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ASSESSING BIODIVERSITY LITERACY AND CONSERVATION ATTITUDES: EVALUATING MULTIDISCIPLINARY PERSPECTIVES ON REGIONAL FAUNA AND ECOLOGICAL PROTECTION

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Abstract

Public awareness is urgently needed to save biodiversity from the increasing threats of global extinction. This study examined the knowledge gap and conservation attitudes of 248 students from science and non-science departments of the Islamia University of Bahawalpur in southern Punjab, Pakistan. The study revealed a discrepancy in literacy attitudes. Both groups of students recognized that human activities are causing various declines. Social science students consider their fields irrelevant with respect to these issues. This gap in agency reinforces disciplinary silos in higher education. Global biodiversity loss is becoming a serious environmental problem. Public awareness and educational awareness play a crucial role in the survival of local life, especially in arid and semi-arid regions. This study aimed to understand the relationship between knowledge and conservation attitudes of biodiversity among students of the Islamia University of Bahawalpur in southern Punjab, Pakistan. For this purpose, information was obtained from 248 students of the Islamia University of Bahawalpur through a survey. The results showed that science students have relatively more scientific and technical knowledge about the regional fauna. In contrast, the knowledge of social science students was found to be limited. The attitudes of both groups towards environmental protection were very similar. Most students supported the ban on hunting and acknowledged that human activities are a major cause of species decline. Importantly, an important aspect of this study was that many social science students consider environmental protection primarily the responsibility of scientific disciplines and consider their field to be less relevant to this process. This situation points to the departmental division existing in the higher education system. Which means that environmental knowledge is probably mostly limited to the realm of life sciences. The study emphasizes that a multidisciplinary educational strategy is necessary for the protection of a unique arid ecosystem like Cholistan. Regional ecology should be included in the general curriculum to instill a shared environmental responsibility among all students. This will bridge the gap between the scientific and social sciences and in the future, such knowledgeable individuals will be prepared who can play an effective role in conserving biodiversity in South Punjab.

Keywords: *Biodiversity Literacy, Multidisciplinary Education, Conservation Attitudes, Environmental Education, Pakistan Wildlife Policy.*

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1 Introduction

1.1.The Global Crisis

The mass extinction phenomenon is a man-made process that we are currently facing. This has posed a threat to human existence and ecosystem. The loss of biodiversity is now being estimated to be 100 to 10,000 times greater than natural pace (Ceballos et al., 2020; Glaubrecht et al., 2023). It is noteworthy that 515 species of vertebrates are at the edge of being wiped out, and 77 mammalian and bird species have gone extinct in the previous century (Ceballos et al., 2020). This concern is not only about the decline of wildlife but also about the collapse of the entire biosphere and its components which are vital for the life on the planet (Dirzo et al., 2022; Pörtner et al., 2023).

This condition has emerged the need of ecological literacy and public awareness as first line of defense in restoring the damage. Fresh sources highlight the paradigm shift that can be accomplished via youth-driven conservation programs. As Bedoya-Rodriguez et al. (2025) reported a significant lack of awareness, where a high regard for biodiversity may not necessarily lead us to an understanding of this global crisis. To fill this gap, it is needed to empower the youth with the help of citizen science and educational integration since these populations tend to become the conservation ambassadors in the wider communities (Ostermann-Miyashita et al., 2021; Hoare et al., 2022). Therefore, ecological literacy of future policy designers in the form of university students is an essential requirement of success of the policy with regard to conservation of the region.

1.2. The Regional Context

Southern Punjab and specifically the Cholistan Desert is a special ecosystem related to arid and semi-arid in Pakistan, with its specific biodiversity and ecological importance (Qureshi et al., 2024; Wariss et al., 2021). It is a hyper-arid desert, covering 2.6 million hectares, characterized by very high and very low climatic oscillations, having temperatures between 6 and 50 o C and an extremely low yearly rainfall (Qureshi et al., 2024). These demanding conditions notwithstanding, the area sustains a special and unique fauna assemblage, such as the Blackbuck (Antilope cervicapra) and the Houbara Bustard (Chlamydotis undulata). Although the Blackbuck is thought to be extinct in the wild in Pakistan, they retain critically endangered captive populations that are held in captivity in Southern Punjab, including Lal Suhanra National Park (Farooq et al., 2022).

Moreover, the area has a variety of plant communities, including Alhagi maurorum Medik., that are becoming increasingly strained because of human-induced forces (Iqbal et al., 2023). Nevertheless, there is an unequal lack of research in this landscape amid the dominant presence of the country in the discourse of biodiversity in the north of Pakistan (Siddique & Molinos, 2024; Din and Hong, 2025). Such a gap causes a serious knowledge gap. Accordingly, a severe gap exists in research to evaluate the biodiversity literacy of the local stakeholders. These attitudes need to be understood to come up with context-specific conservation strategies in this under-explored arid landscape (Din and Hong, 2025; Faiz et al, 2024).

1.3 The Multidisciplinary KAP Gap

In the field of conservation biology, technical and biological data alone cannot guarantee the long-term survival of a species. Instead, the success of protection efforts is often dictated by the Knowledge, Attitudes, and Practices (KAP) of the local population. While the ecological profile of Southern Punjab is increasingly documented, there remains a dearth of empirical data regarding the ecological literacy of the academic fraternity.

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University students represent a vital demographic as they are the future policy makers, educators, and industrialists of Pakistan. There is a growing concern that academic syllabuses may not reflect in pro-environmental behavior or a nuanced awareness of regional fauna. Unless these cognitive and attitudinal barriers are identified, the disconnect between zoological research and community-based conservation will continue to widen. Therefore, evaluating biodiversity literacy through a multidisciplinary lens comparing those in the life sciences with those in the social sciences is essential to foster a holistic conservation culture.

1.4. Research Objectives

Through the identified gaps, the study will be informed by the following objectives:

1. To measure the baseline level of biodiversity literacy among students at The Islamia University of Bahawalpur (IUB).
2. To compare conservation attitudes and perceptions of regional faunal threats between life-sciences and social-science students.
3. To assess the willingness of the student body to support or participate in local wildlife protection initiatives.
4. To identify the primary scholarly and media avenues through which students obtain ecological information.

1.5. Research Questions

RQ1: What is the present degree of the knowledge of the endemic and endangered fauna of the Cholistan region, among students at Islamia University Bahawalpur?

RQ2: Does academic specialization (Science vs. Arts) have a significant impact on the attitude towards conservation by a student?

RQ3: What are the perceived major threats to regional biodiversity as identified by the university student population??

2. Materials and Methods

2.1 Study Design and Setting

This study employed a quantitative, cross-sectional research design to evaluate the ecological literacy and conservation attitudes of the student population at The Islamia University of Bahawalpur (IUB). IUB was selected as the primary study site due to its role as the leading academic hub in Southern Punjab and being one of the largest universities of Pakistan, drawing a diverse student body from regions directly adjacent to the Cholistan Desert.

2.2 Population and Sampling Framework

Undergraduate and postgraduate students from all departments of the university were included in the study. To ensure multidisciplinary assessment, a stratified random sampling method was used. For the purpose, students were allocated to two major groups:

Science/Life Sciences: This included Biology, Zoology, Botany, and Agriculture.

Social Science/Arts: This included Arts, Humanities, and Management.

Although the initial sampling involved the Cochran formula for large samples (with n=385 as target), the analyzed data comprised N=248 respondents.

2.3 Research Instrument (The KAP Scale)

The data was collected digitally via Google survey form. This was designed in accordance with the Knowledge-Attitude-Practice (KAP) model, accustomed to the conservation issues of Southern Punjab. The questionnaire consisted of three sections:

Section 1 was about socio-Demographics like field of study, academic level (BSc, MPhil, MS, PhD), and disciplinary affiliation.

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Section 2 included biodiversity literacy of the participants which was measured through a 3-point Likert scale (Agree, Neutral, Disagree). Knowledge and attitude was assessed regarding endemic species, anthropogenic environmental degradation, conservation, including support for policies on conservation like injunctions on hunting.

Section 3 assessed their educational viewpoint which focused on the role of environmental education.

2.4 Statistical Analysis

Jamovi (Version 2.3) was used to analyze and process the data following the below statistical pathway.

Before the primary analysis, the Cronbach's Alpha (α) was found to assess the internal consistency of the Likert-scale items in order to ensure the stable measure of conservation perspectives.

Descriptive analysis was also obtained using standard deviation, mean and median.

For comparison between students of sciences and social sciences the independent samples T-Test was used. Specifically, the Welch T-test to justify both unequal group sizes and unequal variances (as indicated by Levene's test).

2.5 Ethical Considerations

Informed consent was obtained before the study by informing the respondents about the purpose of the research. Anonymity was ensured as well to maintain confidentiality and to foster honest thoughts on sensitive issues like game hunting and conservation policy in the area.

3 Result Section

The following section presents the empirical results of biodiversity literacy and conservation attitudes of students at The Islamia University of Bahawalpur. The analysis aims to determine the level of baseline literacy as well as assess the fact that academic specialization (Science vs. Social Science/Arts) affects environmental attitudes in the framework of the special ecological situation of Southern Punjab.

3.1. Instrument Reliability

Cronbach's Alpha was used to test the internal consistency of the six-item survey before the actual primary analysis was conducted. The survey tool also reflected moderate internal consistency (α = 0.61), which means that the items provided a solid basis for assessing the conservation views of the target population. This suggests that the items conceptually matched and offered a consistent measure of the ecological knowledge and attitudes of the students, which is statistically comparable.

3.2. Regional Fauna Literacy: Descriptive Profile:

The (Table 1) explains the correlation between regional ecology and the student body. A strong trend in exploring the "Literacy-Attitude Gap" was interesting to note. Although the students were found to have moderate levels of familiarity with the native wildlife of the Cholistan region (Mean = 2.05), there was much more agreement regarding the necessity of policy intervention.

The highest agreement was found on the issue of a regional hunting ban (Mean = 2.55) and the acknowledgment of human influence on species decline (Mean = 2.50). This implies that students do not possess very profound technical knowledge of local fauna, but they have a strong "conservationist instinct." Nevertheless, a significant "agency gap" was observed: students were most neutral when asked whether their own academic discipline could help resolve environmental issues (Mean = 2.16, Median = 2.00), indicating that not many regard conservation as a multidisciplinary task.

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Table 1: Descriptive Statistics of Biodiversity Literacy and Attitudes (N=248)

	Field of Study / Discipline	I am familiar with the native wildlife species of the Bahawalpur	Human activities are the primary cause of the decline in local	I believe that protecting local biodiversity is essential for h	University students, regardless of their major, should take a c	I would support a ban on hunting in protected areas, even if it	I feel that my current academic field can contribute to solving
N	Science	156	156	156	156	156	156
	Social Science/ Arts	89	89	89	89	89	89
Missing	Science	0	0	0	0	0	0
	Social Science/ Arts	0	0	0	0	0	0
Mean	Science	2.19	2.54	2.54	2.49	2.57	2.22
	Social Science/ Arts	1.82	2.43	2.36	2.38	2.53	2.06
Median	Science	2.00	3.00	3.00	3.00	3.00	3.00
	Social Science/ Arts	2	3	3	3	3	2
Standard deviation	Science	0.833	0.712	0.703	0.749	0.692	0.877
	Social Science/ Arts	0.747	0.655	0.742	0.731	0.740	0.909
Minimum	Science	1	1	1	1	1	1

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	Field of Study / Discipline	I am familiar with the native wildlife species of the Bahawalpur	Human activities are the primary cause of the decline in local	I believe that protecting local biodiversity is essential for h	University students, regardless of their major, should take a c	I would support a ban on hunting in protected areas, even if it	I feel that my current academic field can contribute to solving
Maximum	Social Science/ Arts	1	1	1	1	1	1
	Science	3	3	3	3	3	3
	Social Science/ Arts	3	3	3	3	3	3

3.3. Evaluating Multidisciplinary Perspectives

In order to respond to the main research question regarding whether academic discipline has any effect on conservation views, an independent samples t-test was carried out. Since the test used by Levene (unequal variances) showed that the variances of a number of items were not equal ($p < .05$), a Welch t-test was used to provide statistical accuracy.

The findings obtained after Table 2 indicate that there is a dramatic knowledge gap between disciplines. The students in science indicated that they were much more familiar with the wildlife in the region than those in Social Science and Arts ($t(200) = 3.531$, $p < .001$).

Yet, one important observation by the policymakers of the region is that there is no significant difference in conservation attitudes. The two groups were statistically the same in terms of their backing of a hunting ban ($p = .659$) and their appreciation of human-caused extinction ($p = .191$). This means that although the gap between the two groups in Science and Arts can be seen in terms of information (what they know), it is eliminated in terms of values (how they feel).

Table 2: Welch's T-Test Comparing Science (n=156) and Social Science/Arts (n=89)

		Statistic	df	p
I am familiar with the native wildlife species of the Bahawalpur	Student's t	3.428 [a]	243	< .001
	Welch's t	3.531	200	< .001
Human activities are the primary cause of the decline in local	Student's t	1.282	243	0.201

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		Statistic	df	p
I believe that protecting local biodiversity is essential for h	Welch's t	1.312	196	0.191
	Student's t	1.944	243	0.053
University students, regardless of their major, should take a c	Welch's t	1.915	175	0.057
	Student's t	1.066	243	0.287
I would support a ban on hunting in protected areas, even if it	Welch's t	1.073	187	0.285
	Student's t	0.450	243	0.653
I feel that my current academic field can contribute to solving	Welch's t	0.442	173	0.659
	Student's t	1.425	243	0.156
	Welch's t	1.411	178	0.160

*Significant at ($p < .05$).

3.4. Summary of Significant Findings

The findings provide a subtle response to the interdisciplinary question. The research identifies a latent conservationism among Social Science students: they are willing to conserve the Cholistan ecosystem but lack the biological knowledge to base their attitudes on regional facts. Moreover, the marginal significance of the borderline criterion regarding the meaning of Health and Survival ($p = .057$) implies that Science major students are slightly more aware of the ecosystem services provided by biodiversity (i.e., carbon sequestration and nutrient cycling), while Social Science major students may have a more ethical or traditional understanding of the concept of conservation. These results indicate that the failure to protect the ecological condition in the region is caused not by a lack of interest, but by a multidisciplinary knowledge gap that prevents non-science students from considering themselves active participants in the preservation of the fauna of Southern Punjab.

4. Discussion

4.1 The Literacy-Attitude Paradox

This research has boiled down to the discovery of a Literacy-Attitude Paradox. Although the t-test by Welch has shown that the difference in biodiversity literacy levels between science and social science students ($p< .001$) was very significant, the same cannot be said of the differences in conservation attitudes. This means that, among the youths of Southern Punjab, the pro-environmentalism feeling is technologically biological knowledge-enabled rather than driven by ethical or regional identity. This corresponds to the conclusion of Bedoya-Rodriguez et al., (2025) who stated that biodiversity valuation is a separate mental activity rather than a definite vision of the ecological crisis.

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4.2 Disciplinary Siloing and the Knowledge Gap

In this paper, we have defined disciplinary siloing as a phenomenon in which individuals within a single discipline are unable to share or exchange knowledge with members of other disciplines due to certain perceived boundaries.

The fact that familiarity with the regional fauna is significantly higher in the first case (Science M = 2.19 vs. Social Science M = 1.82) highlights the discontinuity caused by disciplinary siloing that Pakistani higher education is rife with. Students of science, especially those who study Zoology and Botany, can be exposed to taxonomical and ecological facts about such species as Blackbuck (Antilope cervicapra) and Houbara Bustard (Chlamydotis undulata). Nevertheless, in the case of social science and arts students, such species are still abstract concepts. This knowledge gap poses a threat to the regional situation; the failure of future lawyers, economists, and administrators—who, above all, are products of social-science streams—to recognize the endemic species of the Cholistan Desert would mean that the species are less likely to emerge in future policy packages.

4.3 Multidisciplinary Consensus on Policy

This approach involves troubling the truths of various disciplines to craft solutions beneficial to all. The most promising result of this study, perhaps, is the statistical cohesiveness of the hunting ban implementation ($p = .659$). Although hunting in the Cholistan area has great historical and cultural importance, a clear generational change is observed, whereby generations are moving towards strict conservation. This observation implies that the attitudinal barrier to conservation is less than it used to be considered. Nevertheless, the "Agency Gap" is still of concern; the social science students were the most negative about it (with a mean of 2.06) when asked whether their particular academic discipline can help find solutions to environmental problems. This is indicative of the inability of the existing curriculum to reveal how disciplines such as Sociology, Economics, or Law help in the socio-ecological effectiveness of protection activities.

4.4 Regional Implications for Southern Punjab

According to Siddique and Molinos (2024), the northern alpine regions tend to dominate the discourse on biodiversity in Pakistan. This paper sheds light on the Southern hyper-dry environment that is long overdue. The assistive nature of the practices in all fields indicates that The Islamia University of Bahawalpur has a distinct chance to spearhead a liberal interdisciplinary model of conservation known as the Southern Conservation Model. By introducing regional ecology as a part of the general education curriculum, the university is able to turn the abstract support of the environment into informed advocacy for the particular species of the Cholistan.

4.5 Limitations and Future Research

This research study was limited by certain weaknesses due to the nature of the selected field, which is emotional intelligence. This research has its weaknesses because it uses self-reported information, which is prone to social desirability bias, especially on sensitive issues such as hunting. Moreover, the sample of $N = 248$ is a strong cross-section of IUB, and in future studies, they should increase the sample to other regional universities in Southern Punjab and establish these results on a larger geographical scale.

5. Conclusion

The conclusion made in this research is that academic specialization at The Islamia University of Bahawalpur has a strong effect on biodiversity literacy without impacting the pro-conservation attitudes behind this literacy. The research establishes that there is a common conservationist ethic among the science and social science students regarding support for hunting bans and the need for compulsory environmental education.

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Nonetheless, there exists a critical literacy gap in which, potentially future administrators and policymakers of Pakistan, social science students do not possess the ecological knowledge of the region necessary to base their attitudes on it. In order to save the rare wildlife of the Cholistan desert, there must be a multidisciplinary pedagogical change. Ecology teaching in the region has to go beyond the boundaries of the Department of Life Sciences and be integrated as part of the university experience. By closing the divide between the science and social science disciplines, it is possible to create a generation of multidisciplinary leaders who will be able to stop the ecological meltdown of the hyper-arid landscapes of Southern Punjab.

6. Further Recommendations

6.1 Interdisciplinary Research Initiatives

Universities in Southern Punjab should encourage collaborative research projects that involve students from science, social science, and arts disciplines. This approach will foster a holistic understanding of biodiversity issues and help break disciplinary silos. For example, economics students could study the financial impact of conservation policies, while law students could explore legal frameworks for wildlife protection.

6.2 Community Engagement Programs

Students should be actively involved in local conservation initiatives, such as habitat restoration projects, wildlife monitoring, and awareness campaigns. Engaging students with the local community will strengthen practical knowledge, reinforce ethical responsibility, and create long-term support for conservation efforts in the Cholistan Desert.

6.3 Integration of Technology in Biodiversity Education

Incorporating digital tools, mobile apps, and GIS mapping into biodiversity studies can enhance learning and engagement. Technology can help students visualize ecological patterns, track endangered species, and contribute to citizen science databases. This will also prepare them to use modern conservation tools in their future careers.

6.4 Workshops and Training for Non-Science Students

Organizing workshops, seminars, and short courses tailored for social science and arts students can enhance their understanding of ecological systems and conservation principles. Such programs can demonstrate how their fields—economics, law, sociology—play a critical role in supporting environmental protection.

6.5 Policy Advocacy and Leadership Development

Universities should cultivate leadership programs that prepare students to influence regional environmental policies. Encouraging students to draft policy briefs, participate in environmental governance simulations, or collaborate with local authorities can create a generation of informed policymakers who integrate ecological knowledge into decision-making.

6.6 Monitoring and Evaluation Framework

Establish a system to periodically assess the effectiveness of environmental education and conservation awareness initiatives. Feedback loops will allow educators to refine curricula, teaching methods, and community programs, ensuring that biodiversity literacy and pro-conservation attitudes continue to improve over time.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

The Authors hereby declare that generative AI technologies, such as Large Language Models, etc., have been used during the writing or editing of manuscripts. This explanation will include the name of the generative AI technology.

Details of the AI usage are given below:

1. Grammarly: To correct grammar

Author Contributions

All of Authors have equal contribution in different angles.

Conflict of interest

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