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Sustainability Literacy Among University Students: Awareness and Practices

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Abstract

This research explores the sustainability literacy of university students in Pakistan with a particular reference to their understanding, attitudes and practices on sustainable development and the role that universities can play to promote sustainability. Quantitative, descriptive survey design was employed to collect data using a structured Likert-scale questionnaire administered to 664 students from different faculties. Findings indicate that students are moderately aware (M = 2.50) and have a positive attitude (M = 2.44) towards sustainability, modest sustainable behavior (M = 2.39), and weak perceived institutional support (M = 2.32). The gender-based analysis indicated that sensitivity was significantly different (p value < 0.05), with females having better awareness, and males expressing stronger attitudes and practices. There were also variations by department, suggesting that sustainability literacy is subject-dependent. Positive correlation between attitudes and practices (r = .841, p < .01) as well as weak relationships between knowledge and practice. While there is the increasing theoretical comprehension of sustainability, the translation into practice within the university does not seem too straightforward. The study suggests that environmental and sustainability education should be embedded within the curriculum in higher education; there is a need to increase institutional engagement and build capacity for authentic experiential learning that leads to changes in values and behavior.

Keywords: sustainability literacy, university students, awareness, sustainable practices, higher education, Pakistan.

Introduction

The concept of sustainability was first introduced in 1713 to conserve forests. After many decades, the concept of sustainability was introduced in 1987 through the Brundtland report,

aiming to focus on economic development, social justice, and a clean environment. Nowadays, sustainable development is an important aspect for people around the world. However, several initiatives have been undertaken to promote sustainability worldwide. Although these steps have made various contributions to the development of many countries, their actual aim wasn't achieved. After many years of collaboration on the project, 193 United Nations member states, along with NGOs, have developed 17 sustainable development goals, aiming to achieve a safe and vibrant future (Sankaran et al., 2020). To achieve this, education can play an essential role in preparing students to be professional and valuable members of society, enabling them to address global issues. However, there is a crucial need for higher education initiatives regarding sustainable development in their country. Universities can play a responsible role by arranging awareness sessions and preparing students for a sustainable future (Wooltorton et al., 2015). This can only be possible when theoretical studies are converted into practical, education- and research-driven studies.

Developing countries have a crucial need for sustainable literacy, which means that students must have knowledge. A positive attitude and sustainable practices among students. Sustainable literacy will also influence students' attitudes, behavior, and practices in their daily lives (Chen et al., 2022). However, the 21st century demands sustainable literacy, and education for sustainable development should be the priority of both developing and developed countries (Oghenekohwo & Frank-Oputu, 2017). Moreover, many universities, especially in developing countries, have failed to integrate sustainability-related content into their curricula. However, various studies have been conducted on sustainable literacy. As a result, countries around the world have reported on the level of understanding and factors that affect sustainable development, including academic background, gender, and institutional policies (Žalėnienė & Pereira, 2021). Pakistan's higher education system lacks comprehensive data on university students' awareness, attitudes, and sustainability practices.

Apart from that, sustainable development can also promote social justice, equity, and equal access to education. Education is a key aspect that can promote and achieve all the 17 Sustainable Development Goals (Garcia et al., 2017). Despite the importance of education for sustainable development, many higher education institutions have failed to incorporate sustainable and environmentally friendly content into their curricula. Many students lack awareness and exhibit negative behavior regarding sustainable development; as a result, they are less inclined to participate in activities related to sustainable development. Therefore, it is

essential to recognize the sustainable literacy among university students and explore their weaknesses, behaviors, and developed educational strategies that can contribute to sustainable development. That is why the research purpose is to identify the level of awareness among university students, examine students' attitudes toward sustainable practices, investigate the factors affecting sustainable literacy among university students, and explore the role of universities in promoting sustainable education and practices.

2 Literature review

Education, along with the 17 SDG goals, also known as Agenda 2030, plays a substantial role as an instrument of transformation, making the earth sustainable, financially manageable, and equitable for everybody. It will happen only when we incorporate these goals into the educational system. These changes in the academic fields create new ways to approach and expand knowledge about sustainable literacy among students on campus. These students play a significant role in widening and accessing prosperity, peace, equality, and harmony in their respective disciplines. Therefore, it is of utmost importance to implement these goals in institutions, as well as to organize practical activities or businesses that increase awareness among students and enhance their knowledge and understanding (Dècamps et al., 2017). Additionally, it helps students develop a comprehensive and service-learning approach. Meanwhile, to create a society filled with harmony and peace, and characterized by prosperity, it requires strong policies on sustainability and the practical implementation of these rules in vulnerable societies. (Suklun & Bengü, 2024).

Poverty is a serious issue that serves as a significant obstacle to achieving sustainable literacy(Leal et al., 2021). This should be addressed in every form of the world to create awareness among the masses. While different reports illustrates that poverty and education are interconnected, a lack of understanding and creativity skills cannot eliminate poverty (Shah & Mushtaq, 2024).However, without financial stability, we can't obtain quality education. To overcome socio-economic challenges and achieve quality education, an inclusive education shouldprovide the power to navigate their educational journey and their practical experiments after graduation in their respective fields.In the context of a university, awareness regarding poverty, inequality, peace, and inclusive education needs to be raised among students on campuses (Oyeyipo et al., 2024). This data would be beneficial for students to acknowledge their rights and raise their voice against injustice in society, even if it is against a person, and then raise. In this way, an effective and inclusive education will be achieved, and enhance the

chance of achieving the 17 Sustainable Development Goals. To attain these goals educational institutions can play a vital role in promoting social, economic, and environmental development through their work (Berchin et al., 2021) such as research, innovative, and informative projects related to sustainable development. These actions are crucial in informing people worldwide about the Sustainable Development Goals and providing a roadmap for a safe and sustainable future. It also suggests that teachers at universities highlight the Sustainable Development Goals in their teaching to promote sustainability (Okolie et al., 2025).

However, sustainable literacy prepares university students to be familiar with the SDGs, collaborate in sustainable activities, and contribute to promoting sustainable development in their surroundings (Qureshi, 2020). While universities have crucial responsibilities in promoting creativity and transformation, they also recognize the importance of the 17 goals in developing equity and equality in society. The implementation of the SDGs goal in higher education can develop awareness of environmental issues and prepare students to take a leading role (Hnatyuk et al., 2024). Several studies explain how university students think about sustainability and evaluate their understanding, values, and attitudes in comparison with their understanding of sustainabledevelopment and its practical implementation (Concina & Frate, 2023), as well as how to enhance students' understanding through research studies.Reports highlights the key role of higher institutions in promoting "sustainability literacy and implementing sustainability in the curriculum as the core subject in every higher institution (Rukspollmuang & Chansema, 2024). Understanding the core of sustainable development goal, enables people to take appropriate decisions and to make their lives better. Although sustainability cannot be achieved solely through understanding information, it requires an inclusive understanding of issues, a well-tailored plan tailored to the surroundings, and its effective application to achieve better outcomes (Mokski et al., 2023). Moreover, the university plays a vital role in implementing these amendments in society to achieve a sustainable environment (price et al., 2021).

Moreover, sustainability literacy is emerging as a pivotal field in social science, encompassing the guidelines for education for sustainable development in universities (Evans, 2019).This discipline pacifies Students' discontent, sharpens their creativity, and helps them create a prosperous future for themselves. Although, universities are the best options for achieving these goals with the help of curriculum, helping students to address various environmental problems, such as economic issues, social justice, social discrimination, and hunger (Alfred et al., 2020).

Furthermore, it is highlighted thatthe key issues discussed in the Sustainable Development Goals (food security), which is a major and crucial concern. Ensuring food security reflects a guarantee of social harmony, economic stability, and global protection. It can be merely possible when comprehensive and inclusive education is provided to higher institutions. These Institutions add to students' creative capabilities and implement these principles on a ground level to achieve real results (Vaganova et al., 2019). Additionally, including sustainability literacy among learners is not just about warning them about these issues. Still, it also inspires and motivates them to incorporate social, economic justice, and equity into their lives. Educational sustainable development helps to apply these principles in developing a sustainable environment that promotes equity in all sectors, including social equity and justice, highlights societal issues such as equality, and fosters harmony (Jangde & Ahmad, 2025). These requirements can only be achieved if there is equity and inclusivity worldwide. If there is prosperity, peace, and equal access to resources, sustainability is achieved. Otherwise, without equality, equity, harmony, and social justice, global destruction cannot be stopped. To address global issues such as climate change and deforestation, and promote peace and equality, sustainability literacy has fostered a mindset that prioritizes a green environment(Arszulowicz, 2025). To sustain these assumptions, digital literacy plays a major role in making information and education accessible to everyone. These digital tools enable learners to identify the issue and help them develop possible solutions to poverty and inequality. So on. Lastly, This research address issues regarding sustainable development, especially global issues (social justice and sustainable growth) along SDG goal 1 and 4 .these assumptions can only be obtain by preparing the mentality of students that it is the ethical, moral and religious responsibilityTo create justice, peace, harmony, promote education, and eliminate poverty from their society through collaboration (Abuzar & Khondoker, 2024). In this way, we can build a better society where we can live through prosperity and peace.

3 Methodology

3.1 Research Design

To investigate the level of knowledge about sustainable development among university students, with a primary focus on their attitudes, practices, and awareness, the study employs a quantitative approach. This method is effective for the study because it ensures the collection of measurable data and its statistical analysis to explore relationships and trends (Dźwigoł, 2019). This research employs a descriptive survey method, which is suitable for collecting

numerical data from a large population to assess the existing status of sustainable literacy in higher education (Décamps et al., 2017). A quantitative approach allows objectivity and generalization of results around the broader

Population of university students

3.2 Population and Sampling

The population of the research involve all undergraduate and postgraduate program with particular focus on social science, environmental science, computer science and other students enrolled in universities across Pakistan.However, these academic discipline are linked with sustainable development.To collect data from large population stratified random sampling technique was use (Howell et al., 2020). While for the effective representation of genders, department, and academic level the sample formula was used to calculate sample size: Formula: $N = \frac{Z^2 \times P \times (1-P)}{E^2}$ where N is the sample size, Z is the score conformity to the confidence level 2.36 for 95% confidence, P is the proportion of the population 0.5 for maximum variability, and E margin of error (0.05). Putting the values: $N = \frac{(2.576)^2 \times 0.5 \times (1-0.5)}{(0.05)^2} = \frac{6.635 \times 0.25}{0.0025} = \frac{1.65875}{0.0025}$= 663.5 so a total of 664 respondents were selected for sample of university students across Pakistan. This method is effective because it can reduce biasness and promote the representation of students from diverse background. The study a criteria for the inclusion of students for sampling; students must be enrolled in bachelor or master degree, individual must be in third semester or aboveof bachelor degree, students must be enrolled in postgraduate studies, and the students who want to participate voluntarily.This sample size ensure sufficient for interpretation of the findings (Lakens, 2022). However, the participation of respondents were totally volunteer base and the consent was distributed before data collection.

3.4 Instrument for Data Collection

The data were collected using three point (Agree, Neutral, and Disagree) Likert scale close ended structured questionnaire, the study follow the framework developed by researcher based on current sustainability literacy (Saarna & Laius, 2025). Five part were included in the survey questionnaire, including demographic, awareness, attitude, practice, and institutional support. The demographic part consist of genders, age, academic level and province. Awareness section

include the knowledge and perceptions of sustainability and SDGs. While attitude parts is about the mindset and belief about sustainable activities (Concina & Frate, 2023). Moreover, the last part of the questionnaire about practice and institutional support focuses on the academic role and extra-curricular activities regarding sustainable development. To verify reliability pilot test were conducted from 20 students, and two experts from relevant field reviewed the data collection. The Cronbach's alpha coefficient was used to assess internal consistency, with a value of 0.70 or greater was considered acceptable (Izah et al., 2023).

3.5 Data Collection Procedure

A solo online data collection technique was employed to collect data, and the survey questionnaires were sent via online platforms, such as email and WhatsApp. Before collecting data the study purpose was clearly explained and confidentiality was maintained throughout the process. The participant was asked to respond freely and honestly. Then, the data were collected and prepared for coding analysis.

3.6 Ethical Considerations

The ethical principles were followed in the process of research, and respondents were familiar with the study's aim, scope, and voluntary nature. Before participation informed consent was obtained. The confidentiality and anonymity of all participants were ensured, and the information will be used solely for research purposes (Wiles et al., 2007). The study had no focus on personal data; therefore, no risk of harm was posed during the process.

3.7 Data analysis

After data collection, the collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) software. Both statistical methods descriptive and inferential were applied. To summarize students' attitudes, levels of awareness, and practices regarding sustainable development, descriptive statistics (frequency, percentage, mean, and standard deviation) were used. To determine diversity in sustainable literacy based on gender, academic program, and year of study inferential statistic (t-test) was used. To check the relationship between awareness, attitudes, and practices Pearson correlation was applied. Graphical and table forms were used to clearly present the interpretation and findings. The result will help to

explore the main areas that universities can use to connect students and promote education for sustainable development (Berchin et al., 2021).

4 Result and Discussion

This chapter explores sustainability literacy based on the results of data collected from university students, with a primary focus on awareness, attitude, practice, and support provided by the university.

4.1 Table 1. Reliability of the instruments

Cronbach's Alpha	N of items
.873	4

Cronbach's Alpha is used to test the reliability of the questionnaire. The coefficient of overall reliability was $\alpha = 0.873$, which shows that the internal consistency between the 32 statements was very high. The high alpha value indicates that the tools used for data collection are highly reliable for assessing awareness, attitude, practices, and institutional support in promoting sustainability among university students.

4.2 Table 2. Awareness, attitude, practice, institutional support.

Variables	Mean	SD	Minimum	Maximum
Awareness about sustainable development	2.50	.17	2.00	2.88
Attitudes toward Sustainability	2.44	.18	1.75	2.75
Sustainability Practices	2.39	.60	1.00	2.39
Institutional Role and Influencing Factors	2.32	.68	1.00	2.32

The table presents the findings from the data, which indicate that individuals typically possess a modest level of knowledge and a positive attitude regarding sustainable development (M = 2.50). It has been shown that they are lacking (M = 2.44, 2.39, 2.32) in terms of practicing, attitude, and institutional support for sustainability. The low standard deviation in awareness and attitude (SD = .17, .18) indicates a rational reaction. In contrast, the higher standard deviation in sustainability practices and institutional support (SD = .60, .68) indicates diversity in the experiences of every individual.

4.3 Table 3. Gender based comparison

Variables	Male Mean	Female Mean	T	p-value
Awareness about sustainable development	2.47	2.51	-2.546	.011
Attitudes toward Sustainability	2.50	2.42	4.601	.000
Sustainability Practices	2.60	2.30	5.379	.000
Institutional Role and Influencing Factors	2.51	2.23	4.326	.000

The table indicates that (P-value < 0.05) there is a statistically significant difference between males and females in all four variables. Female students (M = 2.51) were more aware than male students (M = 2.47), while the scores of male students (M = 2.50, 2.60, 2.51) were higher than those of female students (M = 2.42, 2.30, 2.23) in terms of attitude, practice, and institutional support. This data recommends that sustainability literacy among students was influenced by gender differences (Drake et al., 2024). At the same time, females have more awareness than males, but they are not exhibiting greater practices, positive behavior, and less institutional support compared to males.

4.4 Table 4. Relationship between awareness, attitude, practice and institutional support

Variables		Awareness	Attitude	Practice	Institutional support
Awareness	Pearson correlation	1	.051	-.231	-.199
Attitude	Pearson correlation	.051	1	.841	.819
Practice	Pearson correlation	-.231	.841	1	-.978
Institutional support	Pearson correlation	-.199	.819	.978	1
p-value		.000	.000	.000	.000

The results indicate a strong positive relationship between students' attitudes and practices (r = .841, P-value < 0.05) toward sustainability. This means that students who have serious concerns about sustainable development are more likely to engage in sustainable practices. While institutional support also shows a positive connection with students' attitude (r = 0.819, P-value < 0.05), this suggests that a positive and supportive environment promotes positive behavior among individuals toward sustainability. Moreover, the connection between awareness and attitude (r = 0.051, P-value < 0.05) is not strong, indicating that many students have some awareness of sustainable development. Still, they do not have a positive attitude toward sustainability. The negative relationship between awareness and sustainable practice (r = -.231, P-value < 0.05) indicates that students have awareness about sustainability, but they don't practically apply it. However, institutional support, awareness, and practices also have a low connection (r = -.199, p-value < 0.05), meaning that institutions are less involved in promoting or providing knowledge and activities about sustainable development. In that case, students may depend on self-driven motivation toward sustainability.

4.5 Table 5. Relationship between groups

Variable	Source of variation	Sum of square	df	Mean square	F	p-value
Awareness	Between groups	3.444	3	1.148	45.587	.000
	Within groups	12.491	660	.025		

	Total	15.936	663			
Attitude	Between groups	11.055	3	3.685	276.531	.000
	Within groups	6.610	660	.013		
	Total	17.665	663			
Practice	Between groups	168.478	3	56.159	2190.236	.000
	Within groups	12.718	660	.026		
	Total	181.196	663			
Institutional	Between groups	221.607	3	73.869	2635.780	.000
support	Within groups	13.901	660	.028		
	Total	235.507	663			

The table presents a one-way ANOVA test to examine the differences among students from diverse departments (four groups) in sustainability literacy. The test results show a significant difference among students from diverse groups. The F-values (45,587, 276.531, 2190,236, and 2635.780) are very high, which means the students' responses are significantly altered based on which area they are studying. In simple terms, the rate of change between departments is significantly higher than the rate of change within each group. This indicates that students from departments teaching sustainable content have a more sustainable attitude toward sustainability than those who are not learning sustainable content (Nousheen et al., 2020).However, the p-value is less than 0.01 in all groups; the findings are statistically significant at the 0.1% level, which means these alterations are not due to random chance. The results demonstrate that academic departments have a greater impact on students' sustainability literacy.

4.6 Table 6. Results on sustainability literacy among university students

Dimension	**Statistical test**	**Key values**
Reliability	Cronnbach's alpha	$\alpha = 0.873$
Awareness	Descriptive statistics	Mean= 2.50, SD= .17
Attitude	Descriptive statistics	Mean= 2.44, SD= .18
Practice	Descriptive statistics	Mean= 2.39, SD= .60
Institutional support	Descriptive statistics	Mean= 2.32, SD= .68
Gender differences	Independent t-test	Awareness (P-value .011)

		Attitude (P-value .000) Practice (P-value .000) Institutional support (P-value .000)
Departmental differences	One-way ANOVA	Awareness (F= 45.587, P< .05) Attitude (F= 276.531, P<.01) Practice (F=2190.236, P<.01) Institutional support (F= 2635.780, P<.01)
Correlation (Pearson r)	Correlation analysis	Awareness-attitude (r= .051, P< .05) Awareness-practice (r= .231, P<.01) Attitude-Practice (r= .841, P<.01) Attitude-Institutional support (r=-.819, P<.01) Practice-institutional support (r= -.978, P<.01)

Table 6 shows that university students have a modest level of understanding about sustainable development, indicating that they receive less institutional support and exhibit low practice toward sustainability; A significant difference has been found between academic departments and gender. These results indicate that factors such as gender and academic background have a significant impact on sustainable literacy. It also provides evidence that students are well aware of sustainability; however, theoretical knowledge should also be applied in practical action to promote sustainability.

5 Discussion

The aim of this research is to assess students' knowledge, behavior, activities, and university support in promoting sustainability. However, the study's findings highlighted the key trends and issues in university students' perceptions, attitudes, practices, and support from the university. This is explored through descriptive analysis, which reveals that university students have a positive awareness of sustainability. While students are facing a lack of university support and practical action. This means that students possess a high level of understanding about sustainability, but they are not implementing this in their everyday life activities. One of the reasons behind the Lack of sustainable activities is limited institutional support. The

university can support this by integrating sustainability-related content into its curriculum and research work.

Apart from that, there is a significant gap between awareness, attitude, practice, and university support. Female students have a more conceptual understanding of sustainable development, while males are more likely to exhibit positive behavior toward taking action toward sustainability. However, prior studies have consistently reported similar findings regarding sustainable development. Furthermore, the ANOVA test shows that there is a significant influence of students' academic background on awareness and institutional support. The findings suggest that sustainability literacy varies across diverse disciplines. Students from social science and environmental science have more theoretical knowledge and positive attitudes, as these disciplines integrate a sufficient number of topics related to sustainable development.

Further Pearson correlation analysis revealed that there is a positive connection between attitude and practice ($r = .841$, $p < .01$) and among institutional contribution and attitude support ($r = .819$, $p < .01$). However, the relationship among knowledge, practical action, and institutional support ($r = -.199$, $-.978$ P-value < 0.05) is negative, which proof that the educational institutions have lack of concern regarding sustainable literacy. Overall, these results suggest that sustainability is affected by both institutional and personal factors. While the awareness should not be limited to conceptual knowledge, it should be converted into practical actions (Haldar, 2019).

6 Conclusion

In conclusion, universities in Pakistan demonstrate a high level of understanding and a positive attitude towards sustainability; however, their practical actions and institutional support are lacking. Factors affecting sustainable literacy include gender and academic background. Although female students have sufficient conceptual knowledge, they are taking the initiative for sustainable development by engaging in various sustainable and friendly activities. Apart from that, sustainability-related content in the curriculum also promotes sustainability, while many students from diverse academic backgrounds have limited exposure to such content. These results indicate that higher education has a greater responsibility in producing students and fostering aware societies by arranging extracurricular activities, awareness sessions, competitions among individuals, and implementing sustainable policies (Kotlyk et al., 2025).

These activities can produce a more valuable member of the nation who can contribute to sustainable development.

7 Recommendations

According to the findings, it is recommended that universities across Pakistan provide support to students to promote sustainable development. Universities need to implement sustainable policies by incorporating sustainable content into their curricula. This should include research work, group effort, and extracurricular activities related to sustainable development. Sustainability should not be limited to university students; instead, they need to arrange workshops, seminars, and awareness sessions for members of society. As the results indicate, a gap exists between males and females. Therefore, institutions need to ensure that they include both genders, so that they can act as valuable members of the global community. However, there is a crucial need to promote self-driven studies on sustainable development. Students need to focus on learning independently rather than relying solely on university syllabi. This is an important concept; therefore, further research should be conducted based on a mixed method so that the respondent can share their thoughts as well.

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