivotal role in providing the content to get engaged in various teaching-learning strategies. Teachers can used these strategies and facilitate acquisitions of skills further.



### **Method and Tools**

Classroom interaction with the teachers and engagement in the teaching learning activities using teaching learning materials (like books, models, field visits etc.) can help in providing a platform to develop various skills and capabilities among students. Keeping the same in mind this paper was trying to explore the role played by NCERT science textbook of class 6th in developing green skills among students. The role played by NCERT science textbook was operationally defined as how the following were facilitated by NCERT textbooks in the available content

1. The idea of the adoption of sustainable lifestyle by the students
2. Development of environmental consciousness, ecological sensitivity and awareness among students
3. Sense of living in peace and harmony with nature with an idea of coexistence and interdependence.
4. Practices related to conservation of resources and management of waste

Descriptive analysis approach of qualitative research designs was adopted. Content analysis technique was used to identify the text (including activities, exercise, key concepts, summary, figures, pictures and tables) related to the various domains of green skills. Thematic data analysis technique was used to analyze data where analyzed content of the textbook was coded and categorized under the broad heading i.e.

1. Content related to Environmental Awareness
2. Content related to Living in harmony with nature
3. Content related to Environmental consciousness

4. Content related to Sustainable lifestyles including Waste management and Ecological sensitivity.

The study was significant to all the stakeholders engaged in the environment and education related field. This study also shed light on the traditional methods of environment protection and conservation as quoted in textbooks that can be easily used with children to develop green skills.

### **Data Analysis**

#### ***Content pertaining to environmental awareness in the sixth-grade NCERT Science textbook***

Chapter number 11, “Nature's Treasures”, had content pertaining to environmental awareness that dealt with conveying information. The chapter contains information about every aspect of nature, with the exception of food.

**Table 1**

#### ***Content Pertaining to Environmental Awareness***

<b>S.No</b>	<b>Component of environment</b>	<b>Chapter</b>	<b>Page</b>	<b>Content of the book</b>
1	Water	11	212	“Have you ever noticed plastic bags and wrappers floating on the surface of water? We pollute freshwater sources by throwing trash (waste materials) in them. Waste from homes and industries pollute our water sources when it is dumped into them”



2	Forest (trees) (Natural habitat)	11	217	“From ancient times, India had a tradition of respecting, protecting and preserving forests. One such effort is the famous Chipko movement. It started in the early 1970s in Uttarakhand. Local women actively participated in this movement. They encircled and hugged the trees to protect them from being felled.”
3	Soil	11	221	“Rocks play a vital role in our lives. It takes thousands to millions of years to form rocks. Therefore, it is important to conserve and use them responsibly.”
4	Air	11	223	“Over-dependence on fossil fuels for transportation and as domestic fuels has resulted in large scale air pollution”

***Content related to Living in harmony with nature in the NCERT Science textbook***

There were five chapters i.e. Chapter 2, “Diversity in the living world”; Chapter 3, “Mindful Eating: A Path to a Healthy Body”; Chapter 8, “A Journey through States of Water”; Chapter 9, “Methods of Separation in Everyday Life”; and Chapter 11, “Nature's Treasures”, contained content pertaining to living in harmony with nature or coexisting peacefully with nature. Content available in these chapters deals with cultivating a perspective that sees nature, all living things, and people as interrelated and interdependent.

**Table 2**

*Content Pertaining to Living in Harmony with Nature*

S.No	Component of environment	Chapter	Page	Content of the book
1	Food	3	54	<b>“Reducing food miles</b> is important because it helps to cut down the cost and pollution during its transport, it helps support local farmers, and it also keeps our food fresher and healthier”.
2	Water	8	159	”The number of people using water is increasing with a rise in population. The increasing demand for water causes its shortage in many parts of the world. Hence, it is very important to <b>use water wisely and avoid wasting it</b> . Let us keep our water bodies free from pollution.”
3	Water	8	161	“Usually, when sludge is removed from drains, it is left in heaps next to the drain for 3–4 days. Afterward, it is transported to a garden or a field where it can be used as manure. This approach <b>reduces transportation cost of the sludge and enhances the safety of individuals handling it.</b> ”

4	Water	9	173	“Awareness <b>about the issues of river and ocean pollution</b> by composing a poem. A few lines have been written and remaining lines were expected from the children to be filled (Plastic stuck in the neck of a fish and he is crying with pain and asking help from his fellow fishes)”
5	Forest (trees) (Natural habitat)	11	224,	“Not to pluck fruits to ensure that there would be enough fruits for other animals and birds. The seeds from the droppings of animals and birds would <b>enable new trees to grow</b> , though it would take some years before we get fruits from these new trees.”
6	Air	11	228	“Explain two ways in which human activities pollute the air. <b>Propose one action</b> which can help in reducing air pollution.”
7	Biodiversity	2	29	“Western Ghats and the availability of Sacred Groves”

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***Content in the NCERT Science textbook related to Environmental consciousness***

There were three chapters i.e. Chapter 3, “Mindful Eating: A Path to a Healthy Body”; Chapter 8, “A Journey through States of Water”; and Chapter 11, “Nature's Treasures” deals with

the content pertaining to environmental consciousness, which deals with developing a mindset that involves realizing how one's actions affect the environment and making an effort to mitigate those effects.

**Table 3**

*Content pertaining to Environmental consciousness*

S.No	Component of environment	Chapter	Page no	Content of the book
1	Food	3	55	“How would <b>eating local food</b> help reduce food miles?”
2	Water	8	162	“Reflect on the statement — <b>Water is our responsibility before it is our right.</b>    Share your thoughts.”
3	Water	11	212	“Do you feel that water is <b>being used efficiently in our daily activities?</b> Have you observed water being wasted in your daily activities?”
4	Water	11	213	“ <b>Identify other human activities</b> that lead to water pollution. Discuss with your friends in the class what you can do to reduce water pollution.”

5	Water	11	213	“It is important for us to conserve water and use it judiciously. We <b>must also prevent it from being polluted</b> so that water remains fit for consumption by all living beings. In what ways can you conserve water?”
6	Forest (Natural habitat)	11	217	“What are the <b>consequences of cutting a large forest area?</b> ”
7	Overall natural resources	11	225	“We must conserve our natural resources and use them responsibly without wasting them. This way, we can continue to fulfill our present needs while also saving for the future, without harming the environment.”
8	Air	11	228,	“How can you contribute towards enhancing the green cover of your locality? Make a list of actions to be taken.”

9	Air & Land	11	229	“There is an increasing demand for trees to meet the requirements of industries and for housing. Therefore, trees are being felled. Is it justified? Discuss and prepare a brief report.”
10	Water	11	228	“Propose a plan to use less water in your school. What steps would you take to make this plan happen and how would it help the environment?”
11	Air	11	230	“Investigate the effect of air pollution on human health by interacting with your elders or community members and identify the main sources of air pollution in your local area. Based on your findings, suggest two practical steps that your school or community could take to help reduce air pollution.”

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***Content in the NCERT Science textbook related to Sustainable lifestyles like waste management and ecological sensitivity***

Two chapters, “Mindful Eating: A Path to a Healthy Body” and “Nature's Treasures”, contained content concerning sustainable lifestyles that deals with demonstrating behaviors

related to promoting fair socioeconomic development and an improved standard of living for everyone while reducing environmental degradation.

**Table 4**

*Content Pertaining to Sustainable Lifestyles*

S.No	Component of environment	Chapter	Page	Content of the book
1	Water	11	211	“How do you feel when you cannot get water to drink, especially when you are thirsty?”
2	Water	11	211	“Teaches them how to water the plants so that every drop is used and none of it goes to waste.”
3	Water	11	212	“What can you and your family do to reduce this wastage of water? There are many ways to reduce wastage of water. For example, turning off taps when not in use and fixing water leakages. Recycling water and water harvesting also help in saving water.”
4	Food	3	55	“Many people waste food, leaving it unconsumed on their plates. One must remember the time and effort put by our farmers and other community members in getting the food from the farm to our plate. <b>We must take only as much</b>



**food as we can consume. It would reduce food wastage.”**

5	Air	11	223	“Conserve the fossil fuels by— Walking or cycling to nearby places. < Using public transport. Suggest some more ways.”
6	Air	11	224	“There are electric vehicles that do not release any smoke. So, people are making an effort to create alternatives.¶ Can you list some alternatives for reducing air pollution?”

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### **Result, Discussion and Conclusion**

Acquisitions of green skills among students probably give rise to a generation of pro-planet individuals characterized with their adopted life style towards usage of sustainable and environmental conscious practices. Green skills were ingrained in pupils via educating them about the judicious use of the environment and its components and encouraging sustainable production and consumption behaviors. Students' interactions with the textbooks might be crucial to it.

The present study tries to assess the alignment of NCERT Science textbook of class 6th with Green skills. The findings of the study indicated that

1. Out of 12, 5 chapters have some concepts related to life style for environment (LIFE) that can help students to adopt Pro-planet peoples and adopt pro-planet habits that do not interfere with nature and are in harmony with it.

2. One chapter (11) named “Natures’ Treasures” deals with maximum concepts related to the environment. In total 27 activities/learning experiences were identified that deal with connecting to Nature, out of which 20 activities/learning experiences were identified from chapter no 11.
3. Maximum numbers of activities/learning experiences deals in developing Environmental consciousness about what one can do at individual level to achieve it.
4. Maximum numbers of activities/learning experiences related with Water saving i.e. 13, followed by Air (Pollution) i.e. 7. Activities/learning experiences related to sustainable food related practices and protection of natural habitat like forest were 3 in number. Only 2 activities/learning experiences were related to land and soil
5. There were no activities/learning experiences related to energy saving, reduction in plastic use, adoption of healthy life style and waste reduction
6. There were many incidents where the content of the book explained that people from rural areas and villages seem more connected with nature due to their traditional practices of waste management, food habits etc.

On the basis of the content analysis of NCERT Science textbook of class 6<sup>th</sup>, it can be concluded that the book is designed to facilitate a platform for instructions and hands-on activities that can help in the development of green skills among students. The learning experiences available in the book provide the students with the opportunity to think about our environment, working for its wellbeing and develop into environmentally conscious individuals. Content was already embedded within the science textbook so there is no need of increasing more books in the name of Green skill development or Green education for the students.

Although the book has rich content related to the environment and its connection with human beings, only successful transactions of these learning experiences can decide how much the children would benefit from it.

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