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Role Of Eco-Literacy in Developing Sustainable Behaviors Among Higher Secondary Students of District Faisalabad

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Abstract

Eco-literacy is the understanding of ecological systems and the ability to make informed, responsible environmental decisions. This study explored the role of eco-literacy in promoting sustainable behavior among higher secondary students in public sector colleges of Faisalabad a city facing serious environmental challenges like water scarcity, smog, extreme weather, and poor waste management. From the 51 public colleges listed by the Directorate of Education Faisalabad, four were selected using convenience sampling. Out of a population of 2,800 students, a sample of 244 was chosen using a 95% confidence level and 6% confidence interval, with equal gender and rural–urban representation. A descriptive research design was employed, using a structured questionnaire. Data were analyzed using SPSS. The findings revealed a strong positive relationship between eco-literacy and environmentally responsible behavior. Female students exhibited greater ecological responsibility compared to male students ($p = .000$). Most respondents demonstrated high eco-literacy levels, influenced by curriculum content, previous knowledge, and college-based initiatives like recycling drives. Students showed significant interest in environmental issues, particularly in waste management, and many supported awareness campaigns and practical initiatives. However, opinions were divided regarding enforcement measures such as fines and government regulation. The study concludes that enhancing eco-literacy can significantly contribute to environmental sustainability. It recommends making environmental education a compulsory part of the curriculum in public colleges, initiating more hands-on conservation programs, and enforcing environmental laws more strictly to cultivate a responsible and eco-conscious generation in Faisalabad.

Key Words: Eco-literacy, Sustainable Behavior, Higher Secondary Students

Introduction

The environment is dealing with smog, air pollution, climate change, global warming, and ozone depletion. Because of the factors of contamination, a person can avoid food and drink, but they must rely on the local air quality. The majority of developing nations either lack enforcement or have insufficient legislation. However, the degree of eco-literacy among students in developing nations like Pakistan continues to be a worry despite global achievements in environmental education (Shahzadi *et al*., 2022). Recent climate changes around the world have made environmental literacy

the main focus of study and development in both environmental education and teacher education (Dada*et al.,* 2017). In order to develop sustainability and responsible citizenship, Pakistan's National Education Policy supports the inclusion of eco-literacy. Nevertheless, this policy's application is patchy and uneven. Environmental problems are getting worse in Pakistan, especially in urban and semi-urban areas like Faisalabad, and they need to be addressed right away. One long-term tactic to encourage sustainability is to help public college students become more eco-literate. Therefore, this study explores how eco-literacy can influence this population's sustainable behaviour (Ali *et al.,* 2015).

The World Health Organization (WHO) has placed Pakistan as the fourth most polluted country in the world, behind China, India, and Nigeria (WHO, 2016). This ranking is supported by another report (SUPARCO, 2017). It has emerged as one of the primary reasons for Pakistan's rising annual mortality toll. Air pollution and smog are both caused by the same things (Nawaz*et al.,* 2023). The ability to make better decisions and encourage sustainable behavior is known as eco-literacy. It is also referred to as the ability to recognize the connections between people and the environment and to comprehend environmental challenges. Eco-literacy gives people the knowledge and abilities to address today's environmental problems and prevent future ones (Daudi, 2000). Higher secondary pupils are in a formative phase of their moral and cognitive development. The students that possess eco-literacy are better equipped to promote environmental conservation (McBride *et al*., 2013). The students' behavioral changes and increased environmental awareness are the goals of integrating eco-literacy into the classroom (Pe'er *et al*., 2007).

Statement of the Problem

Cities like Faisalabad are facing serious environmental issues due to industrial growth and urbanization. Although there is growing awareness about these challenges, many students still lack the understanding and motivation to adopt environmentally friendly habits in their daily lives. Eco-literacy is believed to be a key factor in shaping responsible and sustainable behavior. But in our local context, we still don't fully understand how much eco-literacy influences students' choices and actions when it comes to the environment. This study aims to explore how eco-literacy can play a role in promoting sustainable behavior among high school students in Faisalabad. The goal is to identify where students stand in terms of environmental understanding and what kind of learning experiences might help them act more responsibly toward the planet.

Significance of the Study

The study holds great importance in understanding how eco-literacy can influence the development of sustainable behaviors among high school students in Faisalabad. As environmental challenges continue to grow, especially in rapidly urbanizing cities like Faisalabad, educating young people becomes crucial in promoting long-term environmental responsibility. By exploring students' awareness, attitudes, and actions related to environmental issues, this research aims to bridge the gap between knowledge and practice. The findings will be valuable for educators, curriculum developers, and policymakers, offering insights into how environmental education can be improved to make a real impact on students' lives. Furthermore, this study highlights the need to include more practical, engaging, and locally relevant environmental content in school programs. In doing so, it supports the broader goal of nurturing environmentally conscious citizens who can contribute positively to a more sustainable and healthier future.

Objectives

1. To assess the current levels of environmental awareness among higher secondary students of public colleges of Faisalabad
2. To evaluate the impact of eco-literacy on students' environmental consciousness behaviors in

public colleges of Faisalabad

Literature Review

Locke *et al*. (2013) highlighted the role that eco-literacy and environmental education played in promoting sustainable development. In order to guarantee long-term sustainability, education should put more of an emphasis on creating behavioural changes. This study found that participatory learning activities, such outdoor education and community-based projects, were crucial in encouraging environmentally conscious behavior. Jiwa and Esa (2014) examined secondary school pupils' ecological literacy. In addition to highlighting the discrepancies between students' interest in environmental issues and their real-world conduct, their study offered recommendations for bridging these gaps through the use of interactive and problem-based learning strategies. Additionally, they proposed that experiential learning improved students' eco-literacy.

Wardani *et al*. (2018) investigated high school pupils' levels of environmental literacy. They came to the conclusion that while hands-on activities increased students' engagement and comprehension of ecological issues, standard teaching approaches were unable to impart useful environmental information. In order to strengthen classroom learning, the study emphasized the importance of incorporating environmental activities into schooling. Fang (2020) emphasized that in order to promote cognitive, emotional, and behavioral elements in education; a multifaceted approach to environmental literacy is required. Compared to traditional instruction, he discovered that experiential learning was more successful at integrating eco-literacy.

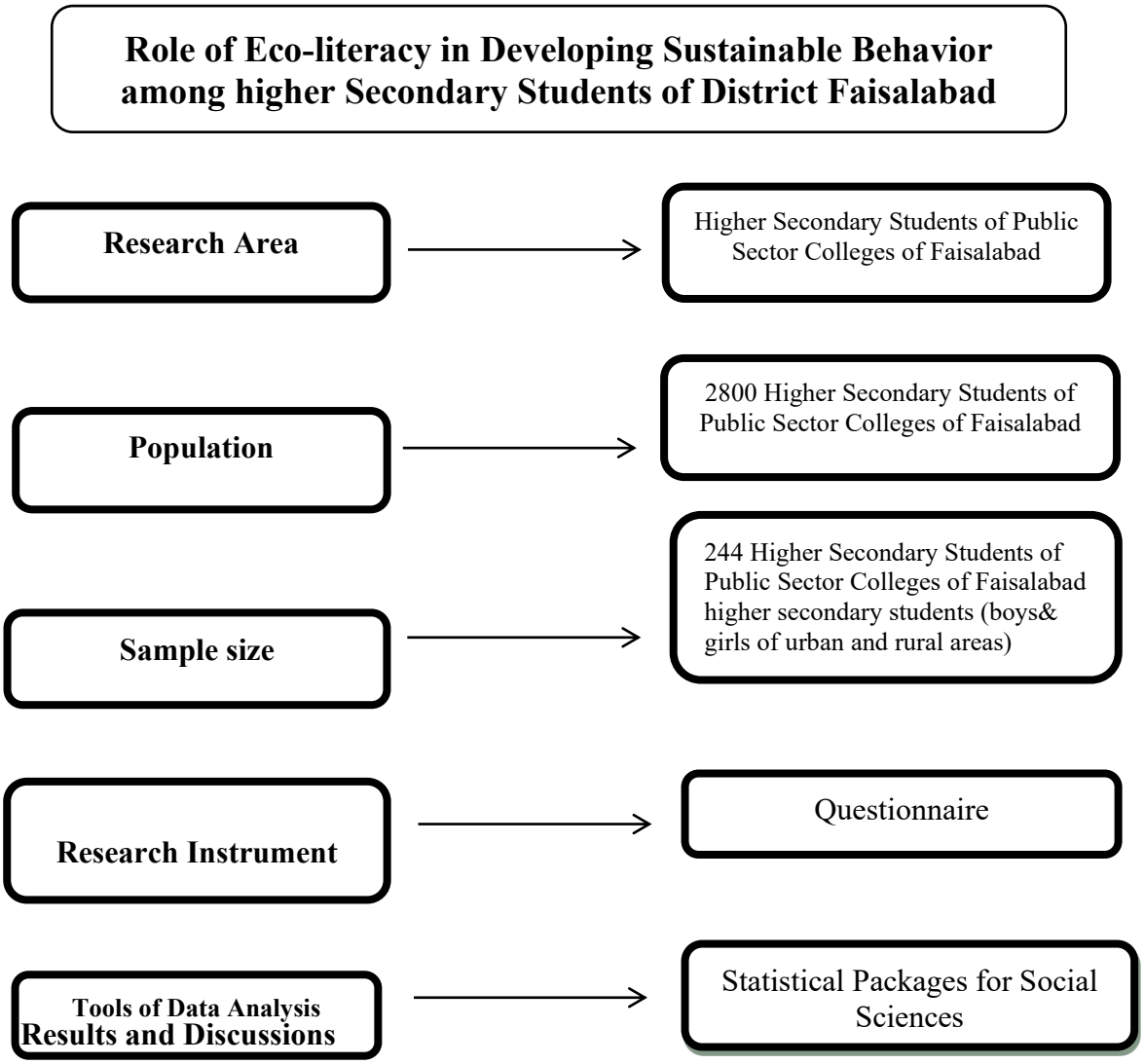
Soomro (2024) assessed how well environmental education is being taught, a comprehensive examination of science textbooks was conducted. He emphasized that many textbooks lacked thorough treatments of sustainability. Additionally, he highlighted the shortcomings in curriculum design. This study emphasized the need for comprehensive, useful sustainability content and identified shortcomings in curriculum design. He pushed for the inclusion of current environmental issues and solutions in instructional materials.

Firinic (2025) investigated how eco-friendly measures affected universities. These projects included energy conservation campaigns, tree planting programs, and trash segregation systems. The author highlighted the school's dedication to environmentally friendly practices and engaged student involvement. The author also highlighted the efforts' symbolic and usefulness in promoting a sustainable culture in educational institutions and strengthening eco-literacy lessons.

Methodology

The research was conducted in district Faisalabad; Punjab Pakistan by employing descriptive research. From the 51 public colleges listed by the Directorate of Education Faisalabad, four were selected using convenience sampling. Out of a population of 2,800 students, a sample of 244 was chosen using a 95% confidence level and 6% confidence interval, with equal gender and rural–urban representation. The four public colleges were selected conveniently. The data was collected through a structured questionnaire. The validity of the questionnaire was tested by getting expert’s opinions and reliability of the questionnaire was tested by using Cronbach’s Alpha after the pilot testing. The data was analyzed by using Statistical Package for Social Sciences (SPSS). To evaluate the impact of eco-literacy on students' environmental consciousness and behavior, correlation and regression analyses was conducted to determine the strength and significance of the relationship between eco-literacy and sustainable practices. Additionally, independent samples t-tests was used to compare sustainable behavior between male and female students, as well as between urban and rural students, to identify significant differences.

(Fig 1: Organogram)



Demographic Characteristics of the Respondents

There was an equal representation of respondents in term grade (11^{th}& 12^{th}), gender (male & female) and locality (rural&urban) the study. The highest percentage of respondents falls within the 15–16 years age group followed by the 17–18 years category. A smaller proportion of respondents are above 18 years. The most common professions of father are businessperson and government employee. Farming is the next most reported profession. Private employment was cited by 10% respondents. Half of respondents reported that their mothers are housewives and businesswomen. Government and private employment were equally represented, with 9.8% of respondents. The majority (80%) of respondents belongs to nuclear families and 20%respondents come from joint families. None of the respondents reported their parents as illiterate or having postgraduate education. The highest percentages are seen at the matriculation and intermediate levels. Middle education accounts for approximately 20%. Graduation level education is reported by 10%.

Eco-literacy Awareness

Table 1: Distribution of the Respondents according to their Eco-literacy Awareness

Eco-literacy Awareness	Yes (%)	No (%)
Do you have any prior knowledge of eco-literacy?	70.0%	30.0%
Have you studied eco-literacy concepts in your curriculum?	80.0%	20.0%
Does your college have recycling programs?	80.0%	20.0%
Have you ever taken part in an environmental awareness campaign?	70.0%	30.0%
Would you like to participate in environmental awareness campaigns?	60.0%	40.0%
Should schools/colleges provide more practical environmental learning activities?	60.0%	40.0%
Should students be given projects related to environmental conservation?	50.0%	50.0%
Should students be encouraged to plant trees in their college?	60.0%	40.0%
Would you consider taking an environmental science course in the future?	80.0%	20.0%
Should people be fined for harming the environment (e.g., littering, cutting trees illegally)?	50.0%	50.0%
Is waste management the major environmental problem in Faisalabad?	80.0%	20.0%
Have you taken any initiatives in your college or community to promote eco-friendly behavior?	50.0%	50.0%

The table summarizes respondents' awareness and attitudes toward eco-literacy and environmental issues. A majority (70%) reported having prior knowledge of eco-literacy, with an even larger proportion (80%) having studied eco-literacy concepts as part of their curriculum. Similarly, 80% acknowledged the presence of recycling programs in their colleges. Participation in environmental awareness campaigns was reported by 70%, while 60% expressed willingness to participate in such campaigns in the future. An equal 60% believed that colleges should provide more practical environmental learning activities and encourage tree planting initiatives. With 50% supporting the idea those students should be assigned conservation-related projects. Interest in pursuing an environmental science course in the future was high at 80%. Half of the respondents agreed that people should be fined for harming the environment, reflecting mixed views on environmental enforcement. Waste management was identified as a major environmental problem in Faisalabad by 80% of respondents. However, only half reported having taken any eco-friendly initiatives in their college or community.

Current Environmental Awareness

Table 2: Gender-based Comparison on Current Environmental Awareness

Sr. No.	Current Environmental Awareness	Male Mean	Male Std. Dev.	Female Mean	Female Std. Dev.	T=value	p-value
1	Industrial emission causes air pollution	1.4754	0.50145	4.2787	0.53416	-3.26	0.911 NS
2	Water pollution is caused by industrial waste.	4.0902	0.73859	4.1967	0.61172	-3.62	0.003*
3	Lack of awareness is the major challenge	3.9180	0.68743	4.1803	0.60325	-3.98	0.515 NS
4	Smog is combination of smoke and fog.	3.9262	0.81482	4.2049	0.58830	-3.55	0.728 NS

5	Crop burning is the cause of smog	4.1721	0.74626	4.1230	0.73381	-2.98	0.013 *
6	Deforestation increases air pollution.	3.8852	.88324	4.1230	.56886	-3.410	0.744 NS
7	Deforestation contributes to climate change.	4.1393	.79581	4.2705	.65602	-3.37	0.085 NS
8	Deforestation decreases oxygen levels.	3.8770	.80881	4.1393	.60733	-3.23	0.267 NS
9	Greenhouse gas emissions cause global warming.	3.8197	.78220	4.0984	.64807	-3.20	0.865 NS
10	Using biodegradable reduces plastic pollution	3.9754	.75474	4.1557	.64309	-3.22	0.576 NS
11	Recycle and reuse plastic reduces pollution	3.5574	.90954	3.4180	.79086	-2.98	0.013 *

In first statement, male respondents reported a mean of 1.48 (SD = 0.50), while female respondents showed a significantly higher mean of 4.28 (SD = 0.53). However, despite this large difference in mean scores, the p-value is 0.911, indicating that the difference is **not statistically significant (NS)**. In the second statement females (M = 4.20, SD = 0.61) demonstrated slightly higher awareness than males (M = 4.09, SD = 0.74), with a statistically significant difference (t = -3.62, p = 0.003).In the third statement, students were asked whether lack of awareness is a major challenge in adopting sustainable behaviors in their community. Females again had a higher mean score (M = 4.18, SD = 0.60) compared to males (M = 3.92, SD = 0.69), but the p-value of 0.515 shows the difference is **not statistically significant**, implying both genders perceive awareness as an important factor, but with no significant gender gap. The fourth statement examined that female students scored higher (M = 4.20, SD = 0.59) than male students (M = 3.93, SD = 0.81), though the p-value (0.728) indicates this difference is **not significant**, suggesting a similar level of understanding among both genders. The fifth statement male respondents scored slightly higher (M = 4.17, SD = 0.75) than females (M = 4.12, SD = 0.73) and the difference was **statistically significant** (p = 0.013). The sixth statement assessed the awareness of deforestation increasing air pollution. Female students (M = 4.12, SD = 0.57) again scored higher than males (M = 3.89, SD = 0.88) yet the p-value (0.744) indicates that this difference is **not statistically significant**, showing both genders have comparable awareness levels regarding this issue. The seventh statement presents that female respondents scored higher (M = 4.27, SD = 0.66) than males (M = 4.14, SD = 0.80) but with a **non-significant** p-value (0.085), indicating no meaningful gender-based difference in understanding of this environmental concern. In the eighth statement, females again had a higher mean (M = 4.14, SD = 0.61) than males (M = 3.88, SD = 0.81), but the p-value of 0.267 shows the result is **not statistically significant**, reflecting a shared understanding between genders. In the ninth statement, female students scored higher (M = 4.10, SD = 0.65) than male students (M = 3.82, SD = 0.78), but the p-value (0.865). The tenth statement shows that female students had a higher mean score (M = 4.16, SD = 0.64) compared to males (M = 3.98, SD = 0.75), though the p-value (0.576). Lastly, the eleventh statement reports male students scored higher (M = 3.56, SD = 0.91) than female students (M = 3.42, SD = 0.79), and this difference was **statistically significant** (p = 0.013), implying that males may have a stronger preference or belief in recycling practices as a key environmental solution.

Gender-Based Comparison on Eco-Literacy Awareness

Table 3: Gender-based Comparison on Eco-Literacy Awareness

1	**Prior knowledge of eco-literacy?**	**1.2951**	**0.45796**	**1.1230**	**0.32973**	**-4.34**	**0.000***
2	Studied eco-literacy in curriculum	1.3689	0.48448	1.1393	0.34773	-4.36	0.011*
3	College have recycling programs? ؟	1.6557	0.47709	1.3279	0.47137	-3.52	0.000*
4	Taken part in an environmental awareness campaign	1.6230	0.48665	1.3934	0.49053	-4.07	0.553 NS
5	Would you like to participate in environmental awareness campaigns?	1.0984	0.29903	1.0328	0.17881	-4.13	0.188 NS
6	want more practical environmental learning activities	1.0246	0.15551	1.0164	0.12751	-4.20	0.504 NS
7	Give more EL projects to students	1.0328	0.17881	1.0164	0.12751	-3.35	0.000*
8	Encourage students to plant trees	1.0000	0.00000	1.0246	0.15551	-2.72	0.008*
9	Would you take environmental science course in the future?	1.1557	0.36410	1.0656	0.24856	-4.10	0.087 NS
10	People should be fined for harming the environment	1.0410	0.19907	1.0328	0.17881	-3.79	0.582 NS
11	Recycle and reuse plastics reduces plastic pollution.	1.0246	0.15551	1.0164	0.12751	-3.55	0.000*

In the first statement, male reported a higher mean response of 1.30 (SD = 0.46) compared to female with a mean of 1.12 (SD = 0.33). The t-value of -4.34 and p-value of 0.000 indicate a statistically significant difference, suggesting male have more prior awareness of eco-literacy than female.

For the second statement, male again reported a higher mean of 1.37 (SD = 0.48) compared to female's mean of 1.14 (SD = 0.35). The difference is statistically significant (t = -4.36, p = 0.011), indicating male may have greater exposure to eco-literacy content in their studies. Regarding the presence of recycling programs in college, male reported a higher mean score (1.66, SD = 0.48) than female (1.33, SD = 0.47), with a significant t-value of -3.52 and p = 0.000, suggesting male perceive more recycling initiatives at their institutions. The statements about participation in environmental awareness campaigns and willingness to participate showed no significant gender differences, with p-values of 0.553 and 0.188 respectively, indicating similar attitudes across genders.

For attitudes toward schools providing more practical environmental activities and assigning projects related to environmental conservation, male showed significantly higher agreement than female on the latter (t = -3.35, p = 0.000), while no significant difference was found for practical learning activities (p = 0.504). Male were less in agreement with encouraging students to plant trees than female (t = -2.72, p = 0.008), showing a significant difference in this specific attitude.

Impact of Eco-literacy on Environmental Consciousness behaviors

Table 4: Gender-based Comparison on impact of Eco-literacy on Environmental Consciousness Behaviors

Sr. No.	Statements	Male Mean	Male Std. Dev.	Female Mean	Female Std. Dev.	T=value	p-value
1	Environmental issues are serious concerns	1.1639	0.37174	1.3279	0.47137	-3.66	0.008*
2	Environmental education should be a compulsory subject	1.4754	0.50145	4.2787	0.53416	-3.26	0.911 NS
3	Industries cause environmental pollution.	4.0902	0.73859	4.1967	0.61172	-3.62	0.003*
4	Eco-literacy helps improve students' environmental responsibility.	3.9180	0.68743	4.1803	0.60325	-3.98	0.515 NS
5	Eco-literacy influences students to take action for the environment.	3.9262	0.81482	4.2049	0.58830	-3.55	0.728 NS
6	College is the main source of environmental knowledge.	4.1721	0.74626	4.1230	0.73381	-2.98	0.013*
7	Television/news/media is the main source of environmental knowledge.	3.7951	0.94422	4.3934	0.52314	-3.86	0.625 NS
8	Daily actions impact the environment.	4.4016	0.70018	4.2459	0.62074	-4.13	0.033*
9	Feel a sense of responsibility towards environment	4.2213	0.92274	4.3361	0.62471	-4.32	0.020*
10	Change daily habits to bemore environmentally friendly.	4.4180	0.58691	4.2869	0.56743	-3.95	0.782 NS
11	Avoid using single-use plastics.	4.1475	0.70032	4.2131	0.56378	-3.74	0.864 NS
12	Use reusable bags, bottles, and boxes.	4.0820	0.77769	4.3115	0.53136	-4.48	0.016*
13	Frequently plant trees in college or community.	4.1230	0.80881	4.2787	0.50226	-3.14	0.654NS
14	Participated in environmental or clean-up campaigns.	4.2295	0.76910	4.2951	0.57046	-3.23	0.949 NS
15	Encourage others to adopt sustainable practices.	4.1803	0.69254	4.2705	0.53066	-3.43	0.056 NS

The first statement reported that female showed a significantly higher mean score of 1.33 (SD = 0.47) compared to male, who scored 1.16 (SD = 0.37). The t-value of -3.66 and p-value of 0.008 indicate a statistically significant difference, suggesting female perceive environmental issues as more serious concerns than male. Regarding whether environmental education should be compulsory in higher secondary education, both male and female showed high agreement with means of 1.48 and 4.28 respectively, but the p-value of 0.911 shows no statistically significant difference. On the perception that industries in Faisalabad are responsible for pollution, female again reported a higher mean of 4.20 (SD = 0.61) than male (mean = 4.09, SD = 0.74). The t-value of -3.62 and p-value of 0.003 show this difference is statistically significant. The statements on the role of eco-literacy in improving responsibility and motivating environmental action showed no significant gender differences, indicating shared views. When asked about sources of environmental knowledge, male and female differed significantly in their responses on school/college as the main source, with male scoring slightly higher (mean = 4.17, SD = 0.75) than female (mean = 4.12, SD = 0.73), t = -2.98, p = 0.013. For television/news/media as a source, no significant gender difference was found. Regarding daily environmental impact and personal responsibility, male students scored significantly higher on acknowledging daily actions' impact (mean = 4.40 vs. 4.25, t = -4.13, p = 0.033) and feeling responsible for protecting the environment (mean = 4.22 vs. 4.34, t = -4.32, p = 0.020). The behavioral changes like habit modification, avoiding single-use plastics, planting trees, participating in campaigns, and encouraging sustainability showed no significant gender differences in most cases. However, male reported significantly lower scores than female in using reusable bags, bottles, and boxes (mean = 4.08 vs. 4.31, t = -4.48, p = 0.016). Overall, this analysis reveals that while both genders exhibit high environmental consciousness and eco-friendly behaviors, female tend to express stronger concern about environmental issues and responsibility, whereas male students report slightly higher awareness of the environmental impact of their daily actions. Many behaviors related to sustainability and participation is similarly endorsed by both genders.

Conclusion

This study offers valuable insights into the eco-literacy awareness and behaviors of higher secondary students in Faisalabad, Pakistan, revealing a generally high level of environmental understanding. A significant majority of students have prior knowledge of eco-literacy, have studied these concepts in their curriculum, and are aware of college recycling programs. There's also a strong inclination towards pursuing environmental science in the future and a widespread recognition of waste management as a major environmental challenge in the city. While many have participated in awareness campaigns and express willingness to do so, there's a notable split in opinions regarding the implementation of specific environmental conservation projects and the enforcement of environmental fines, indicating areas where further consensus and engagement might be needed. Crucially, the study highlights statistically significant gender disparities. Male students consistently report higher eco-literacy awareness in terms of conceptual understanding and engagement with existing programs. Conversely, female students tend to demonstrate a stronger sense of environmental consciousness, perceived responsibility, and reported pro-environmental behaviors, including a heightened awareness of environmental challenges in both urban and rural contexts.

Recommendation

- Eco-literacy should be treated as an ongoing educational journey rather than a one-time intervention.
- Colleges **s**hould provide more practical environmental learning activities such as awareness campaigns and competition like quiz essay for motivation.

- The research also suggests providing equal opportunities in order to fill gender based disparities.

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