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Students' Knowledge, Attitudes, and Practices Regarding Environmental Education among Intermediate-Level Students

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Abstract

The environment is the backbone of human existence, and its protection is not an option but a dire need that has serious long-lasting implications on the lives of human being. The study is significant as the unprecedented environmental changes ponders to plan and immediate implementation of recommended actions to protect environment which demands evaluation of awareness level, attitude and practices. Thus, the present descriptive study was intended to evaluate the knowledge, attitude and practices regarding environmental education in the case of students at the intermediate level in government colleges across the country. In line with the deductive approach, the present study proposed the KAP instrument with the use of the Palmer's framework, which included three major elements: knowledge of, attitude towards, and practice relating to the environment. The validity of the instrument was ensured through the experts' opinion. The reliability of the instrument was ensured through internal consistency, which was calculated using Cronbach's Alpha, yielding a value of 0.816. A convenience sample has been obtained through an online survey, which has been prepared using Google Forms. The findings of this study specify that the learners were found to consider the environment in their lifestyles with a mean overall score entailing the category of being moderate, though the real practice of responsible environmental practices was low. It is hereby recommended to integrate more practical, action-based aspects into environmental education in schools at the intermediate level in Pakistan.

Keywords: Environmental Awareness, Environmental Education, Knowledge, Attitude, Practice, Intermediate Students

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Introduction

The contribution of environmental education is the increasing awareness about the natural environment and developing a positive attitude towards its preservation. Environmental Education has been described as the organized efforts towards communicating how ecosystems work, with an intention of fostering sustainable attitudes (Jia-nan, 2012). The ultimate goal of EE is thus to bring on behavioral changes that happen in connection with ecological responsibility (Chawla & Cushing, 2007; Hungerford & Volk, 1990). But perhaps most important at the school level are teachers in translating knowledge of the environment into behavioral intent among students, as many educators integrate climate realities into instruction even when such instruction is not mandated (Harmon, 2017). Yet, while knowledge and attitudes inform intentions, actual behavior often depends upon perceived control and supportive infrastructure, elements described in the framework of the Theory of Planned Behavior (TPB) (Ajzen, 1991). Full environmental literacy must encompass not only knowledge and attitudes but also cognitive skills and enacted practices.

Despite the importance of this, in Pakistan, the comprehensive assessments of environmental literacy are scarce as previous studies indicate only moderate levels of teacher literacy in areas like problem analysis and responsible behavior (Taj et al., 2020). However, interventions based on "Education for Sustainable Development (ESD)" have been effective, and one study documented significant post-intervention gains in pro-environmental attitudes and actions like recycling and energy conservation among learners (Iqbal & Ghazal, 2023). The adoption of project-based and experiential learning has seemed especially promising: structured in-class and out-of-class activities have notably improved the environmental literacy of middle school students in Lahore (Fazal et al., 2023). Interactive AI-VR systems, such as Ocean Chat, have further evidenced increases in motivation and intention to induce behavioral change over and above static educational content in recent works worldwide (Lim et al., 2024; Pataranutaporn et al., 2024). Moreover, several works have noted that social norms-especially descriptive and injunctive norms, along with the internalization of personal moral norms-are generally stronger predictors of pro-environmental behavior compared to education content per se; knowledge needs iteration through social context in order to take effect (Helferich et al., 2023; Niu et al., 2023).

In Pakistan, environmental challenges including pollution, deforestation, and sudden climatic variation are in dire need of

educational responses. While a few studies reflect moderate levels of environmental awareness among students, practical engagement with sustainability practices has remained relatively thin on the ground, as reported by Taj et al. in 2020. This gap can only be filled through curriculum reforms and community-based learning approaches that empower young people to become active agents of change. This study will, therefore, strive to assess the environmental knowledge, attitudes, and practices of intermediate level students in Pakistan. Such comprehension could serve useful insight into whether or not environmental education is returned to meaningful awareness and actionable behavior.

Problem Statement

The Environmental issues are accelerating in the world at an unprecedented rate but awareness toll is very low. There is utmost need to be aware of the environmental issues and causes with some initiatives which can coup up with the challenges related to environment. Education is the best mode to educate masses so there is dire need to add environmental issues related information in curriculum and to make students aware of its dynamics. Intermediate level is the stage where formal operation starts so this descriptive study is an effort to measure the awareness level of intermediate level students in Pakistan.

Objectives

1. To measure the basic knowledge of students at Intermediate level regarding environmental issues.
2. To explore students' attitudes towards environmental protection and sustainability of learners at intermediate level.
3. To examine students' self-reported environmental practices of learners at intermediate level.
4. To analyze interrelationships among knowledge, attitude, and practice at intermediate level students in Pakistan.

Hypotheses

- H_{01}: There is no significant difference in the distribution of students across high, medium, and low knowledge levels at the intermediate level in Pakistan.
- H_{02}: Students at the intermediate level in Pakistan do not differ significantly in their levels of attitude.

- H_{03}: There is no significant variation in the proportion of students falling into high, medium, and low practice categories at the intermediate level students of Pakistan.
- H_{04}: There is no statistically significant association between knowledge, attitude, and practice categories.

Literature Review

Environmental education (EE) is indispensable for addressing existing challenges and abrupt calamities of environment and fostering sustainable substantial human growth. It is one of the critical matters investigating the relationship among human beings with their surroundings, inspiring critical thought and the human capacities to act accordingly (Castillo, 2010; Varela-Losada et al., 2016). Environmental education and awareness are the dire need of the time to introduce in formal education system, where it can significantly affect the understanding of learners regarding environmental issues, problems, causes of calamities and help to develop environmentally friendly behaviors (Varela-Losada et al., 2016; Llopiz-Guerra et al., 2024). By the collaborative involvement and authentic reflection on complicated ecological incidents, and highlighting the participation of community, environmental education can uplift humans with the valuable knowledge and pre-requisite skills essential for attaining global ecological sustainability (Varela-Losada et al., 2016; Llopiz-Guerra et al., 2024). Moreover, EE serves as a preventative measure to protect young people living in polluted areas by raising awareness of local environmental conditions and promoting active engagement in solving local problems (Llopiz-Guerra et al., 2024).

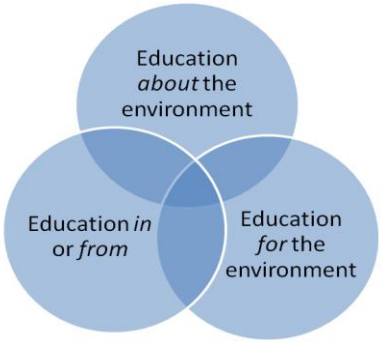
During the past three decades, public concern for environmental issues has risen significantly across the globe after a decline between the early 1990s and 2010, environmental concern rebounded by 2020 to levels comparable with the early 1990s, particularly in wealthier nations and among better-educated individuals, indicating renewed global prioritization of ecological challenges (Franzen & Bahr, 2024).Pakistan is also the part of globe which has been facing a number of environmental issues and are threats for inhabitants. Literature highlights the reasons and penalties of environmental degradation, the passive attitudes that many individuals hold toward ecological issues, and the literature gaps among awareness and genuine behavior, usually mentioned as the value-action breach where high environmental concern does not necessarily translate into eco-friendly practices (Piao & Managi, 2024).

Some schools have found success with environmental certification programs like Eco schools, which support initiatives of educators (Fazio & Karrow, 2013). A geo-philosophical approach has been proposed as an alternative model for curriculum development, promoting sustainable environmental awareness through both effective and practical-contextual actions (Mahaswa et al., 2024). This approach considers geographical agency in teaching and learning, potentially offering a more flexible framework to strengthen environmental education within curricula like Indonesia's Kurikulum Merdeka (Mahaswa et al., 2024). The effective strategy is to connect children to nature by employing experiential strategies, such as going outdoors, immerses them in the natural world (Derman &Gurbuz, 2018; Liu, 2023). The development of environmental education (EE) in Pakistan has not complied with the above requirements (Bashir, 2024; Imran et al., 2021; Khanum, 2019). In this regard it is essential to make masses aware including students, to be responsible towards environment overall.

The major focus of environmental education is to evaluate environmental related problems, propose actionable solutions to any issues that are recognized, and eventually to develop environmentally friendly behavior (Magnus et al., 1997). Recent studies have expanded the possibility of environmental education research beyond behavior and attitudes to include knowledge, intentions, and psychological empowerment. Van de Wetering et al. (2022) conducted a meta-analysis across forty-three countries including one hundred and sixty-nine studies and found that environmental education significantly improved kid's as well as teenagers' environmental knowledge, intentions, attitudes, and self-reported behavior. A model of teaching and learning for environmental education project is inscribed in instrument of this study, which explained, Education in or from the environment, that is using the environment as a resource with emphasis both on planned inquiry and investigations and also on providing opportunities for pupils to engage in first-hand personal experiences within it. Also, Education for the environment, concerned with values, attitudes and positive actions. The model is elaborated as follows:

Figure 1

Teaching and Learning Model in an Environmental Education Project (Based on Palmer's idea, published in 1998s



The environmentalists believe that behavior of masses is very important to preserve climate and meanwhile awareness regarding how to preserve climate is very much needed. "Environmental education" can play a pivotal role to let people know for environmental issues as "Environmental Education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among men, his culture and his biophysical surroundings. EE also entails practice in decision-making and self-formulation of a code of behavior about 199 issues concerning environmental quality" (IUCN, 1970).

Environmental education enumerates the real worth to live on this planet and to conserve nature. "Environmental education has traditionally focused on how to foster changes in individuals that are associated with pro-environmental actions and behaviors (Chawla & Cushing, 2007; Hungerford & Volk, 1990)". Behavior is the main source to keep environment safe and it converts the thoughts into actions. Positive attitude towards climate is a step forward to keep atmosphere healthy and clean. "It was generally thought environmental behavior would change and improve as people became more knowledgeable and aware (Bruvold, 1973; Rodin, 1976)".

In higher education, environmental moral education positively influenced pro-environmental behavior, with psychological empowerment mediating and Islamic religiosity moderating this relationship (Begum et al., 2021). Another study revealed that environmental knowledge and explicit attitudes influence behavior through different pathways, with intentions mediating the impact of explicit attitudes on behavior (Levine & Strube,

2012). Similarly, research in China demonstrated that environmental knowledge indirectly affects pro-environmental behaviors through environmental attitudes and behavioral intentions (Liu et al., 2020). The relevant empirical findings endorse the multifaceted interplay of sub-factors influencing environment-oriented behavior and highlight the necessity of wide-ranging approaches for environment education.

Research has elaborated that environment related issues negatively impact education, attitudes of the learners and health significantly. Poor quality of environment in the educational organizations may negatively impact not only psychological well-being of learners but physical health as well, demanding better air quality, level of noise, and sanitation (Mustafina & Arbuzova, 2024). The students of junior high schools perceive that one of the major environmental problems is plastic waste and suggest accordingly that one of the immediate solutions is spread of awareness regarding general environmental related issues (Tapilouw et al., 2017). Various environmental factors, including physical conditions, socioeconomic status, and peer influences, can positively or negatively affect educational development and future performance of learners (Hussaini & Hussain, 2023). The attitude towards environmental issues of students from universities are shaped by various socio-demographic factors, with higher attitude scores often reported among students in medical and health disciplines, older students, females, and those from urban backgrounds (Begum et al., 2021). However, despite many students expressing concern for environmental problems, their participation in related initiatives remains limited that highlighting the need for targeted educational strategies to effectively translate awareness into concrete pro-environmental actions (Begum et al., 2021).

Research Methodology

This descriptive study is quantitative in nature. The purpose of a descriptive quantitative study is to examine variables in a single sample and to systematically measure, describe and interpret them (Bloomfield & Fisher, 2019). It has deductive approach exploring knowledge, attitude and practice of intermediate level students. Instrument (KAP) for data collection is self-constructed on the model for teaching and learning in an environmental education project, based upon Palmer's (1998) idea. This model deals with education about the environment, for the environment, in or from the environment.

Sample & Population

This study involves intermediate level (HSSC-I & HSSC-II) 1st year

and 2nd students as population, studying in public institutions of Pakistan. Due to pandemic and smart lockdown, educational institutions were closed in Islamabad but open in some parts of Pakistan. Keeping in view this constraint, the convenience sampling was used primarily based on available students of open schools in Karachi, Quetta, Peshawar, Islamabad and Lahore. The sample of the study consisted of 244 students of HSSC level including HSSC-I and HSSC-II overall, excluding the data from those students who did not complete the data collection form. Data was collected through survey form which was circulated in different groups of teachers to collect data from those colleges which were opened in different parts of Pakistan.

Research Instrument

Data was collected through google form. Before administering the research instrument, a pilot study was carried out to establish validity and reliability of the instrument. It was self-constructed upon Palmer's idea, published in 1998 and purpose of data collection was to measure knowledge, attitude and practice (KAP) of intermediate level students studying in Govt. colleges of Pakistan. Survey form had three sections to measure knowledge, attitude and practice subsequently and each section is followed by eight question statements. Questionnaire was close ended and first section was ordered on the statements with multiple choice questions for measuring knowledge level and second section had eight closed-ended statements with ordered response choices on a Likert-type, five-point response scale ranging from 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree. However, the third section with close ended eight questions were ordered on: 1=Never, 2=Occasionally, 3=Sometimes, 4=Often, and 5=Always. The following procedures were adopted to establish validity and reliability of instruments.

Validity

A panel of experts (n = 2) in Islamabad, established content validity of the researcher-developed instrument. This panel of experts was selected based upon their familiarity with environmental and educational activities in Pakistan, research design methodologies, fluency in English and Urdu, and awareness of characteristics of the specific population under study.

Reliability

Reliability of the researcher-developed instrument was established

through calculating the reliability co-efficient of Alpha Cronbach value which was 0.816. As a rule of thumb reliability equal to or greater than 0.7 is acceptable (Mansournia et al., 2021).

Significance of the Study

This research explores the knowledge, attitude and practice of intermediate level students. It is significant for teachers to know what's the status of students on this level towards environment. It is beneficial for policy makers to have data regarding students' environmental awareness of intermediate level so they can draft policies to attain different ways to have it on this level. This research can provide further platforms for researchers to have more studies about environmental issues and in different perspectives.

Delimitation

Environmental issues are rapidly entangling the world. On the basis of this, there is an immediate need to be aware of its causes and effects. This study on intermediate level is the part of all those efforts which can assist to take some steps ahead towards positive attitude to conserve nature as this educational level is the most crucial for inspiring communities and become habitual.

Data Collection

The data for the study were collected from different government colleges of different cities of Pakistan through google form. Link of google form was shared with respondents. Data collection date was through google form.

Results

The quantitative analysis of the data was carried out using SPSS-21, whereas descriptive analysis of frequencies and percentages was employed. The Pearson's Correlation value was measured. Chi-Square test was applied to measure the goodness of fit. The demographic stats of the data can be presented as follows:

Figure 2
Pie Chart showing Sample Distribution

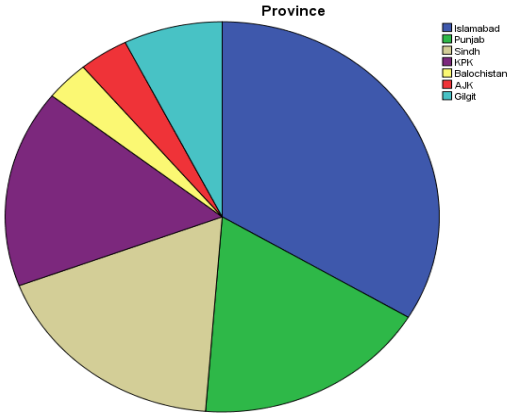


Fig 2. represents visually in the form of pie chart, sample distribution across different regions, with a clear and significant emphasis on Islamabad with 33.6% and Punjab 17.6%, while the other regions include Sindh with 18%, KPK with 16.4%, Baluchistan with 3.3%, AJK with 3.7% and Gilgit with 7.4% make up a smaller cumulative portion respectively.

Figure 3
Frequency Distribution of Participants

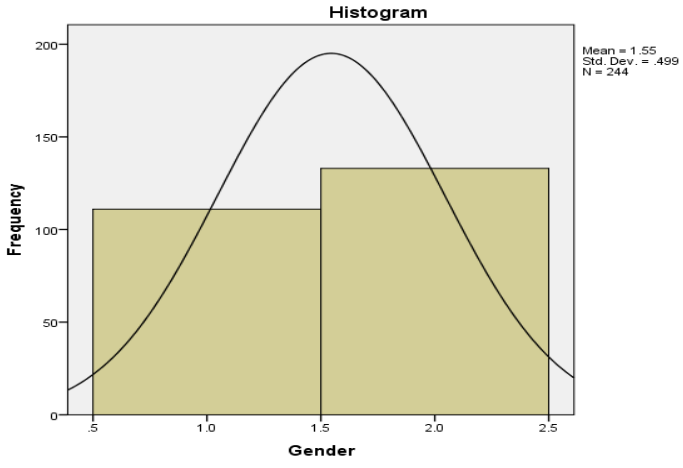


Fig 3. represents a histogram that displays the frequency distribution of sample across gender. The x-axis represents the

gender categories, and the y-axis represents the frequency or count of each category where N = 244.

Table 1

Mean Scores and Categorical Distribution for Knowledge, Attitude, and Practices regarding Environmental Education

Variables	Mean	SD	Low%	Medium%	High%	Chi-Square	p-value
Knowledge	2.14	0.463	4.5	76.6	18.9	213.451	.000
Attitude	1.62	0.487	34.1	61.9	2.0	13.767	.000
Practices	1.32	0.466	63.2	31.6	5.2	33.197	.000

Table 1 represents mean scores and standard deviation across knowledge, attitude and practices regarding environmental education. The mean score across knowledge is 2.14 with a standard deviation of 0.463. The distribution is highly concentrated in the medium category, which accounts for 76.6% of the responses. This points out that most of the students hold knowledge at medium/moderate level. On the other hand, 1.62 was the calculated mean score regarding attitude marking 0.487 scores of standard deviation. However, the moderate/medium category demonstrates the largest portion at 61.9%, there was a statistically significant share of student responses in the bottom/low category at 34.1%. All this indicates that attitude towards environment is generally at moderate level but it inclined towards the bottom/lower side of the scale. Whereas, in the area of practices, the mean score is 1.32 demonstrating a standard deviation of 0.466. Overall data view demonstrates a descending trend from knowledge (2.14) level followed by attitude level (1.62) transcends to practices level (1.32). This recommends that while students have an adequate level of knowledge, this did not consistently explain into their attitudes, and even less transmitted into their positive practices related to environment. The results unfold an obvious and statistically significant pattern across the discussed variables. On the whole, the students hold a moderate level of knowledge, there is a plummeted decline when it was translated into their attitude and, most significantly, into their daily practices.

It was confirmed from the results of Chi-Square test for knowledge, as it was significant ($p<.001$) which approves that the distribution of observed variables is not by chance. Chi-Square value of 213.451 is large, which means that the actual distribution varies from a perfectly even distribution. The Chi-Square test for attitude level is also statistically significant ($p<.001$). The value of 13.767

confirms that the distribution of attitudes is not uniform, with a clear convergence in medium category. The mean score is at its lowest at 1.32 for the practice level. A significant majority of respondents (63.2%) fall into the low category, indicating that practices are generally poor. The Chi-Square test is statistically significant ($p<.001$). The Chi-Square value of 33.197 confirms that this distribution, heavily skewed towards the low category, is a genuine and non-random finding.

Table 2

Cross-tabulation of Knowledge and Attitude Categories and Chi-square Test Results

Knowledge	Attitude (Low%)	Attitude (Medium%)	Attitude (High%)	Total%	X^2	p-value
Low%	2.5	2.0	0	4.5		
Medium%	28.7	45.1	2.9	76.6	1.41	0.494
High%	7	10.7	1.2	18.9		
Total	38.1	57.8	4.1	100		

The Chi-square test is used to determine if there is a statistically significant relationship between the two categorical variables. Chi-square (X^2) value is 1.41 whereas the p-value is 0.494. Since the p-value of 0.494 is much greater than 0.05, the result is not statistically significant. It can be concluded that although there are some observed differences in the percentages, the Chi-square test indicates that these differences are not large enough to conclude a statistically significant association between knowledge and attitude categories.

Table 3

Cross-tabulation of Knowledge and Practice Categories and Chi-square Test Results

Knowledge	Practice (Low%)	Practice (Medium%)	Practice (High%)	Total%	X^2	p-value
Low%	1.6	2.5	0.4	4.5		
Medium%	24.6	48.0	4.1	76.6	1.83	0.767
High%	5.7	11.1	2.0	18.9		
Total	32.0	61.5	6.6	100		

This table shows how the different categories of Knowledge relate to the categories of Practice. The percentages in the cells and total rows/columns reveal the distribution. The majority of respondents have Medium Knowledge (76.6%). Within this group, a large portion of them also fall into the Medium Practice category (48.0%), followed by the Low Practice category (24.6%). This indicates some positive association,

but a significant number of people with medium knowledge also report low practices. The Chi-square test determines if there is a statistically significant relationship between the two categorical variables. Chi-square (X2) test statistic is 1.83 and the p-value is 0.767. Since the p-value of 0.767 is much greater than 0.05, the result is not statistically significant. The Chi-square test indicates that there is no statistically significant relationship between knowledge and practice categories. The level of knowledge a person has does not reliably predict their level of practice.

Table 4

Cross-tabulation of Attitude and Practice Categories and Chi-square Test Results

Attitude	Practice (Low%)	Practice (Medium%)	Practice (High%)	Total%	X^2	p-value
Low%	14.3	20.5	3.3	38.1		
Medium%	16.4	38.1	3.3	57.8	2.19	0.700
High%	1.2	2.9	0.8	4.9		
Total	32.0	61.5	7.4	100		

The table 4 shows the distribution of attitude categories across the practice categories. The majority of respondents fall into the Medium Attitude category (57.8%), and within this group, most have Medium Practices (38.1%). A significant portion of those with a Medium Attitude also have Low Practices (16.4%). A similar pattern is seen in the Low Attitude group (38.1%), where a notable percentage also have Low Practices (14.3%). Within this group, the distribution is skewed towards Medium Practices (20.5%) rather than Low Practices (14.3%), which is an interesting observation. The Chi-square test assesses if there is a statistically significant relationship between Attitude and Practice categories. Chi-square (X^2) value is 2.19 with the p-value of 0.700. Since the p-value of 0.700 is much greater than 0.05, the result is not statistically significant. The Chi-square test indicates there is no statistically significant relationship between a person's attitude and their practices.

For objective 1, H_{01} was made, as shown in Table 1, the mean knowledge score was 2.14 (SD = 0.463), with the majority of respondents (76.6%) in the medium category, 18.9% in high, and 4.5% in low. The Chi-square test was highly significant ($\chi^2 = 213.451$, $p < .001$), rejecting H_{01} and confirming that the distribution is not uniform, with most students concentrated in the medium knowledge category.

For objective 2, H_{02} was made, as presented in table 1, the mean attitude score was 1.62 (SD = 0.487), with 61.9% medium, 34.1%

low, and only 2% high. The Chi-square test was significant (χ^2 = 13.767, $p < .001$), rejecting H_{02} and indicating that attitudes are not evenly distributed, with a strong leaning towards medium and low levels.

For objective 3, H_{03} was made, according to table 1, the mean practice score was 1.32 (SD = 0.466), with 63.2% low, 31.6% medium, and only 5.2% high. The Chi-square test was significant ($\chi^2 = 33.197$, $p < .001$), rejecting H_{03} and revealing that the distribution is heavily skewed towards low practices.

For objective 4, H_{04} was framed, from table 2, table 3, and table 4, the Chi-square analyses examined the categorical associations between knowledge, attitude, and practice levels. The results exposed that the relationship between knowledge and attitude ($\chi^2 = 1.41$, $p = .494$), knowledge and practice ($\chi^2 = 1.83$, $p = .767$), and attitude and practice ($\chi^2 = 2.19$, $p = .700$) were all statistically non-significant. These findings indicate that, when treated as categorical variables, the levels of knowledge, attitude, and practice do not display significant associations with one another, leading to the conclusion that H_{04} is not rejected.

Discussion

The above findings of this study stipulated that in Pakistan, intermediate-level students, although holds moderate levels of knowledge regarding their environment, with a moderate to low level of attitudes toward environmental protection and also, their self-reported environmental practices stand largely at low level. This mirrors a substantial decline from knowledge level to practices level, pinpointing an insistent gap of knowledge-attitude-practice. This type of action gap has also been reported at global level (Piao & Managi, 2024).

The comparatively low level of practices was reported in this study which may be partially explicated by the insufficient opportunities and resources for environmental education in Pakistan, where the progression of environmental education has not kept in balance with globally oriented best relevant practices (Bashir, 2024; Imran et al., 2021; Khanum, 2019). While in contrast, research literature of countries exhibiting more robust and integrated frameworks of environmental education, including the Eco-school's initiative discussed by Fazio & Karrow (2013) and outdoor activities providing experiential learning models as highlighted by Derman and Gurbuz (2018) and Liu (2023) showed more stronger connections between awareness and behavior regarding environment.

Furthermore, there exists a weak correlation among knowledge, attitudes and practices in line with the global findings, justifying that desired change in behavior is always gradual and multifaceted usually influenced by a combination of cognitive, as well as affective, and contextual factors (Chawla & Cushing, 2007; van de Wetering et al., 2022). It was found difficult even in the contexts where immediate issues regarding environment have rebounded to extreme levels including economically strong countries by 2020 (Franzen & Bahr, 2024), and it has been established that competing priorities, lack of institutional reinforcement, and structural barriers may delay the translation of this issue into the part of daily life practices and further into sustained pro-environment friendly actions. Keeping in view the findings of this study, it has been concluded that promoting knowledge of environment unaccompanied by integrated experiential educational strategies, is insufficient. To bridge this gap, it is essential to plan context-specific, values-oriented motivation with support of community-level engagement is effective in the context of Pakistan.

Conclusion

This study set out to assess the environmental knowledge, attitudes, and practices (KAP) of intermediate-level students in Pakistan. The findings unfold an obvious hierarchy which is, learners largely hold moderate level of knowledge regarding environment, related issues and possible solutions, which translated moderate-to-low level in their attitudes, and even more plummeted down into their daily life practices. The statistical examination established that knowledge, attitudes, and practices are not evenly distributed. The results of Chi-square tests and cross-tabulation among the variables reveals no significant categorical associations. This specifies that, at the categorical level, comparatively higher level of knowledge or attitudes do not consistently predict higher level of practices among learners. This overview indicates an action gap that calls for immediate targeted educational strategies which go beyond information transformation, but focused on reshaping attitudes through embedded environmentally responsible citizen behaviors into daily lives of students. These targeted interventions should accentuate all the perspectives of experiential learning, behavior reinforcement, practical engagement, and ensuring that knowledge is readily being internalized and interpreted into their lives.

Recommendations

1. Incorporate Islamic principles of cleanliness into environmental education modules to enhance personal responsibility and community motivation toward sustainable practices.
2. Schools should integrate theoretical environmental education with hands-on projects such as recycling programs, waste audits, and tree-planting drives to bridge the knowledge-practice gap.
3. Adopt outdoor learning strategies and local environmental investigations that allow students to directly observe and address environmental issues in their own communities to integrate experiential learning approaches.
4. Develop school-community partnerships to extend environmental learning beyond the classroom and encourage household-level sustainable practices.
5. Design targeted interventions that link environmental attitudes with specific, achievable actions, such as reducing single-use plastics or conserving water, supported by measurable goals.

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*(2), 179-211. https:// ojs. unbc. ca/index.php/design/article/download/1887/1414

Bashir, S. (2024). Environmental Adult Education (EAE): A Course of Action for the Pakistani Education System. *Convergence*, *45*(1), 80-96. https:// www. convergencejournal.org/vol-45-no-1.pdf#page=84

Begum, A., Jingwei, L., Haider, M., Ajmal, M. M., Khan, S., & Han, H. (2021). Impact of environmental moral education on Pro-environmental behavior: do psychological empowerment and Islamic religiosity matter? *International Journal of Environmental*

Research and Public Health, *18*(4), 1604. https://www.mdpi. com/1660-4601/18/4/1604

Bloomfield, J., & Fisher, M. J. (2019). Quantitative research design. *Journal of the Australasian Rehabilitation Nurses Association, 22*(2), 27-30.https://search. informit.org/ doi/abs/ 10.3316/ INFORMIT. 738299924514584

Bruvold, W. H. (1973). Belief and behavior as determinants of environmental attitudes. *Environment and Behavior, 5*(2), 202-218.*https://journals.sagepub.com/doi/abs/10.1177/001391657300500205*

Castillo, R. M. (2010). La importancia de la educacionambiental ante la problematica actual. *Revista electronica educare*, *14*(1), 97-111.

https://dialnet.unirioja.es/descarga/articulo/4780944.pdf

Chawla, L., & Cushing, D. F. (2007). Education for strategic environmental behavior. *Environmental education research, 13*(4), 437-452. https://doi.org/10.1080/13504620701581539

Derman, M., & Gurbuz, H. (2018). Environmental education in the science curriculum in Different countries: Turkey, Australia, Singapore, Ireland, and Canada. *Journal of Education in Science, Environment, and Health. 4*(2), 129-141. https:// dergipark. org.t r /en/ download/article-file/446999

Fazal, F., Naeem, M., & Sherazi, F. (2023). Developing Environmental Literacy through Classroom Activities among 8th Graders: An Action Research. *Qlantic Journal of Social*

Sciences, *4*(4), 379-388. https://qjss. com.pk/ index.php/ qjss/article/ download/214/199

Fazio, X., & Karrow, D. D. (2013). Negotiating the constraints of schools: Environmental education practices within a school district. *Environmental Education Research*, *19*(5),639-655. https://www.tandfonline.com/doi/abs/10.1080/13504622.2012.729812

Franzen, A., & Bahr, S. (2024). The development of global environmental concern during the last three decades. *Current Research in Environmental Sustainability, 8(2024)*, *1-9.*

Harmon, R. (2017). *Assessing college students' sustainability literacy: the development, use, and analysis of an assessment tool* [Doctoral dissertation, Colorado State University]. https://www.researchgate. net/profile/Renee_ Harmon/publication/349290197

Helferich, M., Thøgersen, J., & Bergquist, M. (2023). Direct and mediated impacts of social norms on pro-environmental behavior. *Global Environmental Change*, *80* (2023), 1-12.https://www. sciencedirect.com/ science/article/pii/S0959378023000468

Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *The Journal of Environmental Education, 21*(3), 8-21.https://www.viristar.com/wp-content/ uploads/ 2024/10/1374624954

Hussaini, M., & Hussain, T. (2023). Impact of environmental factors on student's educational background and their future performance. *International Journal of Scientific Multidisciplinary Research*, *1*(6),607-616. https://pdfs.semanticscholar.org/e9dc/aad9e3748e51c08b641f220b02 988858f75a.pdf

Jia-nan, C. (2012). Contributions of environmental NGO to environmental education in China. *IERI Procedia*, *2*, 901-906. https://doi.org/ 10.1016/ j.ieri. 2012.06.189

Imran, M., Akhtar, S., Chen, Y., & Ahmad, S. (2021). Environmental education and women: Voices from Pakistan. *Sage Open*, *11*(2), 21582440211009469. https:// journals. sage pub. com/ doi/ pdf/ 10. 1177/21582440211009469

Iqbal, I., & Ghazal, S. (2023). Knowledge, attitude and risk perceptions of people towards climate change: predicting pro-environmental behaviors for mitigation and adaptation. *Advanced Psychological Research*, *1*(2), 32-54. https://journals.smarcons. com/ index. php/ APR/ article/ download/288/357

IUCN. (1970). International working meeting on environmental education in the school Curriculum. *Carson City-Nevada, USA.*

Khanum, A. (2019). *Environmentally conscious global citizens: an evolution from environmental education to education for sustainable development in Pakistan* [Doctoral dissertation, University of Glasgow]. https://theses.gla.ac.uk/70969/ 3/2019KhanumPhD.pdf

Levine, D. S., & Strube, M. J. (2012). Environmental attitudes, knowledge, intentions and behaviors among college students. *The Journal of Social Psychology*, *152*(3), 308-326.https: // www. tandfonline.com/doi/abs/10.1080/00224545.2011.604363

Lim, K. Y., Duc, M. A. N., & Thien, M. T. N. (2024). Exploring the potential of AI in nurturing learner empathy, prosocial values and environmental stewardship. *arXiv preprint arXiv:2408.15906*. https://arxiv.org/pdf/2408.15906

Liu, P., Teng, M., & Han, C. (2020). How does environmental knowledge translate into pro-environmental behaviors? The mediating role of environmental attitudes and behavioral intentions. *Science of the Total Environment*, *728(2)*, 1-13.https://www. ScienceDirect. com/science/ article/ pii/S0048969720316399

Llopiz-Guerra, K., Ruiz, D. U., Hernandez, R. M., Mejia, V. L. V., Nunayalle, J. D. R. J., &Sanchez, K. R. (2024). Importance of environmental education in the context of natural sustainability. *Natural and Engineering Sciences*, *9*(1), 57-71. https://dergipark.org.tr/en/download/article-file/3884798

Magnus, V. J., Martinez, P., & Pedauye, R. (1997). Analysis of environmental concepts and attitudes among biology degree students. *Journal of Environmental Education*, *29*(1), 28-33.https://www.tandfonline.com/doi/abs/10.1080/00958969709599104

Mahaswa, R. K., Prayuda, G. B. N., & Riziq, L. B. (2024). The urgency of environmental education in kurikulummerdeka: a geo philosophical approach. *QALAMUNA: Jurnal Pendidikan, Sosial, Dan Agama*, *16*(1), 113-124. https://ejournal. insuriponorogo. ac.id/ index. php/qalamuna/article/download/3901/2620

Mansournia, M. A., Waters, R., Nazemipour, M., Bland, M., & Altman, D. G. (2021). Bland-Altman methods for comparing methods of measurement and response to criticisms. *Global Epidemiology*, *3*, Article*100045*.https://www.sciencedirect.com/science/article/pii/S2590113320300298

Mustafina, B., &Arbuzova, E. (2024). The influence of environmental factors on the health of students: Analysis of environmental quality in educational institutions. In *BIO Web of Conferences*, *140,* 05005. EDPSciences.https://www.bioconferences.org/articles/bioconf/pdf/2024/59/bioconf_sdea2024_05005.pdf

Niu, N., Fan, W., Ren, M., Li, M., & Zhong, Y. (2023). The role of social norms and personal costs on pro-environmental behavior: the mediating role of personal norms. *Psychology Research and Behavior Management*, *16(2023),* 2059-2069. https://www.tandfonline. com/doi/pdf/10.2147/PRBM.S411640

Palmer, J. A. (1998). *Environmental Education in the 21st Century: theory, practice, progress and promise*, London: Routledge.

Pataranutaporn, P., Doudkin, A., & Maes, P. (2024). Ocean Chat: The effect of virtual/conversational AI agents on sustainable attitude and behavior change. *arXiv preprint*
arXiv:2502.02863. https://arxiv.org/pdf/2502.02863

Piao, X., & Managi, S. (2024). Determinants of pro-environmental behavior: effects of socioeconomic, subjective, and psychological well-being factors from 37 countries. *Humanities and social sciences communications*, *11*(1), 1-17. https://www. nature.com/ articles/ s 41599-024-03790-z.pdf

Rodin, J. (1976). Density, perceived choice, and response to controllable and uncontrollable outcomes. *Journal of Experimental Social Psychology*, *12*(6), 564-578. https:// www. ScienceDirect. com/ science/article/pii/0022103176900354

Tapilouw, M. C., Firman, H., Redjeki, S., & Chandra, D. T. (2017). Junior high school students' perception about simple environmental problem as an impact of problem-based learning. *Journal of Physics: Conference Series*, *895*(1), 012130. IOP Publishing. https:// iopscience. iop. org/ article/10.1088/1742-6596/895/1/012130/pdf

Taj, S., Kalsoom, T., & Nader, M. (2020). An exploratory study to measure the environmental
literacy level of teachers teaching at secondary schools in Punjab, Pakistan. *GlobalSocial Sciences Review, 5*(2), 149-156. https://www. Huma pub. com/admin/alljournals/gssr/papers/Mt3pCblQaJ.pdf

van de Wetering, J., Leijten, P., Spitzer, J., & Thomaes, S. (2022). Does environmental education benefit environmental outcomes in children and adolescents? A meta-analysis. *Journal of Environmental Psychology*, *81*, Article *101782* .https:// www. ScienceDirect. com/ science/article/pii/S0272494422000275

Varela-Losada, M., Vega-Marcote, P., Pérez-Rodríguez, U., & Álvarez-Lires, M. (2016). Going to action? A literature review on educational proposals in formal Environmental Education. *Environmental Education Research*, *22*(3), 390-421. https:// www. tandfonline. com/ doi/ abs/ 10. 1080/13504622.2015.1101751

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