

PAPER

Education for a Sustainable Future: The Impact of Environmental Education on Shaping Sustainable Values and Attitudes among Students

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ABSTRACT

In the face of pressing global challenges, the role of education in shaping sustainable values and attitudes among students has become an urgent priority. This study delves into the immediate impact of education and awareness on students' knowledge, values, and attitudes toward a sustainable future, with a specific focus on environmental education (EE). It examines various aspects of EE, including curriculum development, teacher training, environmental initiatives within educational institutions, and students' comprehension of environmental issues. To understand the role of education in fostering a sustainable future, a 2-point Likert scale questionnaire was distributed to a randomly selected sample of 87 high school teachers. The results, analysed through multiple regression analysis, the chi-square test, the t-test, and Cronbach's alpha value tests, underscore the urgent and significant role of EE in preparing children for a secure future. The study further highlights the increasing urgency and importance of EE in the face of climate change, positioning it as a crucial element for early childhood educational policies.

KEYWORDS

environmental education (EE), education for sustainable development (ESD), educational planning, students' awareness, future leaders

1 INTRODUCTION

Education for a sustainable future is not just a concept but a central pillar of the United Nations' 2030 Sustainable Development Goals (SDGs). These goals are designed to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all individuals [1–4]. This underscores the importance of an educational approach that not only fosters a sustainable future but also empowers students to actively contribute to it, giving rise to the 'education for sustainable development' (ESD) movement [5]. Furthermore, the United Nations' fourth and final SDG

Imran, M., Almusharraf, N., Abdellatif, M.S. (2024). Education for a Sustainable Future: The Impact of Environmental Education on Shaping Sustainable Values and Attitudes among Students. *International Journal of Engineering Pedagogy (IJEP)*, 14(6), pp. 155–171. <https://doi.org/10.3991/ijep.v14i6.48659>

Article submitted 2024-02-20. Revision uploaded 2024-05-25. Final acceptance 2024-06-03.

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specifically calls for all students to acquire the knowledge and skills needed to promote sustainable development, including lifelong education that aligns with sustainability principles [6]. These findings have tangible implications for policymakers in the field of education, emphasising the potential of students and the need to integrate environmental education (EE) into the curriculum from an early stage.

Children acquire knowledge through the process of observation [7]. Therefore, it is crucial to go beyond simply providing information and instead encourage children to explore complex subjects, understand causality, and recognise the impact of human activities on society and the environment. Furthermore, integrating sustainable education initiatives into curricula motivates students to actively contribute to environmental sustainability. Educated communities are better equipped to teach younger generations about the consequences of their actions on the environment [8]. Many studies [9–12] have highlighted the consensus among teachers that the educational curriculum should include environmental sustainability projects to instil environmental awareness in future generations from a young age. By collaborating with teachers, educational institutions can organise class discussion sessions on environmental topics, along with school field trips to national parks or other places, as a beneficial activity to enhance students' knowledge about the environmental system. Additionally, fostering a green society and promoting social community engagement through parent-teacher meetings or school extracurricular activities can actively involve students in environmentally friendly initiatives [13].

This study examines how EE awareness affects students' evolving environmental attitudes. To protect the environment through education, educators and educational institutions foster the development of crucial social and personal skills in classrooms and social communities. Through an online survey conducted with educators, this study investigates how EE policies influence students' behaviours, considering recent environmental changes worldwide, particularly in Pakistan. Educational and engagement initiatives targeting parents and teachers can assist in preparing children for challenging situations. Thus, this study is very significant in demonstrating that EE is reflected in the development of students' environmental attitudes. Consequently, teachers and educational institutions should cultivate essential social and personal skills within schools and social communities to actively communicate and protect the environment. Although the research is limited to the Central Punjab region, the findings will aid governing bodies in developing policies to safeguard the entire country and the world from the impacts of climate change. Therefore, the present study explores the effect of environmental knowledge and attitudes on students' environmental behaviours. By incorporating concepts such as ecological literacy, sustainable development, and environmental stewardship, this study underscores the critical role of education in promoting a more environmentally aware and sustainable society.

1.1 Significance of the study

This study is of significant importance as it addresses the urgent need to instil sustainable values and attitudes among students in light of the increasing global environmental challenges, especially following sudden climate change, particularly in Pakistan and around the world. By examining the immediate impact of EE on shaping students' attitudes and values, the study has the potential to influence educational policies and practices. This will empower educators with insights to integrate effective EE strategies into curricula and pedagogical approaches. Furthermore, by assessing educators' perceptions and institutional priorities, the study aims to

promote sustainable behaviours among students, ultimately contributing to the advancement of environmental stewardship and responsibility in society.

The study aims to achieve and address the following objectives and address the research questions:

1.2 Objectives of the study

- a) To evaluate the effectiveness of EE in shaping students' knowledge, values, and attitudes towards sustainability.
- b) To analyse the integration of EE into educational curricula and assess its impact on promoting sustainable values among students.
- c) To examine the existing environmental initiatives within educational institutions and their influence on students' awareness and attitudes toward sustainability.

1.3 Research questions

- a) How does EE contribute to shaping students' knowledge, values, and attitudes toward a sustainable future?
- b) What are the current practices of integrating EE into educational curricula, and to what extent are they effective in promoting sustainable values among students?
- c) What are the existing environmental initiatives within educational institutions, and how do they influence students' awareness and attitudes toward sustainability?

1.4 Hypothesis of research

- **H₁**: EE must be a separate subject in the curriculum.
- **H₂**: Teachers can plan class discussion sessions on environmental topics.
- **H₃**: School field trips to national parks or environmental places as a healthy activity will enhance students' knowledge about the environmental system.
- **H₄**: The green society, community, or extracurricular activities after school will practically involve students in environment-friendly actions.
- **H₅**: The critical and creative thinking skill competitions will inspire students to bring new ideas about environmental protection.
- **H₆**: Teachers' training programs on EE or awareness campaigns will help society be environmentally friendly through parent-teacher meetings.
- **H₇**: The educational curriculum must be equipped with environmental sustainability projects to train future generations.
- **H₈**: Teachers suggestions to governing bodies to add dynamic dimensions of environmental sustainability to the curriculum will show their willingness to protect their children/students.
- **H₉**: Teachers must educate the next generation about the effects of climate change, especially after the 2022 floods in Pakistan.
- **H₁₀**: Teacher training, educational policies, and curriculum can overcome the deficiency of environmental knowledge, values, and attitudes among students.

2 LITERATURE REVIEW

Environmental education goes beyond promoting an appreciation for nature; it also involves encouraging individuals, especially children, to explore environmental

issues, engage in problem-solving, and take practical action to improve the environment [14]. Children, being the most vulnerable segment of society, are particularly affected by natural disasters. Therefore, EE should be recognised as a lifelong learning process that instils a sense of responsibility and awareness from an early age. Research has shown that when girls are educated about environmental issues during their school years, they are more likely to make sustainable choices as family members at home and as members of various institutions [15].

Several studies [1, 2, 8, 13] have investigated the impact of environmental knowledge and attitudes among Pakistani students. These studies have recommended new directions and initiatives at the school and university levels to promote a sustainable future. The EE occurring is likely to increase the vulnerability of affected children in terms of food, housing, education, and healthcare. According to [16], EE is an ongoing process that requires individuals to take responsibility for developing their environmental awareness, knowledge, skills, attitudes, and level of participation in addressing environmental concerns. Additionally, [17] emphasises that current environmental problems include industrialization, overpopulation, pollution, urbanisation, ozone depletion, deforestation, global warming, inadequate biodiversity conservation, and insufficient waste treatment. Expanding on this context, [5] emphasises the importance of rethinking education beyond traditional methods of instruction and recognising its potential for personal growth and the development of alternative and open futures. Furthermore, [5] explores how this broader understanding of education can help address significant environmental challenges, with a focus on sustainability, EE, and interdisciplinary communication.

A study conducted in Turkey [18] investigated the effects of EE practices on the attitudes and awareness of environmental issues among elementary school students. The findings revealed that implementing EE practices resulted in an improved understanding of environmental awareness and related issues among the students. This study concluded that raising environmental awareness among students is crucial and serves as a valuable investment for the future. Similarly, a study conducted in Latvia [19] discussed the importance of raising environmental awareness among students through education. The study focused on providing six months of training on sustainable environmental activities, particularly household chemicals and their alternatives. The results showed a significant change in the student's behaviour towards adopting alternatives that reduce the environmental impact of various chemicals used at home. This highlights the effectiveness of education in promoting environmentally friendly choices and practices among students.

Environmental disasters serve as stark reminders of the dire state of the environment, prompting reflection and action. In the Philippines, a study conducted by [20] explored the implementation of EE practices in promoting environmental awareness and education among students and teachers. The findings revealed that most students were integrating EE into subjects such as science, social studies, and values education. The study recommended the development of instructional materials and training programmes for teachers to effectively teach and integrate EE across different subject areas. A similar study conducted in Barbados [21] identified gaps in understanding the connections between perceptions, emotions, experiences, and environmental awareness and practices. Although the study focused on participants from a single major public university, it recommended that future studies should encompass a wider range of student-related factors and environmental literacy domains across the Caribbean region. This highlights the need for comprehensive studies to better comprehend the factors influencing environmental awareness and practices.

Like these global perspectives, several studies [1, 2, 8] have emphasised the necessity of students' environmental knowledge and awareness in Pakistan, as the country is among the most affected nations by climate change. The Pakistani government has made commitments to improve education, the environment, health, poverty alleviation, and food security. However, sustainable development in all spheres of life is inconceivable without educating the population. Educated and trained individuals are essential for enhancing the education system, formulating effective environmental policies, and driving economic growth, thus contributing to a better future and establishing a positive international reputation for Pakistan [22].

Recognising the importance of EE, studies [23, 24] emphasise that EE should be integrated into the future development goals of every nation to safeguard the environment and promote sustainable progress. EE fosters critical and creative thinking skills, as well as learning abilities that encourage students to actively engage with their environment and community. To enhance students' understanding of the environment and the impacts of climate change, [23] advocates for the implementation of green community education and extracurricular activities. On a global scale, industrialised countries are embracing the concept of "Green Education," which involves incorporating EE into various aspects of the modern educational system [6].

Based on [6], it is noted that Pakistan has yet to establish its EE policies and mechanisms. Consequently, there is an urgent need to prioritise EE as a fundamental component in order to develop an understanding of living in an eco-friendly society, particularly in light of the 2022 floods in Pakistan. The key objective of the green education project is to systematically elucidate the functioning of natural environments, including how human behaviour and ecosystems can be managed to promote sustainable living. It is crucial to raise future generations within a cultural framework that values environmental sustainability and comprehends its implications across various contexts. By instilling such values and awareness, Pakistan can strive towards a more environmentally conscious society.

To engage children in EE and counter the impacts of excessive indoor time, institutes can incorporate enjoyable outdoor activities. Richard Louv introduced the term 'Nature Deficit Disorder' in 2005 to describe the negative effects of limited interaction with nature. Therefore, engaging children in outdoor activities in parks and environmentally friendly spaces can promote their physical activity and attentiveness. Studies [25, 26] suggest that outdoor activities can help prevent health issues such as obesity, sensory impairments, and difficulty focusing among children. Teaching through practical examples and actions reinforces the understanding that the environment is crucial for their future well-being. Additionally, discussion sessions create a relaxed environment for students, fostering their confidence to share ideas and perspectives. EE is viewed as a lifelong and holistic process, stressing its importance at all stages of a student's academic journey. The Green School Program (GSP), in collaboration with the Worldwide Fund for Nature (WWF) Pakistan, is an example of a year-long course that consistently exposes students to aerodynamics and various ecological issues at local, national, and global scales.

3 METHODOLOGY

This study utilises a quantitative study approach to investigate the impact of EE on students' attitudes and values following the 2022 floods in Pakistan. A sample of 87 high school teachers from Central Punjab districts was surveyed using a two-point Likert scale questionnaire to collect data on the effects of educational

policies. Data analysis includes statistical tests, and ethical guidelines are adhered to. Limitations of the study involve sample representativeness and reliance on self-report measures, aiming for a more comprehensive examination of the relationship between students' environmental knowledge, values, and attitudes (dependent variables) and educational factors such as schools, teachers, and education department policies (independent variables). A two-point Likert scale is used to assess the effects of educational policies on students' environmental behaviours post-the 2022 floods in Pakistan, with "yes" coded as 1 and "no" coded as 2. A contextual analysis method is employed, and data is gathered through a survey. Statistical tests, including the chi-square goodness-of-fit test (χ^2), T-test, and Cronbach's alpha value (α), are performed using SPSS software to evaluate the p-value for the null hypothesis (H_0).

3.1 Participants

A sample of 87 high school teachers from Central Punjab districts was randomly selected to participate in the study. High school teachers were chosen due to their crucial role in delivering EE within educational institutions.

3.2 Instrumentation

Data on the effects of educational policies on students' environmental behaviours following the 2022 floods is collected through a two-point Likert scale questionnaire. The questionnaire comprises items that evaluate teachers' views on EE initiatives, curriculum enhancement, teacher training, and institutional focus on environmental concerns. The Likert scale gauges respondents' attitudes and opinions by assigning "yes" as 1 and "no" as 2.

3.3 Data collection

Data is collected through a survey in either electronic or paper format, based on participants' preferences and accessibility.

3.4 Data analysis

Statistical analyses are conducted using SPSS software to examine the relationship between independent and dependent variables. The chi-square goodness-of-fit test (χ^2) assesses the significance of associations between categorical variables, such as educational policies and students' environmental behaviours. T-tests compare means between groups, and Cronbach's alpha value (α) is computed to assess the reliability of the questionnaire. Multiple regression analysis is used to explore the predictive power of educational factors on students' environmental knowledge, values, and attitudes.

3.5 Ethical considerations

Ethical guidelines are followed throughout the study process to ensure participant confidentiality, informed consent, and the protection of participants' rights. Approval is sought from relevant institutional ethics committees prior to data collection.

3.6 Limitations

Efforts are made to ensure the representativeness of the sample, but the findings may not be generalizable to all educational contexts. Additionally, the reliance on self-report measures may introduce response bias, and the cross-sectional nature of the study limits the ability to infer causality.

4 FINDINGS AND ANALYSIS

The findings of this study provide insight into the current state of EE within school systems, highlighting both strengths and areas for improvement. The exploration of teachers' perspectives reveals a widespread recognition of the importance of integrating environmental topics into the curriculum. However, there are discrepancies in the implementation of related initiatives such as field trips, extracurricular activities, and critical thinking competitions. These findings emphasise the need for further investment and strategic planning to enhance EE efforts and equip students with the necessary knowledge and skills to address environmental challenges. The results of the hypotheses set for this study are as follows:

- **H₁:** EE must be a separate subject in the curriculum to raise awareness about climate change and its impacts. 48.3% of teachers agree that it is not currently included in the curriculum. According to the Chi-square goodness-of-fit test, $\chi^2 = (.103^a)$, $p(0.05) \leq .748$. The T-Test result shows $T = -4.295$, with a significance level of $p(2\text{-tailed})(0.05) \geq .000$. The Cronbach's alpha value (α) is (≤ 0.7) (**0.688** ≤ 0.7), which is considered acceptable.
- **H₂:** Do you plan discussion sessions with students on environmental topics? 73.6% of teachers attempt to discuss environmental issues in class alongside the curriculum. According to the Chi-square goodness to fit test $\chi^2 = (19.322^a)$, $p(0.05) \geq .000$: $T = -1.262$, Sig. (2-tailed) $p(0.05) \leq .261$. The Cronbach's alpha value (α) is (≤ 0.7), (**.598** ≤ 0.7). **Accepted**
- **H₃:** Does the school plan field trips to national parks or environmental places? 42.5%: According to the Chi-square goodness to fit test, where $\chi^2 = (1.943^a)$, $p(0.05) \leq .163$: $T = -3.584$, Sig. (2-tailed) $p(0.05) \geq .001$. Cronbach's alpha value (α) is (≤ 0.7), (**0.609** ≤ 0.7). **Accepted**
- **H₄:** Does the school have any green society, community, or extracurricular activity after school? 43.7%: As per Chi-square goodness-of-fit test $\chi^2 = (1.391^a)$, $p(0.05) \leq .238$: $T = -3.528$, Sig. (2-tailed) $p(0.05) \geq .001$. Cronbach's alpha value (α) is (≤ 0.7), (**0.608** ≤ 0.7). **Accepted**
- **H₅:** Does the school organize competitions to promote critical and creative thinking skills and inspire students about environmental protection? 31%: According to the Chi-square goodness-of-fit test $\chi^2 = (12.517^a)$, $p(0.05) \geq .000$: $T = -1.945$, Sig. (2-tailed) $p(0.05) = 0.05$. The Cronbach's alpha value (α) is (≤ 0.7), (**0.578** ≤ 0.7). **Accepted**
- **H₆:** Does the school arrange EE or awareness campaign training programs? 42.5%: As per the Chi-square goodness-of-fit test $\chi^2 = (1.943^a)$, $p(0.05) \leq .163$: $T = -3.304$, Sig. (2-tailed) $p(0.05) \geq .001$. Cronbach's alpha value (α) is (≤ 0.7), (**0.605** ≤ 0.7). **Accepted**
- **H₇:** Do you think the educational curriculum should include environmental sustainability projects? 96.6%: According to the Chi-square goodness to fit test $\chi^2 = (75.414^a)$, $p(0.05) \geq .000$: $T = 3.577$, Sig. (2-tailed) $p(0.05) \geq .001$. Cronbach's alpha value (α) is (≤ 0.7), (**0.705** ≤ 0.7). **Accepted**

- **H₈**: Will you suggest the governing bodies add dynamic dimensions of environmental sustainability to the curriculum? 93.1%: According to the Chi-square goodness to fit test $\chi^2 = (64.655^a)$, $p(0.05) \geq .000$: $T = 2.580$, Sig. (2-tailed) $p(0.05) \geq .012$. Cronbach's alpha value (α) is (≤ 0.7), **(0.663 \leq 0.7)**. **Accepted**
- **H₉**: Do you agree to educate the next generation about the effects of climate change after the 2022 floods? 98.9%: As per Chi-square goodness to fit test $\chi^2 = (83.046^a)$, $p(0.05) \geq .000$: $T = 4.233$, Sig. (2-tailed) $p(0.05) \geq .000$. Cronbach's alpha value (α) is (≤ 0.7), **(0.664 \leq 0.7)**. **Accepted**
- **H₁₀**: Do students lack environmental knowledge, values, and attitudes? 81.6%: According to the Chi-square goodness to fit test $\chi^2 = (34.770^a)$, $p(0.05) \geq .000$: Cronbach's alpha value (α) is (≤ 0.7), **(0.672 \leq 0.7)**. **Accepted**

4.1 Discussion and analysis

The findings of this study highlight the positive impact of nature on students, fostering a sense of passion and care for the environment through outdoor activities and community service. Developing a love for nature motivates students to engage in outdoor education and learn more about the environment. As a result, EE and outdoor education complement each other, benefiting students' physical and mental health [24]. This integrated approach has been found to enhance academic performance, reduce stress levels, and improve social skills [27, 28]. The outdoor educational environment provides opportunities for students to engage in laughter, physical activities, and creative endeavours [29, 30]. It stimulates their imaginative abilities, allowing them to create new stories, ask questions, and conduct experiments, thereby honing their critical thinking skills [31]. Table 1 presents a frequency description of the responses obtained from individuals in the study.

Table 1. Frequency description of the respondents' responses

Labels	Observed N/Ratio			
	Yes	%	NO	%
Is Environmental education a separate subject in the curriculum?	45	51.7	42	48.3
Do you plan discussion sessions with students on the topic of environmental issues?	64	73.6	23	26.4
Does the school plan field trips to national parks or environmental places?	50	57.5	37	42.5
Does the school have any green society/community or extracurricular activity after school?	49	56.3	38	43.7
Does the school plan critical and creative thinking skills competitions to inspire students about environmental protection?	60	69.0	27	31.0
Does the school arrange training programs on environmental education or awareness campaigns?	50	57.5	37	42.5
Do you think the educational curriculum must be equipped with environmental sustainability projects?	84	96.6	03	3.4
Will you suggest that the governing bodies add dynamic dimensions of environmental sustainability to the curriculum?	81	93.1	06	6.9
Do you agree to educate the next generation about the effects of climate change after the 2022 floods?	86	98.9	01	1.1
Do you feel students are lacking environmental knowledge, values, and attitude?	71	81.6	16	18.4

The response frequencies of 87 respondents were recorded based on ten label statements. Table 1 illustrates that 48.3% of the respondents acknowledge that EE is not a separate subject in the curriculum of Pakistan. Additionally, 73.6% of teachers

make an effort to discuss environmental issues in class alongside the curriculum. Furthermore, 42.5% and 43.7% of teachers reported that schools do not organise trips to environmental-related places or develop any green community activities after school, respectively. On the other hand, 31% of the teachers confirmed that schools lack competitions that promote critical or creative thinking skills to increase students’ awareness of environmental disasters. Additionally, 42.5% of teachers have never participated in any training programmes related to environmental awareness.

Moreover, 96.6% of teachers agreed to incorporate environmental sustainability projects into the educational curriculum, while 93.1% of teachers expressed their willingness to recommend that the governing bodies introduce dynamic dimensions of environmental sustainability to the curriculum. Furthermore, 98.9% of teachers agreed to educate the next generation about the effects of climate change, especially in light of the 2022 flood catastrophe. Finally, 81.6% of teachers observed the impact of inadequate environmental awareness and education on students’ environmental knowledge, values, and attitudes.

4.2 Chi-square test

According to Table 2, the results of the chi-square goodness-of-fit test indicate that the hypotheses are valid for promoting societal and environmental awareness, especially among the most vulnerable children.

Table 2. Chi-square test statistics

	Environmental Education is a Separate Subject in the Curriculum	Discussion Sessions with Students on the Environmental Topic	School Field trips to National Parks or Environmental Education	Green Society/Community or Extracurricular Activity after School	Critical and Creative Thinking Skills Competitions about Environmental Protection	Training Programs on Environmental Education or Awareness Campaigns	Inclusion of Environmental Sustainability Projects in Educational Curriculum	Suggesting Governing Bodies Add Dynamic Dimensions of Environmental Sustainability to the Curriculum	Educate Children about the Effects of Climate Change after the 2022 Floods	Students Lack Environmental Knowledge, Values, and Attitude
Chi-Square	.103 ^a	19.322 ^a	1.943 ^a	1.391 ^a	12.517 ^a	1.943 ^a	75.414 ^a	64.655 ^a	83.046 ^a	34.770 ^a
Df	1	1	1	1	1	1	1	1	1	1
Asymp. Sig.	.748	.000	.163	.238	.000	.163	.000	.000	.000	.000

Note: ^a The minimum expected cell frequency is 43.5.

The first hypothesis examines whether EE is a distinct subject in the curriculum. The Chi-square goodness-of-fit test ($\chi^2 = 0.103$, $p \leq 0.748$) does not provide significant evidence to reject this hypothesis. Notably, 48.3% of teachers acknowledge that EE is not a separate subject in the curriculum. Regarding the second hypothesis, it investigates the discussions between teachers and students on environmental topics in class. The Chi-square goodness-of-fit test ($\chi^2 = 19.322$, $p \geq 0.000$) reveals a significant relationship, indicating that a majority of teachers (73.6%) do engage in such discussions. The third hypothesis focuses on school field trips to national parks or other environmental

locations. The Chi-square goodness-of-fit test ($\chi^2 = 1.943, p \leq 0.163$) does not offer significant evidence to reject this hypothesis. It is worth noting, however, that 73.6% of teachers discuss the possibility of organising such field trips in their classrooms.

The hypothesis regarding green society, community, or extracurricular activities after school shows no significant evidence to reject the hypothesis ($\chi^2 = 1.391, p \leq 0.238$). Notably, 43.7% of schools do not plan such activities. In relation to improving critical and creative thinking skills through competitions to inspire environmental protection, there is a significant relationship ($\chi^2 = 12.517, p \geq 0.000$). This approach is implemented in 69% of schools. Regarding training programmes on EE or awareness campaigns, 57.5% of schools are involved ($\chi^2 = 1.943, p \leq 0.163$). Lastly, there is strong support (96.6% agreement) among teachers for the inclusion of environmental sustainability projects in the educational curriculum ($\chi^2 = 75.414, p \geq 0.000$).

In the next hypothesis, the majority of teachers (93.1%) willingly suggest adding dynamic dimensions of environmental sustainability to the curriculum. The data analysis shows a significant relationship ($\chi^2 = 64.655, p \geq 0.000$). Following the 2022 floods in Pakistan, an overwhelming 98.9% of teachers expressed their passion for educating the next generation about the effects of climate change. The data analysis reveals a significant relationship ($\chi^2 = 83.046, p \geq 0.000$). Regarding the dependent variable, a high frequency (81.6%) indicates that teachers perceive a lack of environmental knowledge, values, and attitudes among students, emphasising the importance of EE in educational policies. The data analysis supports this perspective ($\chi^2 = 34.770, p \geq 0.000$), leading to the rejection of the null hypothesis. Moreover, Table 3 presents the T-test data. The authors have provided a comprehensive analysis of these T-test findings in the accompanying table.

Table 3. Paired samples test

IDV Pairing with DV (Labels/Variables)		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Students lack environmental knowledge, values, and attitude – Environmental education is a separate subject in the curriculum	.29885	.64906	.06959	-.43718	-.16052	-4.295	86	.000
Pair 2	Students lack environmental knowledge, values, and attitude – Discussion sessions with students on the environmental topic	.08046	.59491	.06378	-.20725	.04633	-1.262	86	.211
Pair 3	Students lack environmental knowledge, values, and attitude – School field trips to national parks or environmental places	.24138	.62813	.06734	-.37525	-.10751	-3.584	86	.001
Pair 4	Students lack environmental knowledge, values, and attitude – Green society/ community or extracurricular activity after school	.25287	.66854	.07167	-.39536	-.11039	-3.528	86	.001
Pair 5	Students lack environmental knowledge, values, and attitude – Critical and creative thinking skills competitions about environmental protection	.12644	.60626	.06500	-.25565	.00277	-1.945	86	.055

(Continued)

Table 3. Paired samples test (Continued)

IDV Pairing with DV (Labels/Variables)		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 6	Students lack environmental knowledge, values, and attitude – Training programs on environmental education or awareness campaigns	.24138	.68141	.07305	–.38661	–.09615	–3.304	86	.001
Pair 7	Students lack environmental knowledge, values, and attitude – Inclusion of environmental sustainability projects in educational curriculum	.14943	.38966	.04178	.06638	.23247	3.577	86	.001
Pair 8	Students lack environmental knowledge, values, and attitude – Suggesting governing bodies add dynamic dimensions of environmental sustainability to the curriculum	.11494	.41555	.04455	.02638	.20351	2.580	86	.012
Pair 9	Students lack environmental knowledge, values, and attitude – Educate children about the effects of climate change after the 2022 floods	.17241	.37993	.04073	.09144	.25339	4.233	86	.000

4.3 T-test data analysis

Keeping in mind Table 3, the pairing results of the study are as follows:

1. The result of pair 1, comparing the dependent variable (students' lack of environmental knowledge, values, and attitude) with the independent variable (EE as a separate subject), yields a T-value of -4.295 . The significance level (p) is less than 0.001 , indicating that the null hypothesis is rejected.
2. In pair 2, when examining the dependent variable with the independent variable (Discussion sessions on environmental topics), the T-value is -1.262 . The significance level (p) is greater than 0.05 , indicating that the null hypothesis is accepted.
3. Pair 3, analysing the dependent variable with the independent variable (school field trips to national parks or environmental places), produces a T-value of -3.584 . The significance level (p) is less than 0.001 , leading to the rejection of the null hypothesis.
4. For pair 4, comparing the dependent variable with the independent variable (Green society/community or extracurricular activity after school), the T-value is -3.528 . The significance level (p) is less than 0.001 , resulting in the rejection of the null hypothesis.
5. In pair 5, when examining the dependent variable with the independent variable (Critical and creative thinking skills competitions about environmental protection), the T-value is -1.945 . The significance level (p) is 0.05 , indicating that the null hypothesis is rejected.
6. Pair 6, analysing the dependent variable with the independent variable (Training programs on EE or awareness campaigns), yields a T-value of -3.304 . The significance level (p) is less than 0.001 , leading to the rejection of the null hypothesis.
7. For pair 7, when comparing the dependent variable with the independent variable (Inclusion of environmental sustainability projects in the educational curriculum), the T-value is 3.577 . The significance level (p) is less than 0.001 , leading to the rejection of the null hypothesis.

8. In pair 8, when examining the dependent variable with the independent variable (suggesting governing bodies add dynamic dimensions of environmental sustainability to the curriculum), the T-value is 2.580. The significance level (p) is less than 0.05, which leads to the rejection of the null hypothesis.
9. Pair 9, analysing the dependent variable with the independent variable (educating children about the effects of climate change after the 2022 floods), yields a T-value of 4.233. The significance level (p) is less than 0.001, leading to the rejection of the null hypothesis.

4.4 Reliability statistics of variables

Table 4 presents the evaluation of the comparable concept’s reliability using Cronbach’s alpha value (≤ 0.7). Cronbach’s alpha, developed by Lee Cronbach in 1951, is a measure of internal consistency and reliability. In our study, the Cronbach’s alpha value for the ten standardized items is 0.657, which is less than or equal to 0.7. This indicates that the scales used in the Pakistani context are reliable, demonstrating the reliability of the scales in our study.

Table 4. Reliability statistics

Cronbach’s Alpha	Cronbach’s Alpha Based on Standardized Items	N of Items
.667	.657	10

4.5 Reliability analysis

Table 5. Item-Total Statistical values of the findings

Label Statements	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach’s Alpha if Item Deleted
Environmental education is a separate subject in the curriculum	10.0920	3.387	.153	.110	.686
Educate children about the effects of climate change after the 2022 floods	10.5632	3.854	.135	.409	.670
Discussion sessions with students on the environmental topic	10.3103	2.914	.535	.392	.590
School field trips to national parks or environmental education	10.1494	2.873	.476	.414	.602
Green society/community or extracurricular activity after school	10.1379	2.888	.463	.318	.606
Critical and creative thinking skills competitions about environmental protection	10.2644	2.755	.615	.482	.566
Training programs on environmental education or awareness campaigns	10.1494	2.803	.523	.506	.589
Students lack environmental knowledge, values, and attitude	10.3908	3.845	-.050	.137	.711
Inclusion of environmental sustainability projects in educational curriculum	10.5402	3.740	.209	.420	.662

Table 5 presents a statistical analysis of the hypothesis as follows:

1. The Cronbach's alpha (α) for EE as a separate subject in the curriculum is 0.688, which is less than 0.7. Therefore, the result is accepted.
2. The Cronbach's alpha (α) for discussion sessions with students on the environmental topic is 0.598, which is less than 0.7. Therefore, the result is accepted.
3. The Cronbach's alpha (α) for school field trips to national parks, or EE, is 0.609, which is less than 0.7. Therefore, the result is accepted.
4. The Cronbach's alpha (α) for the green society, community, or extracurricular activities after school is 0.608, which is less than 0.7. Therefore, the result is accepted.
5. The Cronbach's alpha (α) for critical and creative thinking skills competitions about environmental protection is 0.578, which is less than 0.7. Therefore, the result is accepted.
6. The Cronbach's alpha (α) for training programs on EE or awareness campaigns is 0.605, which is less than 0.7. Therefore, the result is accepted.
7. The Cronbach's alpha (α) for students' lack of environmental knowledge, values, and attitude is 0.705, which exceeds 0.7. Therefore, the result is deemed acceptable.
8. The Cronbach's alpha (α) for the inclusion of environmental sustainability projects in the educational curriculum is 0.663, which is less than 0.7. Therefore, the result is accepted.
9. The Cronbach's alpha (α) for recommending that governing bodies incorporate dynamic dimensions of environmental sustainability into the curriculum is 0.664, which is less than 0.7. Therefore, the result is accepted.
10. The Cronbach's alpha (α) for educating children about the effects of climate change after the 2022 floods is 0.672, which is less than 0.7. Therefore, the result is accepted.

5 RECOMMENDATIONS

The discussion overview supports the idea that EE should be a separate course in schools and colleges. It can include topics such as the biosphere, greenhouse effect, depletion of the ozone layer, safe fertilisation, wildlife protection, soil chemistry, domestic and industrial waste management, pollution, ecosystems, kitchen gardening, nuclear energy, environmental regulations, and eco-friendly energy sources. This idea is supported by a study conducted in Turkey, where the investigators concluded that raising environmental awareness among students is crucial and serves as a valuable investment for the future. Teachers can utilise environmental protection issues in textbooks to establish connections, particularly between science and the environment. Textbooks and teacher training programmes should enhance educators' capacity to impart environmental awareness, foster attitudes, interests, and skills, and instil ecologically sustainable practices in students. Similarly, in Latvia, a study focused on providing six months of training on sustainable environmental activities, particularly household chemicals and their alternatives, to students and proved that such practices are beneficial for students worldwide to teach environmental ethics and awareness.

The government's collaboration with the National Environmental Education Foundation (NEEF) can help train professional EE teachers and equip them with resources such as infographics, lesson planning materials, activity guides, maps, and environment-related apps. Researchers from the Philippines, in a study [20],

recommended the development of instructional materials and training programmes for teachers to effectively teach and integrate EE across different subject areas. These resources can be accessed on electronic devices, bringing EE to the forefront of modern teaching methods. Furthermore, society's environmental knowledge can help individuals understand the importance of EE for themselves, fostering a positive commitment to standardised training in their local communities.

Particularly, institutions in Pakistan should reinstate their green and sustainable education policy, which was introduced in 2021 [32]. This policy is crucial to ensuring that ecological attitudes and values are fostered in individuals, enabling them to recognise their responsibility towards natural resources and the climate. Additionally, subjects related to environmental awareness should be incorporated into language and social sciences degree programs. This integration will assist students in acquiring and internalising environmental knowledge during the diversification stage of their education.

6 CONCLUSION

This study concludes that EE plays a crucial role in developing sustainable values and attitudes among students. It further examined various aspects, such as curriculum development, teacher training programmes, institutional initiatives, and students' understanding of environmental issues. The findings emphasise the importance of integrating EE into educational policies to tackle pressing environmental challenges such as climate change. By educating students about the environment, EE equips them with the skills to mitigate environmental threats and cultivates a sense of responsibility towards environmental preservation. In the future, it is essential to continue enhancing EE programmes and promoting collaborative initiatives between educational institutions and governing bodies to foster a generation of environmentally conscious individuals who will address sustainability challenges in the future.

Therefore, to secure a sustainable future, it is crucial to have a robust curriculum and training process that raises awareness and improves efficiency through education. Instead of focusing on annual or seasonal planning, governments should transition towards decade-long educational planning to ensure a sustainable future. Early EE plays a significant role in helping students develop experience, interest, and enthusiasm for nature, climate change, environmental issues, and environmental preservation. This can give rise to a generation of lifelong environmental activists who will continue to lead sustainable lives as they grow into adulthood, provided that educational institutes foster this passion in young minds. By implementing environmentally friendly educational policies, we can enhance environmental knowledge and develop students' values and attitudes towards the environment.

7 CONFLICT OF INTEREST

The authors declared no conflict of interest.

8 ACKNOWLEDGMENT

The authors thank Prince Sultan University for providing technical and financial support (APC) for this manuscript.

This study is supported by funding from Prince Sattam bin Abdulaziz University, project number PSAU/2024/R/1445.

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