Student Perceptions of Environmental Education in India

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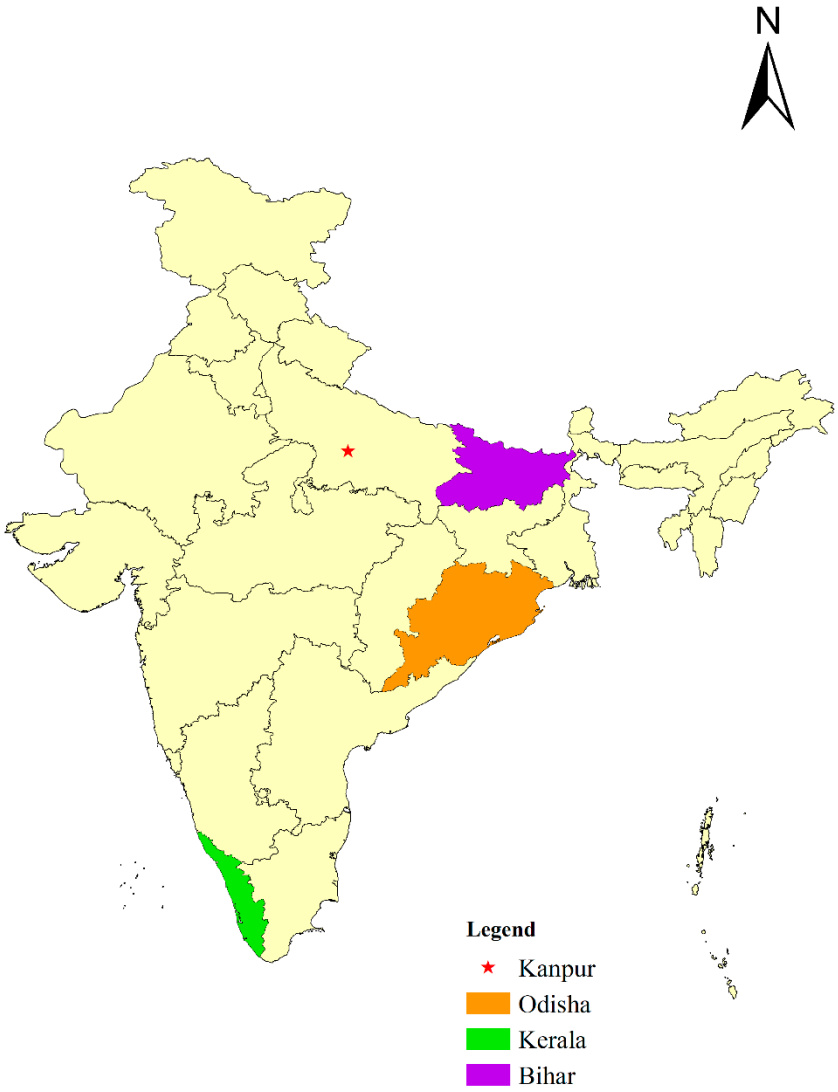

State	Land Area (sq. km)	Population (in crores) (Census 2011)
Bihar	94,163	10.41
Kerala	38,863	3.34
Odisha	155,707	4.19

Figure S1. Map of India showing study location (Kanpur) and state of Odisha, Kerala, and Bihar along with the land area and population.

School Survey

1.	**Gender**	☐ M	☐ F	**Class:**	
2.	**Have you heard the term Climate Change?**			☐ Yes	☐No
3.	**Have you heard the term Sustainable Development?**			☐ Yes	☐No
4.	**Have you heard the term Carbon Footprint?**			☐ Yes	☐No
5.	**Have you heard the term Global Warming?**			☐ Yes	☐No
6.	**Do you believe that climate change will impact your daily life**			☐ Yes	☐No
7.	**Do you know what causes climate change?**			☐ Yes	☐No
8.	**List any one consequence of climate change**				
9.	**From where did you learn about climate change/environment?**			☐ School ☐ TV ☐ Newspaper ☐ Social Media ☐ Friends/Relatives ☐ Parents ☐ Others (Please specify)	
10.	**In your opinion, do you think the temperature on Earth has been rising over the past years?**			☐ Yes	☐No
11.	**Do you participate in sustainability/climate change-related events or initiatives?**			☐ Yes	☐No
12.	**Do you participate in any tree plantation Event?**			☐ Yes	☐No
13.	**Do you think that our daily activities can make a difference in tackling climate change?**			☐ Yes	☐No
14.	**Do you turn off lights and electronics when not in use?**			☐ Yes	☐No
15.	**Do you turn off the water tap while brushing your teeth?**			☐ Yes	☐No
16.	**In your opinion, what is the most effective way to raise public awareness about climate change**			☐ Newspaper campaigns ☐ Educational programs ☐ Organising more lectures and talks ☐ Social Media Campaigns (on Facebook, Instagram, WhatsApp)	
17.	**Do you think that activities related to sustainability and climate change should be increased in schools?**			☐ Yes	☐No

Figure S2. Sample Questionnaire survey used in the present study.

Table S1. Standard Definitions of Terms used in the present study

Term	Definition	Reference
Climate Change	It refers to long-term shifts in temperatures and weather patterns, mainly caused by human activities, especially the burning of fossil fuels.	[45]
Climate Change Education	It is learning geared toward helping people address and develop effective responses to climate change. CCE aims to foster learning and knowledge about climate change to help people develop effective responses, adopt more sustainable ways of living, and demand greater change from society at large	[10]
Climate Change Mitigation	Ti is defined by the United Nations as a human intervention to reduce the sources of greenhouse gas emissions primarily linked to human actions of production and consumption	[46]
Climate Change Adaptation	It refers to building resilience and reducing the vulnerability of natural and human systems to the impacts of CC. The ‘'adaptation'' dimension involves developing the knowledge, skills, and dispositions to better cope with already evident and looming climate impacts. It usually has a strong local focus	[46]
Carbon Footprint	It refers to the total amount of greenhouse gases, primarily carbon dioxide and other emissions like methane, that are emitted directly or indirectly by an individual, organization, product, or activity throughout its lifecycle. It is typically measured in units of carbon dioxide equivalent (CO2e) and expressed as the equivalent amount of CO2 emissions that would have the same global warming potential over a specified time period.	[47]
Education for Sustainable Development	It is a holistic and interdisciplinary educational framework that seeks to foster the knowledge, skills, values, and attitudes necessary for individuals and societies to effectively address global challenges related to sustainability, such as environmental degradation, social inequality, and economic instability. It integrates principles of environmental stewardship, social equity, and economic viability into educational curricula and practices to empower learners to make informed decisions, engage in responsible behavior, and contribute to the well-being of present and future generations. ESD is also sometimes referred to as Education for Sustainability.	[9]
Environmental Education	It is a learning process that increases people's knowledge and awareness about the environment and its associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action. [6]	[8]
Environmental Literacy	It refers to knowledge and awareness of environmental issues. It also refers to positive involvement and attitude among students towards environment.	[48]
Sustainability	It refers to "meeting the needs of the present without compromising the ability of future generations to meet their own needs”	[49]
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs	[50,51]
Sustainable Development Goals	These are a universal call to action to end poverty, protect the planet, and improve the lives and prospects of everyone, everywhere. SDGs were adopted in 2015 by the UN. The UN-SD Agenda to be achieved by 2030 includes 17 SDGs and 169 targets [The signatory countries worldwide have committed to taking action to meet these goals]. The efforts include making energy clean and affordable, stopping global warming, and creating sustainable cities and communities.	[52,53]

Table S2: Variation with student education level to response related to the closed-ended question about belief in the earth's temperature rise. [N (% the valid responses obtained from students present in a class during the survey)]

Class	Q. Is the temperature of the earth rising?		Total Responses
	No	Yes	
6	18 (20)	72 (80)	90
7	10 (8.5)	108 (91.5)	118
8	7 (4.5)	150 (95.5)	157
9	12 (7)	159 (93)	171
10	7 (4.9)	136 (95.1)	143
12	3 (3)	96 (97)	99
Total*	**57 (7.3)**	**721 (92.7)**	**778**

Total* represents total valid responses across all classes.

Table S3: Variation with student education level to response related to the closed-ended question about the belief that our daily activities can help combat environmental issues. [N (% the valid responses obtained from students present in a class during the survey)]

Class	Q. Can our daily activities help combat environmental issues		Total Responses
	No	Yes	
6	39 (45.3)	47 (54.7)	86
7	16 (14)	98 (86)	114
8	16 (10.3)	139 (89.7)	155
9	15 (8.7)	157 (91.3)	172
10	14 (9.9)	127 (90.1)	141
12	3 (3.1)	93 (96.9)	96
Total*	103 (13.5)	661 (86.5)	764

Total* represents total valid responses across all the classes.

Table S4. Schemes for promotion of environmental literacy initiated by Govt. of India/ Central institutes. (The data for the different programs has been obtained from different websites, which are noted under Reference and the authors have interpreted the program objective in terms of Indian context)

S.No.	Program/ Initiative	Program objectives	References	Indian context in relation to international vocabulary
1	Strengthening Environment Education in School System (StrEESS)	To raise awareness about the reasons for environmental deterioration and to recommend ways to prevent behaviors that hurt the environment. To foster an attitude conducive to environmental protection measures.	[54]	EE
2	Environment Education Programme (EEP)	To promote responsibility for the environment and the wise use of its resources. To use skills and knowledge to protect, safeguard, and use the environment well for coming generations.	[55]	EE
3	Environment Education, Awareness, Research, and Skill Development (EEARSD)	To organize training sessions on sustainable living encouraging young people to think critically and develop lifestyles compatible with the natural world. To augment the classroom knowledge that children and the younger generation learn with practical experience from the surroundings and hands-on learning.	[56]	EE, ESD
4	National Green Corps (NGC) Programme	To create awareness among school students about environmental concerns and the significance of conservation efforts. To develop skills such as observation, experimentation, survey, recording, analysis, and reasoning requisite for conserving the environment through various activities.	[57]	EE
5	District Level Teacher Training Programme (Government of India)	To train teachers about environmental awareness schemes, programs, and initiatives. To enable teachers to motivate and stimulate students about environmental problems and their solutions.	[58]	EE, CCE
6	Environmental Education in Teacher's Training Institutes	To elaborate on the teaching methodologies suitable for environmental issues and updates. To develop research attitude and decision-making abilities towards the environment and sustainable living.	[58]	EE, ESD, CCE
7	Paryavaran Mitra Programme	To involve the entire community by introducing the Paryavaran Mitra programme in schools.	[59]	EE

	(Translation: friend of the environment)			

Table S5: Initiatives for the promotion of environmental awareness and community involvement by Northern states

S.No.	Program/ Initiative	Programme Goals	Implementation/initiation	State (Reference)
1.	Uttar Pradesh Yuva Paryavaran Leader programme	To establish a cadre of enthusiastic young students across the state to act as role models within their schools and communities, initiating sustainable development efforts.	Centre for Environment Education (CEE) in collaboration with Uttar Pradesh Pollution Control Board (UPPCB).	Uttar Pradesh [60]
2.	Children Forest Programme	To make students aware of the advantages of forests and the consequences of deforestation. To promote environmental conservation and protection.	CEE with support from the Uttar Pradesh Forest Department.	Uttar Pradesh [61]
3.	School Eco Club Action (SECA)	To focus on action-oriented activities related to sustainability issues such as waste management, recycling, greening, biodiversity, natural resource conservation, renewable energy, and traditional knowledge.	CEE, with the financial assistance of the United States Consulate Kolkata	Bihar [62]
4.	Earthian - Paryavaran Mitra Programme	To guide educators in implementing sustainability focused education (SfE) within their respective educational institutions.	CEE North conducted this workshop in the cities of Patna and Bettiah districts.	Bihar [62]
5.	Young Advocates for Clean Air	To actively involve students in raising awareness among their community and peers about effective strategies for mitigating air pollution within the city.	CEE conducts this programme, supported by the US Consulate General of Kolkata.	West Bengal [63]
6.	Project Urja Chetna	To implement community service projects by schools to encourage students to generate awareness and action on energy conservation.	CEE	West Bengal [63]
7.	Science Express Climate Action Special (SECAS)	To create awareness about environmental issues among students and the local public in West Bengal.	CEE started this program in collaboration with the Dept of Environment, Government of West Bengal	West Bengal [63]
6.	Trees Outside Forests in India (TOFI)	To support global CC mitigation by bringing together farmers, businesses, and other private organizations to rapidly extend green cover outside typical forests in the stat.	Forest, Environment and Climate Change Department, Govt. of Odisha, started this programme in collaboration with the US Agency for	Odisha [64]

			International Development (USAID).	
7.	The Green School Project	To create awareness among students on climate change and how a sustainable lifestyle can help mitigate the adverse impact of climate change.	The Energy and Resources Institute (TERI), in association with Tata Steel Limited (Conducted in school campuses in the operational areas of Tata Steel.)	Odisha [65]
8.	Environmental Leadership Bootcamp	To provide experiential knowledge to the students required to address environmental concerns and build climate awareness.	Government of Delhi	Delhi [66]

Table S6: Benefits of upgradation of teaching strategies (Sources: Information has been collated from online available reports of UNICEF, UNESCO, non govt. organizations and journal articles References numbered [6], [38], [67], and [39])

S.No	Objective and suggested activities	Benefits
1	Promote field-based and project-based learning activities. - Integrate local action projects. - Incorporate biodiversity mapping, air pollution monitoring, and water quality monitoring. - Include educational trips in the curriculum.	Field trips can allow students to witness and learn about best practices in pollution management, CC mitigation, and adaptation. Exposure to real-life examples of successful environmental initiatives can inspire students and motivate them to implement similar measures within their communities. These activities enable students to gather data and analyze findings. People in school and the wider community can discuss their results further.
2	Develop training guidelines and enhance the skills of teachers in promoting environmentally sustainable practices within schools, - Conduct curricular mapping to identify places in the regular syllabus to introduce EE modules best. - - Develop a teacher training guideline that highlights this information. - - Focus on making CCE meaning and relevant for learners (e.g., Focus on initiatives directly applicable to the local context. - - Conduct Workshops for teachers and school authorities.	Fostering practices such as the prudent use of natural resources, water conservation, waste management, utilization, and maintenance of renewable energy technology, as well as implementing awareness-raising strategies among students, can enable them to use these practices at their level. Schools can play a pivotal role by upgrading teachers' knowledge and equipping them with the skills to integrate these practices into their curricula.
	Develop programs designed to uncover and address misconceptions about CC	