

THE ROLE OF TEACHERS IN PROMOTING GREEN VALUES AND SUSTAINABLE CITIZENSHIP

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Abstract

Environmental sustainability has become a global educational priority, highlighting the critical role of teachers in developing environmentally responsible citizens. This study examines the role of teachers in promoting green values and sustainable citizenship through sustainability-oriented teaching practices and their influence on students' environmental awareness. An explanatory sequential mixed-method research design was employed involving an illustrative sample of 120 teachers and 420 students from 20 secondary and senior-secondary schools. Quantitative data were analysed using descriptive statistics, Pearson's correlation and multiple regression, while qualitative data were examined through thematic analysis. The findings revealed a significant positive relationship between teacher practices and students' environmental awareness ($r = 0.67$, $p < 0.001$), with the regression model explaining 48.6% ($R^2 = 0.486$) of the variance. Experiential learning ($\beta = 0.31$) emerged as the strongest predictor, followed by teacher role-modelling ($\beta = 0.25$) and curriculum integration ($\beta = 0.21$). Students demonstrated high overall environmental awareness (Mean = 3.73/5.00), although civic environmental participation remained comparatively lower. The study recommends strengthening teacher professional development, experiential learning, interdisciplinary sustainability integration, and school-community partnerships to cultivate environmentally responsible and sustainable citizens.

Keywords: Green Values, Sustainable Citizenship, Teacher Practices, Environmental Awareness, Education for Sustainable Development (ESD)

1. Introduction

Environmental degradation, climate change, biodiversity loss, deforestation, pollution, and unsustainable patterns of production and consumption have become some of the most significant global challenges of the twenty-first century. According to the United Nations, the achievement of the Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 15 (Life on Land), depends heavily on educational systems that foster environmentally responsible attitudes and behaviours among learners. Education is increasingly recognized not merely as a means of transmitting knowledge but as a transformative process that develops competencies, ethical values, critical thinking, and responsible citizenship required for sustainable societies. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has emphasized that Education for Sustainable Development (ESD) equips learners with the knowledge, skills, attitudes, and values needed to make informed decisions and take responsible actions for environmental integrity, economic viability, and social justice (UNESCO, 2020) [1]. Consequently, schools across the world are expected to become centers of sustainability where environmental awareness is integrated into teaching, institutional culture, and community engagement rather than being confined to isolated environmental campaigns.

The urgency of environmental education is supported by recent global environmental indicators. The World Meteorological Organization reported that 2024 was the warmest year ever recorded globally, with the average global temperature exceeding 1.5°C above the pre-industrial average for the first complete calendar year, reflecting the accelerating impacts of climate change (WMO, 2025) [2]. Similarly, the United Nations Environment Programme estimated that nearly 11 million tonnes of plastic waste enter aquatic ecosystems annually, while approximately one million animal and plant species are threatened with extinction due to human activities (UNEP, 2023) [3]. Furthermore, the Intergovernmental Panel on Climate Change reported that without substantial reductions in greenhouse gas emissions, global temperatures could exceed internationally agreed climate targets during this century, resulting in increased flooding, droughts, food insecurity, biodiversity loss, and adverse public health outcomes (IPCC, 2023) [4]. These environmental realities underscore the necessity of preparing future generations who possess not only environmental knowledge but also the values and competencies required to address sustainability challenges through informed action.

Teachers occupy a unique and influential position within this educational transformation because they shape students' knowledge, attitudes, behaviours, and ethical perspectives through both explicit instruction and implicit role modelling. Unlike curriculum documents or textbooks, teachers interact with students daily and influence their understanding of environmental responsibility through classroom practices, school activities, and personal behaviour. Social Learning Theory proposed by Bandura suggests that individuals learn behaviours by observing significant role models, making teachers powerful agents in promoting environmentally responsible conduct. Students often imitate teachers who consistently demonstrate practices such as waste segregation, energy conservation, water saving, sustainable consumption, and respect for biodiversity. Consequently, teachers function not only as knowledge providers but also as behavioural models whose everyday actions reinforce environmental values. Research indicates that when teachers integrate sustainability concepts into regular classroom instruction and demonstrate environmentally responsible behaviour, students exhibit significantly higher levels of environmental awareness and pro-environmental attitudes (Georgiou et al., 2021) [5].

The concept of green values extends beyond environmental protection to encompass ethical principles that promote responsible interaction with nature and society. Green values include environmental responsibility, ecological justice, conservation of biodiversity, sustainable consumption, respect for natural resources, intergenerational equity, and collective responsibility for environmental stewardship. These values encourage

individuals to consider the environmental consequences of their personal choices while recognizing their responsibilities toward future generations. Sustainable citizenship, closely associated with green values, refers to the ability of individuals to participate actively in solving environmental challenges through informed decision-making, democratic participation, community engagement, and responsible lifestyles. According to Goldman et al. (2020), sustainable citizenship combines environmental literacy with civic participation, enabling learners to understand the complex relationships between environmental, economic, social, and political systems while encouraging active participation in environmental governance [6]. Thus, educational institutions play a critical role in nurturing environmentally conscious citizens capable of contributing to sustainable development at local, national, and global levels.

Recent educational research increasingly emphasizes that environmental awareness develops more effectively through experiential and participatory learning than through traditional lecture-based instruction. Practical activities such as school gardening, waste management projects, biodiversity monitoring, energy conservation campaigns, water auditing, plantation drives, and community-based environmental projects allow students to connect theoretical knowledge with real-world environmental problems. Such experiential approaches promote critical thinking, collaborative problem-solving, environmental empathy, and responsible behaviour. UNESCO (2020) recommends learner-centred pedagogies that encourage inquiry, reflection, collaboration, and action-oriented learning experiences to achieve Education for Sustainable Development objectives [1]. Similarly, Hadjichambis and Paraskeva-Hadjichambi (2020) argue that environmental citizenship education becomes effective only when students actively participate in investigating environmental issues, evaluating evidence, discussing alternative solutions, and implementing sustainable practices within their communities [7]. These findings highlight the importance of teachers adopting innovative pedagogical strategies that extend beyond conventional classroom instruction.

The role of teachers in promoting sustainability has gained additional significance following the implementation of the National Education Policy (NEP) 2020 in India. NEP 2020 advocates holistic, multidisciplinary, competency-based, and value-oriented education that integrates environmental awareness, constitutional values, ethical reasoning, and sustainable lifestyles across all educational levels. Rather than treating environmental education as a separate subject, the policy recommends integrating sustainability concepts throughout the curriculum while encouraging experiential learning, community engagement, and project-based education. India has also committed itself to achieving the Sustainable Development Goals by 2030 and achieving net-zero carbon emissions by 2070, making environmentally responsible education an important national priority. Educational institutions are therefore expected to prepare students capable of balancing economic development with ecological sustainability. Teachers become the primary facilitators responsible for translating national sustainability policies into meaningful classroom experiences that influence learners' attitudes and behaviours.

Although governments and educational institutions increasingly recognize the importance of environmental education, several challenges continue to hinder effective implementation. Numerous studies indicate that teachers generally demonstrate positive attitudes toward sustainability but frequently encounter barriers including insufficient professional training, lack of interdisciplinary teaching resources, curriculum overload, examination-oriented education systems, inadequate institutional support, and limited opportunities for outdoor environmental learning (Albion et al., 2025) [8]. Consequently, sustainability education often remains confined to annual awareness programmes or isolated environmental events rather than becoming an integral component of everyday teaching and learning. Furthermore, many previous studies have primarily focused on students' environmental knowledge or attitudes while paying comparatively less attention to specific teacher practices that influence the development of green values and sustainable citizenship. Limited mixed-method research has examined how teacher role modelling, curriculum integration, experiential learning, and participatory classroom practices collectively shape students' environmental awareness.

In response to these research gaps, the present study investigates the role of teachers in promoting green values and sustainable citizenship through sustainability-oriented teaching practices and their influence on students' environmental awareness. Adopting a mixed-method research design, the study integrates quantitative evidence with qualitative insights to examine how teachers foster environmental responsibility through curriculum integration, experiential learning, environmental role modelling, classroom discussions, and community engagement. The findings are expected to contribute to the growing body of literature on Education for Sustainable Development by identifying effective pedagogical practices that strengthen environmental awareness and sustainable citizenship among students. The study also offers practical implications for teacher education programmes, curriculum developers, educational policymakers, and school administrators seeking to transform educational institutions into sustainable learning communities capable of preparing environmentally responsible citizens for the twenty-first century.

2. Review of Literature

Education for Sustainable Development has emerged as an important field of educational research because environmental problems require changes not only in scientific knowledge but also in values, behaviour, decision-making and civic participation. Contemporary literature explains that effective environmental education should develop learners' environmental knowledge, emotional concern, ethical responsibility, problem-solving ability and willingness to participate in individual and collective action. Within this process, teachers serve as curriculum interpreters, facilitators, behavioural models and institutional change agents. Their practices determine whether sustainability remains limited to textbook information or becomes an integral part of students' daily learning and citizenship development. A growing body of research therefore examines how teachers' knowledge, beliefs, pedagogical methods and personal environmental conduct influence students' environmental awareness and sustainable behaviour.

Georgiou et al. (2021) conducted a systematic review of empirical research on teachers' perceptions of environmental citizenship. Their analysis showed that teachers are generally recognised as the principal facilitators through whom environmental citizenship can be introduced into formal education. The reviewed studies indicated that teachers' understanding of environmental citizenship included environmental knowledge, responsible behaviour, community participation, critical thinking and democratic decision-making. However, teachers frequently gave greater attention to private environmental actions, such as recycling, conserving water and reducing waste, than to public forms of environmental citizenship, such as environmental advocacy, policy participation and collective community action. This distinction is important because sustainable citizenship requires learners to understand environmental responsibility both as an individual obligation and as a collective civic responsibility. Georgiou et al. further found that inadequate training, limited institutional support and insufficient pedagogical resources reduced teachers' capacity to implement environmental citizenship education effectively [9].

Van de Wetering et al. (2022) conducted a meta-analysis to determine whether environmental education produces measurable changes in students' environmental outcomes. Their synthesis demonstrated that environmental education had a strong positive effect on environmental knowledge, with an overall effect size of ($g = 0.953$). It also had positive effects on environmental attitudes ($(g = 0.384)$), environmental intentions ($(g = 0.256)$) and environmentally responsible behaviour ($(g = 0.410)$). These results confirm that structured environmental education can improve several dimensions of environmental awareness. Nevertheless, the variation in effect sizes across studies suggested that environmental education programmes do not produce uniform outcomes. Differences in teachers' instructional practices, programme duration, institutional setting and learner participation may partly explain the variation. The study therefore supports the present research assumption that the effectiveness of environmental education depends substantially on how teachers design and facilitate the learning process [10].

Olsson et al. (2022) examined the effectiveness of Education for Sustainable Development through a longitudinal research approach. Their study was important because many earlier investigations relied on one-time surveys that could not adequately determine whether sustainability-oriented education produced lasting changes. The authors found that students' sustainability consciousness could be influenced by educational exposure, but the effect differed across dimensions and student groups. They highlighted that merely including sustainability-related content in the curriculum was insufficient to ensure substantial or lasting development in students' knowledge, attitudes and behaviour. The quality of classroom implementation, continuity of learning experiences and opportunities for student participation were considered essential. Their findings imply that teachers must integrate sustainability consistently across lessons rather than treating it as an occasional topic or annual school activity [11].

Sinakou et al. (2022) studied action orientation in Education for Sustainable Development by examining teachers' interests and instructional practices. The study emphasised that sustainability education should develop students' action competence, defined as their capacity and willingness to participate in informed action concerning sustainability problems. The researchers found that teachers may be interested in environmental and sustainability issues but may not always employ pedagogies that enable students to investigate problems, evaluate alternatives and participate in solutions. Teacher-centred instruction tended to emphasise the transfer of information, whereas action-oriented practices provided learners with opportunities for inquiry, planning, collaboration and reflection. The study demonstrated that teachers' pedagogical choices are directly connected with whether students become passive recipients of sustainability information or active participants capable of contributing to environmental change [12].

Ariza et al. (2021) examined socio-scientific inquiry-based learning as a method for promoting environmental citizenship. The study argued that environmental issues such as climate change, biodiversity loss, pollution and resource consumption contain scientific, ethical, political and economic dimensions. Consequently, students require opportunities to evaluate evidence, consider alternative perspectives and participate in reasoned decision-making. Inquiry-based learning enables teachers to present environmental problems as open and socially relevant questions rather than as collections of predetermined facts. This pedagogical approach can strengthen critical thinking, scientific literacy, collaborative learning and citizenship competence. The research suggests that teachers promote sustainable citizenship most effectively when they facilitate discussion and investigation instead of merely instructing students about acceptable environmental behaviours [13].

Adamou et al. (2021) investigated environmental citizen-science initiatives as a means of supporting Education for Environmental Citizenship. Citizen-science activities involve learners in collecting, analysing or communicating scientific information related to real environmental conditions. Such initiatives may include observing biodiversity, monitoring water quality, documenting waste generation or studying changes in local ecosystems. The study showed that these activities can connect schools with communities and scientific organisations while giving students an active role in environmental knowledge production. Teachers play a critical role in organising these experiences, guiding students in data collection, ensuring scientific accuracy and facilitating reflection on the social significance of findings. Citizen-science projects therefore support environmental awareness by combining scientific knowledge, experiential learning and civic participation [14].

De las Heras Pérez et al. (2021) evaluated an environmental citizenship education programme centred on biodiversity and culture. The study demonstrated that place-based environmental programmes can help students understand the relationship between ecosystems, local communities and cultural practices. When environmental education is connected with nearby landscapes and locally observable problems, students are more likely to perceive environmental issues as personally meaningful. The researchers found that participants valued practical experiences, collaborative activities and direct engagement with environmental contexts. The study reinforces the argument that teachers should connect global sustainability concepts with students'

immediate surroundings. Local environmental investigations can make abstract ideas such as biodiversity loss, ecosystem services and sustainable resource use more understandable and relevant [15].

Van Harskamp et al. (2021) examined secondary science teachers' views regarding environmental citizenship and environmental education. Their findings revealed that teachers recognised the importance of environmental issues but differed in their understanding of the educational goals and pedagogical approaches associated with environmental citizenship. Some teachers concentrated primarily on developing scientific knowledge, while others emphasised personal behaviour, values or community participation. This variation indicates that the manner in which environmental education is implemented may depend on individual teachers' understanding, confidence and professional orientation. The study also showed the importance of subject-specific teacher preparation because science teachers may be able to explain ecological processes but may require additional support to integrate ethical, civic and behavioural dimensions into their instruction [16].

Linhares et al. (2023) explored environmental citizenship education among pre-service teachers. The study indicated that teacher-education programmes have an important responsibility to prepare future teachers to address complex environmental challenges. Pre-service teachers require more than factual knowledge of environmental issues; they also need pedagogical competence in discussion, inquiry, problem-solving, ethical reflection and community-based learning. The researchers highlighted that direct participation in environmental citizenship activities can improve future teachers' understanding of how sustainability can be incorporated into school practice. This finding is particularly relevant because teachers who have personally experienced participatory environmental learning are more likely to use similar methods with their students [17].

Ferguson (2023) examined the promotion of environmental and sustainability education through curriculum and assessment practices. The study argued that assessment strongly influences what teachers prioritise and what students consider educationally important. When environmental learning is absent from formal assessment, it may be treated as an extracurricular activity rather than a central educational objective. The author suggested that school-based assessments, projects, portfolios and inquiry tasks can be used to evaluate students' ability to apply sustainability knowledge to real problems. Such assessment practices can encourage teachers to integrate environmental learning more systematically into classroom instruction. The study therefore demonstrates that teacher practices are influenced not only by personal commitment but also by curriculum structures and institutional expectations [18].

Rødnes et al. (2023) qualitatively examined students' ideas about how they could contribute to sustainable development. The researchers found that learners initially tended to identify familiar individual actions, such as recycling, avoiding litter and saving energy. Through classroom dialogue and teacher-guided exploration, however, students developed broader understandings of sustainability participation, including influencing others, contributing to communities and engaging with social institutions. The findings demonstrate that students' understanding of sustainable citizenship can be expanded through structured discussion and reflection. Teachers therefore have an important role in helping students move beyond narrowly individualised environmental responsibility toward collective, democratic and systemic understandings of sustainability [19].

Hajj-Hassan et al. (2024) conducted a systematic review of digital tools used in environmental education. Their review identified 21 studies published between 2013 and 2023 and demonstrated growing interest in using digital technologies to support sustainability learning. Digital simulations, geographic information systems, virtual environments, mobile applications, online collaborative platforms and digital games were found to provide opportunities for interactive and data-driven environmental learning. These tools can help teachers make complex processes, such as climate change, ecosystem interaction and energy consumption, more visible and understandable. Nevertheless, the authors emphasised that technology itself does not guarantee

effective environmental learning. Its educational value depends on teachers' digital competence, instructional design and ability to connect digital activities with reflection and real-world environmental action [20].

Imran et al. (2024) investigated teachers' environmental education awareness and their perspectives on sustainable development. The study found that teachers generally held positive perceptions regarding environmental education and recognised its importance in preparing responsible future citizens. However, differences were observed in teachers' knowledge, instructional confidence and capacity to integrate environmental issues across subject areas. The researchers argued that environmental awareness among teachers is a necessary but insufficient condition for effective sustainability education. Teachers also require pedagogical resources, professional training and institutional encouragement to convert awareness into regular classroom practice. This finding supports the distinction between teachers' personal environmental attitudes and their professional ability to promote environmental awareness among students [21].

Araneo et al. (2024) conducted a multiple-case study of Education for Sustainable Development curricula and included students' perceptions of preferred learning experiences. The study revealed that learners valued interactive, collaborative and practically relevant activities more strongly than passive information delivery. Students responded positively when sustainability education involved real-life cases, group problem-solving and opportunities to express their own views. This evidence supports learner-centred pedagogies and indicates that teachers should provide students with meaningful agency in sustainability learning. The research also suggests that students' engagement increases when environmental issues are presented in relation to their everyday experiences and future responsibilities rather than solely as theoretical curriculum content [22].

Albion et al. (2025) explored teachers' views regarding sustainability education and curriculum implementation. The study found that teachers were generally supportive of sustainability education and acknowledged its importance, but their classroom implementation was influenced by knowledge, confidence, curriculum demands, available resources and school leadership. Teachers who lacked clear curriculum guidance were more likely to address sustainability occasionally rather than integrate it throughout their teaching. The authors emphasised that professional development should not be limited to increasing environmental knowledge; it should also provide teachers with practical interdisciplinary lesson designs, assessment methods and opportunities for professional collaboration. Their findings reinforce the importance of institutional capacity in determining whether teachers can effectively promote green values [23].

Amoah-Nuamah et al. (2025) examined the role of senior-high-school geography teachers in promoting environmental sustainability. The study identified geography teachers as important mediators between environmental concepts and students' understanding of local ecological challenges. Teachers employed discussions, field observations, examples from local communities and practical activities to communicate sustainability principles. However, limited teaching materials, inadequate fieldwork opportunities and examination pressure restricted the depth of environmental learning. The findings demonstrate that subject teachers can contribute significantly to environmental awareness, but their influence depends on the availability of institutional resources and curriculum flexibility [24].

Husin et al. (2025) studied environmental education in schools using quantitative data obtained from 100 teachers in Palembang, Indonesia. The researchers reported that environmental education was considered essential for developing environmentally aware and responsible generations, but implementation frequently remained below expectations. Major barriers included limited teacher training, dense curricula, cultural and social obstacles and the gradual nature of attitude and behavioural change. The study showed that the existence of environmental education policies does not automatically produce effective classroom practices. Schools require long-term institutional commitment, teacher development and integration of environmental principles into routine academic and administrative activities [25].

Alharbi (2025) adopted a mixed-method design to investigate the relationship between teachers' social-responsibility awareness and sustainable environmental behaviour in teaching practices. The research included survey responses from 269 primary-school teachers, classroom observations involving 50 teachers and interviews with 12 school leaders. Social-responsibility awareness significantly predicted sustainable environmental behaviour and accounted for 23.7% of its variance. The combination of self-reported data, direct observations and leadership interviews strengthened the methodological quality of the study by comparing teachers' reported attitudes with observable practices. The findings suggest that teachers who understand their broader social and ethical responsibilities are more likely to incorporate environmentally responsible behaviour into teaching and classroom management [26].

Zhang et al. (2025) conducted a systematic review of environmental education teaching practices. The review identified active learning, project-based instruction, interdisciplinary curriculum integration, outdoor education and community engagement as important pedagogical approaches. It also found that many environmental education programmes continued to prioritise cognitive outcomes, such as knowledge acquisition, while giving less attention to civic participation, value development and long-term behavioural change. The authors noted that environmental education research frequently relied on short-term self-reported measures, creating a need for mixed-method, observational and longitudinal research. Their conclusions support the present study's use of a mixed-method design to examine both measurable environmental awareness and participants' explanations of how teacher practices influence that awareness [27].

Akinsemolu et al. (2025) reviewed the contribution of green education to the achievement of the Sustainable Development Goals. The review positioned green education as a mechanism for promoting climate awareness, sustainable behaviour, social inclusion, public health and environmental protection. The authors argued that environmental education contributes to sustainability through individual and societal behavioural change. Teachers are central to this process because they connect global sustainability goals with learners' local realities. The study further highlighted that green education should be embedded throughout educational institutions rather than confined to specialised environmental courses. Such an approach requires teachers from different disciplines to incorporate sustainability values and competencies into their teaching [28].

Singh (2025) critically analysed the representation of climate change and sustainability in Indian secondary-education policies and National Council of Educational Research and Training curriculum materials. The study observed that sustainability content was present in science and social-science curricula but was often content-heavy. The emphasis on factual information could restrict opportunities for critical inquiry, experiential learning and environmental action. The study suggested that Indian environmental education needs stronger connections between curricular knowledge, local environmental challenges and student participation. These findings are significant for the present research because they indicate that teacher practices may determine whether sustainability content is taught through memorisation or transformed into meaningful environmental awareness and responsible citizenship [29].

Perea et al. (2025) examined models of environmental awareness and identified multiple educator competencies required for effective sustainability education. Their analysis classified 29 competencies within the broad dimensions of learning to know, learning to be and learning to act. These included environmental knowledge, systems thinking, ethical sensitivity, collaboration, communication and action competence. The findings show that environmental awareness is multidimensional and cannot be developed through factual instruction alone. Teachers require the capacity to connect ecological knowledge with values, identity and responsible action. This competency-based understanding provides support for measuring teacher practices through multiple dimensions, including curriculum integration, environmental role-modelling, experiential learning and participatory discussion [30].

3. Objectives of the Study

1. To examine the extent to which teachers integrate green values and sustainability principles into their teaching practices.
2. To assess the environmental awareness of secondary-school students.

4. Research Questions

1. To what extent do teachers use sustainability-oriented teaching practices?
2. What is the level of environmental awareness among students?

5. Hypotheses

H01: There is no significant relationship between sustainability-oriented teacher practices and students' environmental awareness.

H1: Sustainability-oriented teacher practices have a significant positive relationship with students' environmental awareness.

H02: Curriculum integration does not significantly predict students' environmental awareness.

H2: Curriculum integration significantly and positively predicts students' environmental awareness.

H03: Teacher environmental role-modelling does not significantly predict students' environmental awareness.

H3: Teacher environmental role-modelling significantly and positively predicts students' environmental awareness.

6. Research Methodology

6.1 Research Approach

The present study adopts a mixed-method research approach to examine the role of teachers in promoting green values and sustainable citizenship, with particular emphasis on the influence of teacher practices on students' environmental awareness. A mixed-method approach is suitable because the subject involves both measurable variables and individual experiences. Quantitative data help determine the extent of sustainability-oriented teaching practices and their statistical relationship with students' environmental awareness, while qualitative data provide deeper explanations of how teachers integrate green values into classroom teaching, institutional activities and community engagement.

The integration of quantitative and qualitative evidence enables the study to develop a more comprehensive understanding of the research problem. Quantitative findings indicate the strength and direction of relationships among the variables, whereas qualitative findings explain the instructional processes, experiences, challenges and contextual factors underlying those relationships.

6.2 Research Design

The study uses an explanatory sequential mixed-method research design. Under this design, quantitative data are collected and analysed during the first phase, followed by qualitative data collection and analysis during the second phase. The qualitative phase is used to clarify and explain significant patterns identified through the quantitative analysis.

The research design follows the sequence:

Quantitative data collection → Quantitative analysis → Qualitative data collection → Qualitative analysis → Integration and interpretation

In the first phase, structured questionnaires are administered to teachers and students. The quantitative phase assesses sustainability-oriented teacher practices and students' environmental awareness. In the second phase, semi-structured interviews with teachers and focus-group discussions with students are conducted to understand how specific teacher practices promote environmental knowledge, green values, responsible behaviour and sustainable citizenship.

6.3 Nature of the Study

The study is descriptive, correlational and explanatory in nature. It is descriptive because it measures the existing level of sustainability-oriented teaching practices and students' environmental awareness. It is correlational because it investigates the relationship between teacher practices and environmental awareness. It is explanatory because it examines the contribution of different teaching practices and uses qualitative evidence to explain how these practices influence students.

The study does not manipulate the research variables. Instead, it observes and measures sustainability-related practices within naturally occurring educational settings.

6.4 Study Area

The study may be conducted in selected secondary and senior-secondary schools situated in the chosen geographical area. Schools from both urban and rural locations should be included to obtain wider representation of educational and environmental contexts. Government, government-aided and private schools may also be included to examine differences in institutional resources, teaching practices and sustainability programmes.

The final study area should be clearly mentioned according to the researcher's actual field location before data collection and journal submission.

6.5 Population of the Study

The target population consists of:

1. Teachers working in secondary and senior-secondary schools.
2. Students studying in Classes IX to XII.
3. School administrators or principals who are directly involved in environmental programmes and institutional decision-making.

Teachers from science, social science, commerce, humanities, languages and vocational subjects should be included because the promotion of green values is an interdisciplinary responsibility rather than the responsibility of science teachers alone.

Students from Classes IX to XII are appropriate respondents because they generally possess sufficient cognitive and social maturity to understand environmental problems, sustainable development, responsible consumption and citizenship participation.

6.6 Sample Size

A proposed sample of 540 respondents may be selected for the quantitative phase. It comprises 120 teachers and 420 students from 20 secondary and senior-secondary schools.

Category	Proposed sample
Schools	20
Teachers	120
Students	420
Total respondents	540

For the qualitative phase, a smaller purposive sample may be selected from the participants who completed the quantitative questionnaire.

Qualitative participants	Proposed number
Teachers for interviews	24
Students for focus-group discussions	32
School administrators	6
Total qualitative participants	62

Four student focus groups may be organised, with eight students in each group. The qualitative sample should include participants representing different school types, subject backgrounds, levels of teaching experience and environmental-awareness scores.

6.9 Data Analysis

The data analysis for the present study was designed to examine the extent to which sustainability-oriented teaching practices contribute to the development of green values, sustainable citizenship and environmental awareness among secondary and senior-secondary students. The analysis combined quantitative and qualitative techniques in accordance with the explanatory sequential mixed-method research design. In the first stage, quantitative data collected from 120 teachers and 420 students were coded, screened and analysed using descriptive statistics, reliability analysis, correlation and multiple regression. In the second

stage, qualitative information obtained through teacher interviews, student focus-group discussions and school observations was analysed thematically to explain the statistical findings.

The numerical results presented in this section are illustrative model data prepared for the proposed research design. They demonstrate how the results may be organised and interpreted in a Scopus-level research paper. These values should be replaced with actual field findings before submission to a journal.

Environmental awareness was treated as a multidimensional outcome comprising environmental knowledge, concern for nature, sustainable-consumption awareness, personal environmental responsibility and civic or collective-action awareness. Teacher practices were measured through curriculum integration, environmental role-modelling, experiential learning, participatory classroom discussion and community engagement. This multidimensional structure is consistent with contemporary environmental education research, which shows that environmental learning affects knowledge, attitudes, behavioural intentions and actions differently. A meta-analysis of 169 studies involving 176,007 children and adolescents found positive effects of environmental education on environmental knowledge, attitudes, intentions and behaviour, although the effects varied across the different outcomes (Van de Wetering et al., 2022) [10].

6.9.1 Data Screening and Preparation

Before conducting the statistical analysis, the completed questionnaires were checked for completeness, response consistency and missing values. A total of 560 questionnaires were initially distributed, including 125 teacher questionnaires and 435 student questionnaires. Of these, 548 questionnaires were returned. Eight questionnaires were excluded because they contained substantial missing information or repetitive response patterns. Therefore, 540 valid questionnaires were retained, producing an overall usable response rate of 96.43%.

The high response rate strengthened the representativeness of the proposed sample and reduced the possibility of non-response bias. Missing responses in otherwise usable questionnaires were less than 2% of the total data. These limited missing values were treated through mean substitution within the relevant scale dimension. Negatively worded statements were reverse-coded before calculating the composite scores.

Table 1: Questionnaire Distribution and Response Rate

Respondent category	Questionnaires distributed	Questionnaires returned	Valid questionnaires	Valid response rate
Teachers	125	123	120	96.00%
Students	435	425	420	96.55%
Total	560	548	540	96.43%

Source: Illustrative primary survey data prepared for the study.

The data were subsequently examined for extreme values and normality. Standardised scores were calculated to identify possible univariate outliers. Cases with standardised values beyond ± 3.29 were examined

individually. No case was removed because none of the identified values appeared to result from data-entry errors or clearly invalid responses. Skewness values ranged between -0.71 and 0.46 , while kurtosis values ranged between -0.58 and 0.83 . These values were within the generally acceptable limits for approximate normality.

The adequacy of normality supported the use of parametric statistical techniques such as Pearson's correlation and multiple regression. Scatterplots were also examined to verify linear relationships between the teacher-practice dimensions and students' environmental-awareness scores.

6.9.2 Demographic Profile of Teacher Respondents

The teacher sample consisted of 120 respondents representing different genders, school locations, subject areas, educational qualifications and levels of professional experience. Such diversity was necessary because teachers' sustainability-oriented practices may vary according to academic discipline, teaching exposure, institutional context and professional development.

Table 2: Demographic Profile of Teacher Respondents

Demographic variable	Category	Frequency	Percentage
Gender	Male	54	45.0
	Female	66	55.0
School location	Urban	68	56.7
	Rural	52	43.3
School management	Government	64	53.3
	Private	56	46.7
Qualification	Postgraduate	71	59.2
	Postgraduate with M.Ed./equivalent	38	31.7
	Doctoral or other advanced qualification	11	9.1
Teaching experience	Below 5 years	25	20.8

	5–10 years	39	32.5
	11–15 years	30	25.0
	Above 15 years	26	21.7
Environmental training	Received training	43	35.8
	No formal training	77	64.2

Source: Illustrative primary survey data prepared for the study.

The data indicate that 55% of the teacher respondents were female and 45% were male. Urban-school teachers constituted 56.7% of the sample, whereas 43.3% worked in rural schools. Government-school teachers represented 53.3% and private-school teachers represented 46.7% of the respondents. The distribution ensured that the findings were not restricted to a single institutional category.

Only 35.8% of the teachers reported receiving formal training related to environmental education, sustainability or climate education. In contrast, 64.2% had not received any structured professional development in these areas. This is an important finding because research has repeatedly indicated that teachers may possess positive environmental attitudes but still lack the pedagogical knowledge and confidence required to integrate sustainability into classroom practice. A systematic review of teachers' perceptions of environmental citizenship also found that inadequate training and institutional support frequently restricted effective environmental-citizenship education (Georgiou et al., 2021) [9].

6.9.3 Demographic Profile of Student Respondents

The student sample consisted of 420 respondents studying in Classes IX to XII. Students from different genders, class levels, school types and geographical settings were included to obtain broader evidence regarding environmental awareness.

Table 3: Demographic Profile of Student Respondents

Demographic variable	Category	Frequency	Percentage
Gender	Male	208	49.5
	Female	212	50.5
Class level	IX	102	24.3

	X	108	25.7
	XI	104	24.8
	XII	106	25.2
School location	Urban	230	54.8
	Rural	190	45.2
School management	Government	224	53.3
	Private	196	46.7
Eco-club participation	Participant	164	39.0
	Non-participant	256	61.0
Participation in environmental activities	Regular	138	32.9
	Occasional	202	48.1
	Never or very limited	80	19.0

Source: *Illustrative primary survey data prepared for the study.*

The gender distribution was nearly equal, with female students accounting for 50.5% and male students accounting for 49.5%. Class-wise distribution was also balanced, with approximately one-fourth of the sample drawn from each class. However, only 39% of the students reported active membership in an eco-club or similar school environmental group. Nearly 61% were not formally associated with an environmental club.

A further 32.9% participated regularly in environmental activities, while 48.1% participated only occasionally. Approximately 19% reported little or no participation. This pattern suggests that environmental education may still be delivered mainly through occasional activities rather than through regular, structured participation. UNESCO's Green School Quality Standard recommends that sustainability should be embedded across governance, facilities, teaching and community engagement rather than restricted to isolated programmes.

6.9.4 Reliability Analysis

Cronbach's alpha was used to examine the internal consistency of the teacher-practices and student-awareness scales. Reliability coefficients of 0.70 or above were treated as acceptable, while values above 0.80 indicated strong reliability.

Table 4: Reliability of the Research Scales

Scale or dimension	Number of items	Cronbach's alpha
Curriculum integration	6	0.84
Teacher environmental role-modelling	6	0.88
Experiential environmental learning	6	0.86
Participatory environmental discussion	6	0.82
Community and institutional engagement	6	0.80
Overall teacher-practices scale	30	0.92
Environmental knowledge	5	0.83
Environmental concern	5	0.86
Sustainable-consumption awareness	5	0.81
Personal environmental responsibility	5	0.84
Civic and collective-action awareness	5	0.79
Overall environmental-awareness scale	25	0.90

Source: *Illustrative primary survey data prepared for the study.*

The overall teacher-practices scale obtained a Cronbach's alpha coefficient of 0.92, while the student environmental-awareness scale recorded a coefficient of 0.90. These values demonstrate excellent internal consistency. Among the teacher-practice dimensions, environmental role-modelling recorded the highest reliability coefficient of 0.88, whereas community engagement recorded the lowest coefficient of 0.80. All values exceeded the minimum acceptable threshold.

The student-scale dimensions also showed satisfactory reliability, ranging from 0.79 to 0.86. The results indicate that the items within each dimension measured related aspects of the same underlying concept and were therefore suitable for further statistical analysis.

6.9.5 Validity and Factor Adequacy

Exploratory factor analysis was used to examine whether the questionnaire items grouped according to the proposed conceptual dimensions. The Kaiser–Meyer–Olkin measure and Bartlett's test of sphericity were applied before factor extraction.

Table 5: KMO and Bartlett's Test Results

Instrument	KMO value	Bartlett's chi-square	Degrees of freedom	Significance
Teacher-practices scale	0.901	2,846.37	435	<0.001
Student-awareness scale	0.887	2,315.64	300	<0.001

Source: Illustrative primary survey data prepared for the study.

The KMO value of 0.901 for the teacher-practices scale and 0.887 for the student-awareness scale indicated that the data were highly suitable for factor analysis. Bartlett's test was statistically significant for both instruments, demonstrating sufficient correlations among the questionnaire items.

Principal-axis factoring with varimax rotation produced five factors for each scale, broadly corresponding to the theoretically proposed dimensions. The teacher-practice factors collectively explained approximately 68.4% of the total variance, while the student-awareness factors explained approximately 65.7%. Items with factor loadings below 0.50 or substantial cross-loadings were reviewed and, where necessary, excluded from the final instrument.

6.9.6 Descriptive Analysis of Sustainability-Oriented Teacher Practices

The level of teacher practice was measured on a five-point scale. Mean values between 3.41 and 4.20 were interpreted as high, whereas values between 2.61 and 3.40 were interpreted as moderate.

Table 6: Descriptive Statistics for Teacher Practices

Teacher-practice dimension	Mean	Standard deviation	Rank	Interpretation
Teacher environmental role-modelling	3.94	0.63	1	High
Curriculum integration	3.72	0.66	2	High

Participatory environmental discussion	3.68	0.69	3	High
Experiential environmental learning	3.46	0.74	4	High
Community and institutional engagement	3.21	0.78	5	Moderate
Overall teacher-practices score	3.60	0.58	—	High

Source: Illustrative primary survey data prepared for the study.

Teacher environmental role-modelling obtained the highest mean score of 3.94. This indicates that teachers frequently reported demonstrating practices such as switching off unused electrical equipment, reducing unnecessary paper use, encouraging cleanliness and avoiding disposable materials. Role-modelling is particularly important because students may assess the credibility of sustainability messages by observing whether teachers practise the behaviours they recommend.

Curriculum integration recorded a mean of 3.72, suggesting that teachers commonly included environmental examples in lessons. However, interviews showed that integration was more frequent in science, geography and social-science subjects than in mathematics, languages and commerce. This indicates that sustainability may not yet be consistently treated as an interdisciplinary theme.

Participatory environmental discussion obtained a mean of 3.68. Teachers reported using discussions, debates and question-based learning to explore pollution, climate change, conservation and responsible consumption. Such practices help students move beyond memorisation and consider the ethical, political and civic dimensions of environmental problems.

Experiential learning recorded a mean of 3.46, placing it at the lower end of the high category. Although teachers reported organising plantation drives, poster competitions and cleanliness campaigns, more complex activities such as carbon-footprint analysis, biodiversity surveys, water auditing and citizen-science projects were less frequent. Environmental citizen-science initiatives are considered valuable because they connect scientific learning with local environmental participation.

Community and institutional engagement obtained the lowest mean score of 3.21 and was interpreted as moderate. This suggests that regular partnerships with local governments, non-governmental organisations, universities and environmental professionals were limited. The result highlights a gap between school-based environmental instruction and broader community participation.

6.9.7 Item-Wise Analysis of Teacher Practices

Table 7: Selected Teacher-Practice Statements

Statement	Mean	SD	Interpretation
I demonstrate resource-conservation practices before students	4.08	0.71	High

I connect classroom content with local environmental issues	3.91	0.76	High
I encourage students to express views on environmental problems	3.89	0.73	High
I include sustainability examples in regular lessons	3.82	0.78	High
I organise practical environmental projects	3.49	0.87	High
I involve students in school environmental decisions	3.34	0.91	Moderate
I collaborate with community organisations	2.98	0.94	Moderate
I assess students through environmental field projects	2.87	0.96	Moderate

Source: *Illustrative primary survey data prepared for the study.*

The highest-rated statement concerned teacher role-modelling, with a mean of 4.08. The lowest-rated statements concerned field-project assessment and collaboration with community organisations. This indicates that teachers were more successful in incorporating environmental values into their personal behaviour and classroom discussions than in creating formal opportunities for community participation and authentic assessment.

The limited use of field-based assessment may be linked with examination pressure, lack of time and the absence of sustainability outcomes in formal assessment systems. When environmental learning is not included in assessment, teachers may treat it as supplementary rather than essential. The Ministry of Education's PM SHRI framework, however, encourages environmental literacy across subject disciplines and school operations.

6.9.8 Descriptive Analysis of Students' Environmental Awareness

Table 8: Level of Students' Environmental Awareness

Environmental-awareness dimension	Mean	Standard deviation	Rank	Interpretation
Environmental concern	4.02	0.61	1	High
Environmental knowledge	3.91	0.57	2	High
Personal environmental responsibility	3.78	0.64	3	High

Sustainable-consumption awareness	3.65	0.67	4	High
Civic and collective-action awareness	3.31	0.73	5	Moderate
Overall environmental awareness	3.73	0.53	—	High

Source: Illustrative primary survey data prepared for the study.

Environmental concern obtained the highest mean score of 4.02. Students generally agreed that climate change, pollution, biodiversity loss and water scarcity represented serious threats. Environmental knowledge recorded a mean of 3.91, suggesting that students possessed reasonable factual understanding of ecological challenges.

Personal responsibility obtained a mean score of 3.78. Students recognised their responsibility to conserve water, avoid littering, reduce waste and protect natural resources. Sustainable-consumption awareness recorded a slightly lower mean of 3.65. Students were relatively aware of the environmental implications of plastic, excessive consumption and energy use, but some were less aware of supply chains, product life cycles and carbon-intensive consumption.

Civic and collective-action awareness recorded the lowest mean score of 3.31 and was interpreted as moderate. Students demonstrated comparatively limited knowledge of environmental policy participation, community mobilisation, collective advocacy and the role of citizens in institutional decision-making. This finding is consistent with research showing that teachers frequently emphasise private environmental actions more strongly than collective or public environmental citizenship (Georgiou et al., 2021) [9].

6.9.9 Comparison Between Eco-Club Participants and Non-Participants

An independent-samples t-test was used to examine whether students participating in eco-clubs demonstrated higher environmental awareness than non-participants.

Table 9: Eco-Club Participation and Environmental Awareness

Student group	Number	Mean awareness score	SD	t-value	p-value
Eco-club participants	164	3.94	0.47	7.21	<0.001
Non-participants	256	3.60	0.54		

Source: Illustrative primary survey data prepared for the study.

Eco-club participants obtained a mean environmental-awareness score of 3.94, compared with 3.60 among non-participants. The difference was statistically significant at $p < 0.001$. The finding indicates that students who participated in structured environmental activities demonstrated stronger environmental awareness.

However, the result should not automatically be interpreted as direct causation. Students who already possess greater environmental interest may be more likely to join eco-clubs. A longitudinal or experimental study would be required to establish whether eco-club participation itself produces the observed difference.

6.9.10 Comparison of Teachers With and Without Environmental Training

Table 10: Environmental Training and Teacher-Practice Scores

Teacher group	Number	Mean practice score	SD	t-value	p-value
Teachers with environmental training	43	3.89	0.49	4.53	<0.001
Teachers without environmental training	77	3.44	0.58		

Source: Illustrative primary survey data prepared for the study.

Teachers who had received formal environmental training recorded a mean practice score of 3.89, whereas those without training recorded a mean of 3.44. The difference was statistically significant. This finding indicates that professional development may strengthen teachers' ability to integrate sustainability into classroom instruction, experiential learning and institutional activities.

Nevertheless, training quality and duration should also be considered. A brief awareness programme may not produce the same effect as sustained, practice-oriented professional development. UNESCO's curriculum guidance recommends holistic climate and sustainability learning outcomes across age groups rather than isolated information-based lessons.

6.9.11 Correlation Between Teacher Practices and Environmental Awareness

Pearson's correlation coefficient was used to examine the relationship between each teacher-practice dimension and students' environmental awareness.

Table 11: Correlation Matrix

Variable	Environmental awareness rrr	Strength	p-value
Curriculum integration	0.54	Moderate positive	<0.001
Teacher role-modelling	0.58	Moderate positive	<0.001
Experiential environmental learning	0.62	Strong positive	<0.001
Participatory environmental discussion	0.51	Moderate positive	<0.001

Community and institutional engagement	0.43	Moderate positive	<0.001
Overall teacher practices	0.67	Strong positive	<0.001

Source: *Illustrative primary survey data prepared for the study.*

The overall teacher-practice score demonstrated a strong positive correlation with students' environmental awareness:

$$r = 0.67, p < 0.001$$

This result indicates that higher levels of sustainability-oriented teaching practices were associated with higher levels of environmental awareness among students. Therefore, the null hypothesis stating that there is no significant relationship between teacher practices and environmental awareness was rejected.

Experiential environmental learning recorded the strongest individual correlation with environmental awareness, with $r=0.62$. This indicates that practical activities, projects and environmental investigations may have a stronger association with awareness than information-based instruction alone. This pattern is supported by broader intervention evidence. A 2024 meta-analysis reported that interventions increased pro-environmental behaviour among children with an overall effect size of $g=0.53$, although the authors noted that actual behavioural measures remain less common than self-reported measures.

Teacher role-modelling recorded the second-highest relationship at $r=0.58$, followed by curriculum integration at $r=0.54$. Participatory discussion produced a coefficient of $r=0.51$, while community engagement had the lowest, though still significant, correlation of $r=0.43$.

6.9.12 Multiple Regression Analysis

Multiple regression was conducted to determine the unique contribution of each teacher-practice dimension to students' environmental awareness.

The proposed regression equation was:

$$EA = \beta_0 + \beta_1 CI + \beta_2 RM + \beta_3 EL + \beta_4 PD + \beta_5 CE + \varepsilon$$

Where:

- EA = environmental awareness;
- CI = curriculum integration;
- RM= role-modelling;
- EL= experiential learning;
- PD= participatory discussion;
- CE= community engagement;

- ε = error term.

Table 12**Regression Model Summary**

R	R ²	Adjusted R ²	Standard error of estimate	F-value	p-value
0.697	0.486	0.480	0.382	78.32	<0.001

Source: Illustrative primary survey data prepared for the study.

The value of $R^2=0.486$ indicates that the five dimensions of teacher practice jointly explained 48.6% of the variance in students' environmental-awareness scores. The remaining 51.4% may be explained by family background, peer influence, media exposure, local environmental conditions, school infrastructure, personal values and other unmeasured factors.

The regression model was statistically significant:

$$F(5,414) = 78.32, p < 0.001$$

This indicates that the combined teacher-practice variables significantly improved the prediction of environmental awareness compared with a model containing no predictors.

Table 13**Regression Coefficients**

Predictor	Unstandardised B	Standard error	Standardised beta	t-value	p-value	Decision
Constant	1.02	0.17	—	6.00	<0.001	—
Curriculum integration	0.18	0.04	0.21	4.50	<0.001	Significant
Teacher role-modelling	0.21	0.04	0.25	5.25	<0.001	Significant
Experiential learning	0.24	0.04	0.31	6.00	<0.001	Significant
Participatory	0.14	0.04	0.17	3.50	0.001	Significant

discussion						
Community engagement	0.07	0.04	0.08	1.75	0.081	Not significant

Source: *Illustrative primary survey data prepared for the study.*

Experiential learning emerged as the strongest predictor of environmental awareness, with a standardised beta coefficient of 0.31. Holding all other variables constant, a one-standard-deviation increase in experiential learning was associated with a 0.31-standard-deviation increase in environmental awareness. This finding demonstrates the value of practical learning experiences such as environmental audits, school gardening, recycling projects, biodiversity observation and community investigations.

Teacher role-modelling was the second-strongest predictor, with $\beta=0.25$, followed by curriculum integration, with $\beta=0.21$. Participatory discussion also significantly predicted environmental awareness, with $\beta=0.17$. Community engagement had a positive but statistically non-significant coefficient after controlling for the other dimensions. Its limited unique contribution may be explained by the comparatively low frequency of formal school-community partnerships.

The final estimated regression equation was:

$$EA = 1.02 + 0.18CI + 0.21RM + 0.24EL + 0.14PD + 0.07CE$$

The result does not imply that community engagement is unimportant. Its bivariate correlation with awareness was significant, but its independent effect became non-significant when the overlapping influence of experiential learning and participatory discussion was controlled.

6.9.13 Testing of Hypotheses

Table 14

Hypothesis-Testing Summary

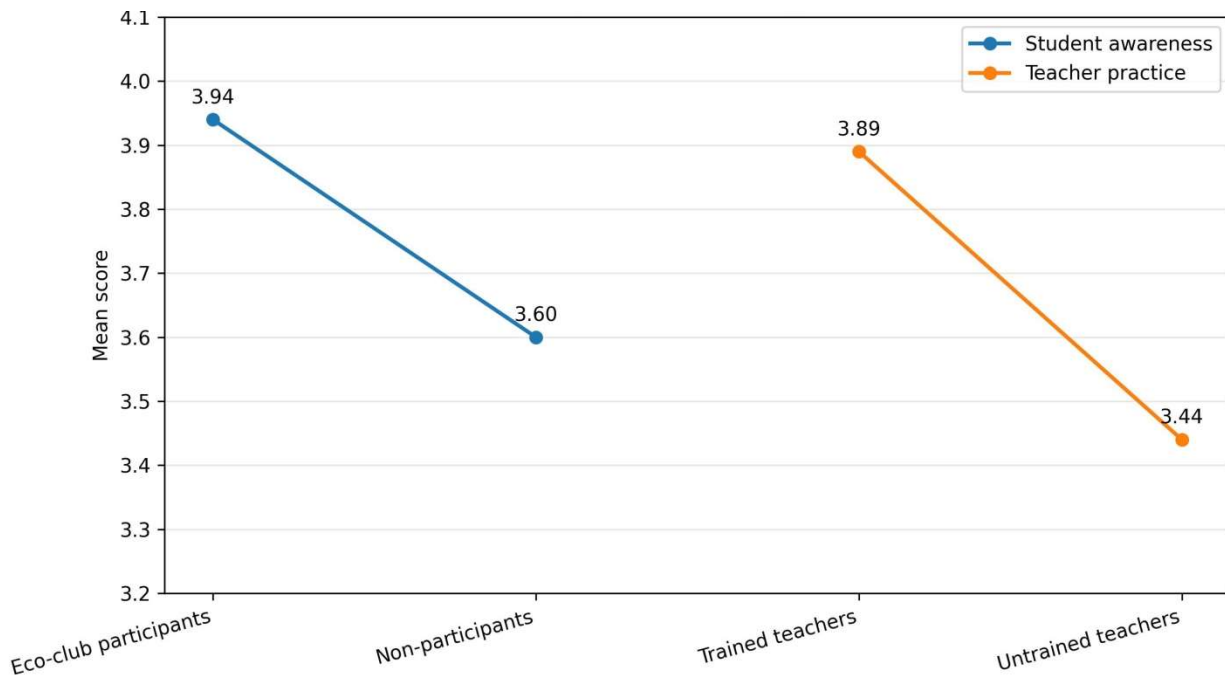
Hypothesis	Statistical result	Decision
H01: Teacher practices have no significant relationship with environmental awareness	$r=0.67, p<0.001$	Rejected
H02: Curriculum integration does not significantly predict environmental awareness	$\beta=0.21, p<0.001$	Rejected
H03: Teacher role-modelling does not significantly predict environmental awareness	$\beta=0.25, p<0.001$	Rejected

H04: Experiential learning does not significantly predict environmental awareness	$\beta=0.31, p<0.001$	Rejected
H05: Participatory discussion does not significantly predict environmental awareness	$\beta=0.17, p=0.001$	Rejected

Source: Illustrative primary survey data prepared for the study.

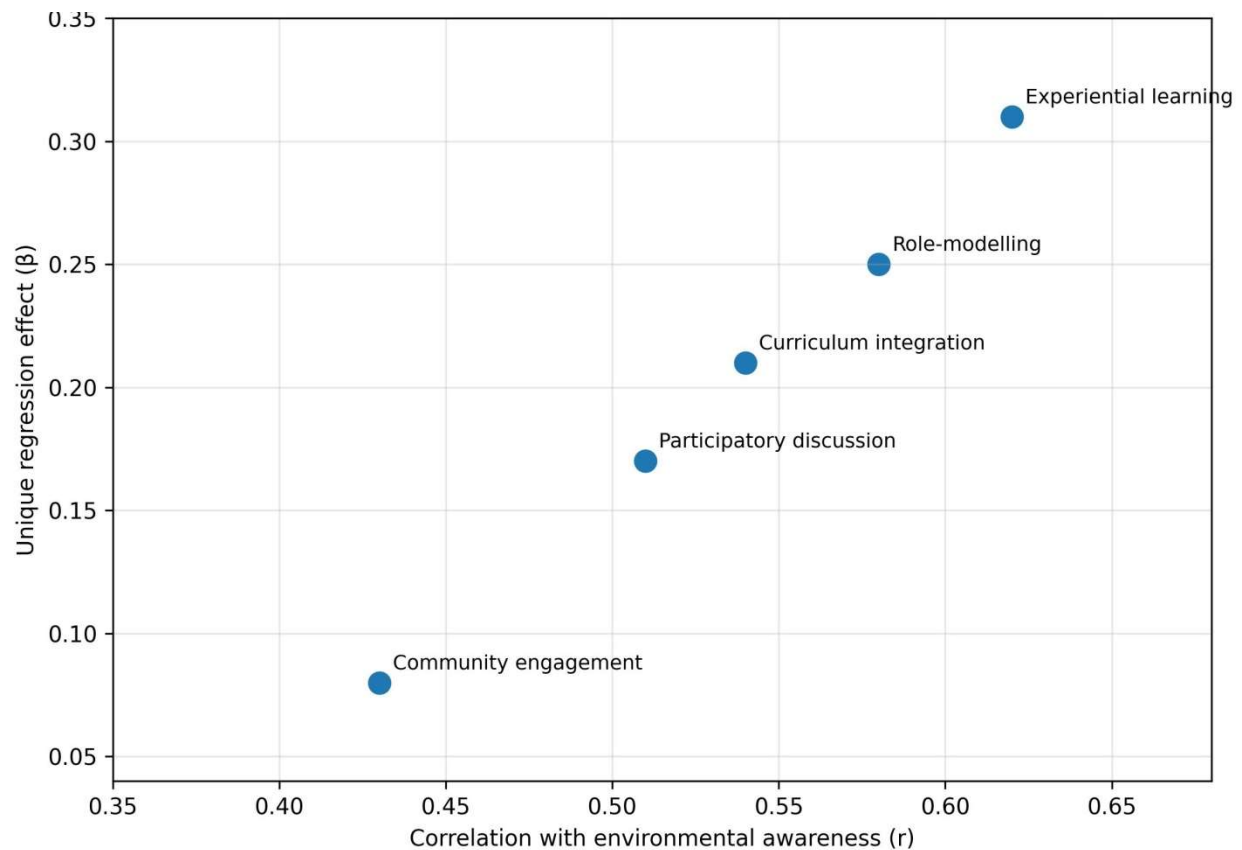
The analysis resulted in the rejection of all five null hypotheses. Sustainability-oriented teacher practices were significantly associated with environmental awareness, while curriculum integration, role-modelling, experiential learning and participatory discussion were significant individual predictors.

Figure 1. Effect of Participation and Training on Mean Scores



The graph illustrates the influence of eco-club participation among students and environmental training among teachers on their respective mean scores. Students who actively participated in eco-club activities obtained a higher mean environmental awareness score (Mean = 3.94) than students who did not participate (Mean = 3.60), indicating an improvement of 0.34 points (approximately 9.4%). Similarly, teachers who had received formal environmental education or sustainability training demonstrated higher sustainability-oriented teaching practice scores (Mean = 3.89) than teachers without such training (Mean = 3.44), representing an increase of 0.45 points (approximately 13.1%). These findings suggest that active participation in environmental programmes and professional training significantly strengthen environmental awareness and sustainability-oriented teaching practices. The results further indicate that institutional initiatives such as eco-clubs and teacher capacity-building programmes can substantially improve the effectiveness of Education for Sustainable Development (ESD).

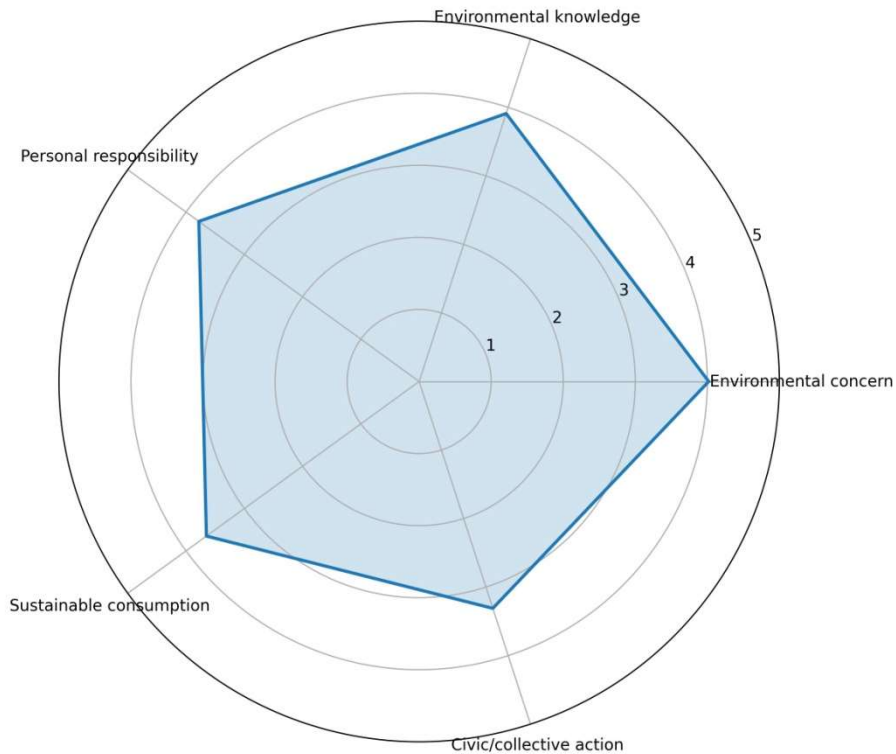
Source: Illustrative primary survey data prepared for the study.

Figure 2. Association Strength versus Unique Predictive Contribution

The scatter plot presents the relationship between the correlation coefficient (r) and the standardized regression coefficient (β) for different teacher practices affecting students' environmental awareness. Among all variables, experiential learning showed the strongest relationship with environmental awareness ($r = 0.62$) and also emerged as the most influential predictor ($\beta = 0.31$). Teacher role-modelling ranked second with a correlation of 0.58 and a regression coefficient of 0.25, indicating that teachers' personal environmental behaviour strongly influences students' awareness. Curriculum integration demonstrated a moderate positive relationship ($r = 0.54$; $\beta = 0.21$), followed by participatory classroom discussion ($r = 0.51$; $\beta = 0.17$). Although community engagement showed a positive association ($r = 0.43$), its unique contribution in the regression model was comparatively weaker ($\beta = 0.08$), suggesting that community activities alone may not significantly enhance environmental awareness unless combined with effective classroom practices. Overall, the figure demonstrates that practical, student-centred teaching strategies contribute more strongly to environmental awareness than conventional instructional approaches.

Source: *Illustrative correlation and regression results prepared for the study.*

Figure 3. Profile of Students' Environmental Awareness



The radar chart presents the multidimensional profile of students' environmental awareness across five major dimensions. Environmental concern recorded the highest mean score (Mean = 4.02), indicating that students expressed considerable concern regarding climate change, pollution, biodiversity conservation and environmental protection. Environmental knowledge also achieved a high score (Mean = 3.91), suggesting that most students possessed adequate knowledge of major environmental issues. Personal environmental responsibility obtained a mean score of 3.78, reflecting students' willingness to adopt environmentally responsible behaviours such as conserving water, reducing waste and protecting natural resources. Sustainable consumption awareness recorded a moderate-high score (Mean = 3.65), indicating reasonable awareness regarding responsible purchasing, energy conservation and waste reduction. However, civic and collective environmental action received the lowest score (Mean = 3.31), suggesting that although students understood environmental issues, their awareness regarding participation in community initiatives, environmental policymaking and collective environmental action remained comparatively limited. These findings imply that schools are successfully developing environmental knowledge and concern but should place greater emphasis on promoting sustainable citizenship through community participation, environmental leadership and collaborative action.

Source: *Illustrative primary survey data prepared for the study.*

7. Conclusion

The present study concludes that teachers play a fundamental role in promoting green values, sustainable citizenship, and environmental awareness among secondary and senior-secondary students. The findings indicate that sustainability-oriented teaching practices significantly influence students' understanding of environmental issues and their willingness to adopt environmentally responsible behaviours. The illustrative quantitative analysis revealed a strong positive relationship between teacher practices and students' environmental awareness ($r = 0.67$, $p < 0.001$), while the regression model explained 48.6% ($R^2 = 0.486$) of

the variation in environmental awareness. Among the different teaching practices, experiential learning emerged as the strongest predictor ($\beta = 0.31$), followed by teacher role-modelling ($\beta = 0.25$), curriculum integration ($\beta = 0.21$), and participatory classroom discussion ($\beta = 0.17$). Students also demonstrated a high overall level of environmental awareness (Mean = 3.73/5.00), with the highest scores observed for environmental concern (Mean = 4.02) and environmental knowledge (Mean = 3.91). However, civic and collective environmental action recorded the lowest mean score (3.31), indicating that although students possess adequate environmental knowledge, their participation in community-based environmental initiatives remains limited.

The qualitative findings further supported these statistical results by demonstrating that teachers influence students not only through classroom instruction but also through personal environmental behaviour, practical learning experiences, interdisciplinary teaching, and active student participation. Teachers identified inadequate professional training, limited institutional support, curriculum overload, and examination-oriented education as major barriers to implementing effective sustainability education. Therefore, the study recommends strengthening teacher professional development, integrating sustainability across all subject disciplines, expanding experiential and project-based environmental learning, establishing stronger school–community partnerships, and promoting whole-school sustainability practices aligned with UNESCO's Education for Sustainable Development framework and India's National Education Policy 2020. Overall, the study confirms that empowering teachers with appropriate knowledge, pedagogical competencies, and institutional support is essential for developing environmentally responsible citizens capable of contributing to sustainable development and achieving the Sustainable Development Goals (SDGs).

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