



Optimizing Campus Landscapes a Comprehensive Study for Stress Reduction and Enhancing Student Well-Being

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Abstract:

This research investigates strategies to enhance open outdoor spaces at UET Abbottabad campus, aiming to cultivate a health-oriented and culturally enriched environment conducive to students' well-being. Employing a mixed-methods approach, data collection included questionnaires distributed via digital platforms and participant observations during peak hours. The study focused on understanding student utilisation patterns, preferences for improvements, and the integration of cultural elements in outdoor space design. Findings revealed significant underutilisation of current spaces, influenced by basic maintenance and available facilities, prompting student demands for increased seating, shaded areas, and amenities such as water features and Wi-Fi connectivity. Recommendations emerged for enhancing greenery with regional plants, improving pathways and lighting for safety and usability, establishing functional study areas with power outlets, and incorporating cultural elements such as art installations and themed gardens. These enhancements aim to foster a more inclusive and dynamic campus environment, supporting diverse student activities, from social interactions to academic pursuits. By addressing these insights comprehensively, the research proposes strategies to transform outdoor spaces into vibrant hubs that promote holistic student development and contribute to a more engaging campus experience.

Keywords: outdoor spaces, student well-being, cultural integration, environmental enhancements

1. Introduction

The campus environment plays a critical role in shaping students' educational experience and overall well-being. Both male and female students face challenges and barriers in pursuing higher education in university due to various kind of stresses (Andersson, Johnsson, Berglund, & Öjehagen, 2009) (Chambel & Curral, 2005), (Bai, Wang, Yang, Ling, & Cao, 2024).

Open and green spaces within university campuses - characterized by their natural beauty, serenity, natural elements like flowers, birds, and water features, and exposure to sunlight -

play a significant role in helping students manage stress and promote psychological restoration (Aghabozorgi, Jagt, Bell, & Smith, 2024), (Wen, Lin, Liu, Guo, & He, 2025), (Kimberly Craig & Silva, 2024). Research suggests that active engagement with green spaces improves mood, enhances well-being, and lowers perceived stress among students (Holt, Lombard, Best, Smiley-Smith, & Quinn, 2019), (S. Liu et al., 2022), (H. Liu et al., 2025).

Many universities have embraced sustainable and green campus initiatives across the globe (Lau, Gou, & Liu, 2014). Outdoor open spaces in universities are often designed to provide students with a natural respite from the indoor academic environment. For many students, these green spaces serve as vital outlets for relaxation and recreation, helping to alleviate stress and improve mental health. Trees and greenery not only enhance the aesthetic appeal of the campus but also creates a more inviting and pleasant atmosphere, which can boost overall student morale and foster a sense of belonging. Integrating natural elements, such as greenery, water features, and open landscapes, into campus design can enhance students' well-being and academic performance by providing restorative environments that support mental health. Therefore, the design of open spaces with integration of aesthetically pleasing and natural elements in academic campus is not merely an architectural choice but an essential component in creating a supportive and healthy university environment.

Another significant negligence is the lack of integration of cultural and social aspects into the design of outdoor spaces in academic campuses. Often, these areas are designed without considering the diverse needs and preferences of the student body. This can result in spaces that do not resonate with the students' cultural contexts or fail to provide for varied recreational needs, such as gender-segregated spaces or culturally sensitive design elements. In Pakistan, outdoor campus spaces generally include maintained lawns, shaded seating areas, and in some cases, sports facilities that promote both physical activity and social interaction. A key question, therefore, is how the design and use of these space - specifically at UET Abbottabad - can be optimized to improve student well-being and stress alleviation. This question highlights the importance of examining the current condition of outdoor areas, while also identifying opportunities for enhancement, with a central focus on student mental health and overall campus experience. It enables a comprehensive analysis of the factors that contribute to effective open spaces, considering both strengths and shortcomings and their influence on students.

To address these gaps, Stephen et al. (Lau, Gou et al., 2014) propose a framework (Figure 1) integrating landscape architecture, spatial planning, and sustainable design to create restorative campus environments. This study applies that framework to the Abbottabad campus of UET Peshawar, assessing its capacity to support student health and well-being while identifying areas for improvement. Additionally, it seeks to develop design proposals tailored to local cultural contexts, thereby enhancing the campus experience and promoting a more inclusive, supportive environment.

The objectives of this study are: (i) to evaluate the applicability of the Healthy Campus Framework in comparison with the existing spatial and landscape conditions at UET Abbottabad; (ii) to assess the potential for developing additional green spaces within the

campus; and (iii) to propose culturally sensitive design strategies to enhance the effectiveness of campus open spaces.

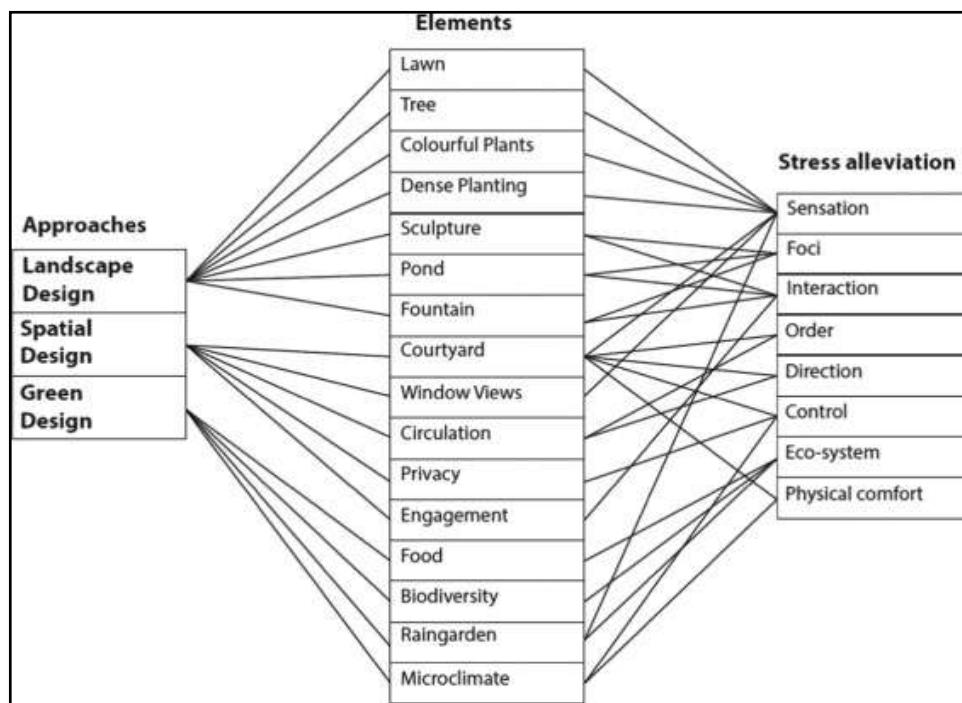


Figure 1: Framework for Healthy Campus Open Space Design

Literature Review

Exposure to natural environments has been shown to restore mental capacities, alleviate stress and fatigue, and promote overall well-being, all of which are conducive to effective learning (Ly & Vella-Brodrick, 2024) (World Health Organization. Regional Office for, 2016), (Sun, Liu, & Zheng, 2023). Research further indicates that nature enhances cognitive functions such as working memory, attention, and flexibility (Schertz & Berman, 2019). This has fuelled growing recognition of the need to create environments that inspire, promote well-being, and stimulate a connection with nature. Nature-integrated landscaping in educational spaces recognises the importance of this bond for student development, as it benefits well-being, academic performance, and health (Team, 2023), (Zhang, Mavoa, Zhao, Raphael, & Smith, 2020). Incorporating natural elements, such as vegetation, water, natural light, and natural materials, makes educational spaces more stimulating and conducive to learning.

Well-planned landscape design enriches visual quality while improving quality of life for students, staff, and visitors (*Air Mobility*, 1999). As a result, core principles of landscape design that inspire learning and promote healthy outdoor learning are essential. Table 1 (Lau et al., 2014) shows the positive effects of natural views.

Equally important is the integration of regional cultural elements in landscape planning. Zhao (Zhao, 2018) stresses that designs grounded in traditional cultural traits and everyday practices help preserve identity and ensure resonance with local communities, fostering recognition and belonging. Work (Abdul Wahab, Hassan, & Ezzedin, 2025) acknowledges that landscape design extends beyond aesthetics, serving as a medium for expressing local identity, history, and collective memory. These studies advocate for contextually grounded

design frameworks that integrate cultural narratives and regional characteristics, ensuring that landscapes reflect the social values and spatial traditions of their surroundings. UNESCO World Heritage campuses exemplify this integration, blending architecture, art, and public space into cohesive cultural expressions (World Heritage Convention) Similarly, Indigenous-inspired landscape architecture reflects cultural narratives through symbolic forms, materials, and ceremonial spaces that reinforce identity and community ties (Wikipedia, 2025). When culture and emotion are intentionally integrated into the design of a campus, students' sense of belonging and connection to their institution can be strengthened. Employing environmental design strategies across both interior and exterior spaces helps address the emotional needs associated with campus culture (Kai Cao, Qian Ye, & Qiu, 2023).

The literature highlights the crucial role of open space design in educational environments, emphasizing both its restorative and cognitive benefits as well as its cultural and emotional significance. Well-designed open spaces, incorporating elements like vegetation, water, and natural light, enhance student well-being, academic performance, and overall health. These spaces also promote relaxation, reduce stress, improve focus and information retention, and, when infused with local traditions and narratives, create culturally meaningful and inclusive campus experiences.

UET Abbottabad Campus

Table 1: Summary of evidence of health effects of natural views

Healing effects	Measurements	Design elements
Shorter post-operative hospital stays	Number of days in hospital after surgery	Natural scene; trees
Restorative benefits for heart rate data and emotional states	Heart rate; self-reports of emotional state	Painting of natural scene; distant mountains, sunset, clustered trees and open grassy areas, path (mystery)
Less job stress and intention to quit	Self-reports of emotional state	Percentage of the view from window with rural elements
Higher naturalness score post-move gave better cognitive functioning	Behavioral observation	Amount of nature in window view
Lower mental fatigue	Attention-tests; neighborhood social ties-test	Varying levels of nature (trees and grass) surrounding public housing (scale 0-4)
Improved self-discipline	Attention-tests	Amount of window view of nature
Increased powers of concentration	Attention-tests; blood pressure; heart rate	Garden, with old fruit trees and a variety of flower species
Higher happiness, lower stress, anger, depression and tension	Attention-tests; emotion-test	Park-like forest area with creek
Reduced stress and improved mood	Attention-tests; blood pressure; emotion-test	Natural environment: tree views/nature reserve

The University of Engineering and Technology (UET), Peshawar, inaugurated its Abbottabad campus in October 2002 at the former premises of Ayub Medical College, with the first department established in March 2004 (UET, 2025). Establishment of campus of UET in Abbottabad has not only addressed a longstanding public demand but also enhanced the city's image as a seat of learning.

Abbottabad serves as an educational hub, drawing students from diverse regions of Pakistan to study in its schools and colleges (Jaamiah.com, 2015). The city hosts several higher education institutions, including Ayub Medical College, Frontier Medical College,

COMSATS University of Science and Technology, and Abbottabad University of Science and Technology ((College) (COMSATS) (FMC) (AUST). Known for its scenic natural beauty, pleasant climate, and strong network of educational facilities, Abbottabad provides a favorable environment for the advancement of educational institutions and the holistic development of students.

As per the 2023 census, the literacy rate in Abbottabad District stands at 77.34%, with male literacy at 86.20% and female literacy at 68.42% (Statistics, 2023). This high level of educational attainment reflects both the city's academic culture and its demand for quality higher education environments. In this context, the design of open spaces at UET Abbottabad holds unique potential. Unlike campuses located in congested urban centers, Abbottabad benefits from its natural landscape and climate, which can be harnessed to create restorative, culturally relevant, and aesthetically appealing outdoor spaces. Such spaces not only improve the well-being and mental health of students but also strengthen the city's broader academic identity by setting an example of how open space design can complement natural surroundings. Integrating these elements effectively positions UET Abbottabad as a model of how campus planning can merge local environmental advantages with student-centered design to promote both individual well-being and collective academic vitality.

2. Outdoor Open Spaces at UET Abbottabad Campus

The UET Abbottabad campus contains several open spaces characterized by natural features such as trees, shrubs, hedges, and flowerbeds, along with a few built elements. For this study, the selected open spaces include the Cafeteria Lawn, Staff Parking Lawn, Jalal Baba Boys Hostel Courtyard, Jalal Baba Boys Hostel Front Yard, Basketball Court, and the New Academic Block Front Yard — as these areas are actively utilized by students. Although additional open spaces exist across the campus, they currently remain outside regular student use. Figure 2 illustrates the identified open spaces. Overall, while the campus possesses the essential natural and structural components for creating functional outdoor environments, further development is needed to enhance their usability, comfort, and contribution to student well-being.

1. Data Collection

To fulfill the study objectives, data were gathered using a mixed-methods approach that integrated questionnaire and participant observations. For Objective (i), participant observations combined with GIS tools were utilized to identify and map open spaces across the campus. Observations took place during peak activity hours (12 PM–2 PM) in June–July 2024 to assess student behaviour and patterns of space utilization. Additionally, a comparative analysis was conducted between the open space features at UET Abbottabad and those outlined in the reference study Healthy Campus by Open Space Design.

For Objectives (ii) and (iii), an online questionnaire was distributed to students from the Architecture and Electronic Engineering departments of UET Abbottabad. The survey was voluntary and anonymous, with the questionnaire link distributed through departmental WhatsApp groups as well as individual student accounts to ensure broader participation across different semesters. A total of 95 students participated. The questionnaire addressed four main themes: (1) utilization and perception of campus open spaces, (2) preferences and suggestions for improvement, (3) the influence of open spaces on campus life, and (4) recognition and integration of cultural elements.

FIGURE 02: UET Abbottabad Campus Outdoor open spaces



Figure 2: Selected Outdoor Open Spaces - UET Abbottabad Campus

5.1 Questionnaire

An online survey comprising both closed- and open-ended questions was conducted to gain insights into the types of activities students engage in within the campus's open outdoor spaces, the improvements they recommend, and their views on incorporating cultural elements into these areas (Objectives ii and iii). A total of 95 responses were received from students of both the Architecture and Electronic Engineering departments, with 68.4% from Architecture and 31.6% from Electronic Engineering, as illustrated in Figure 3.

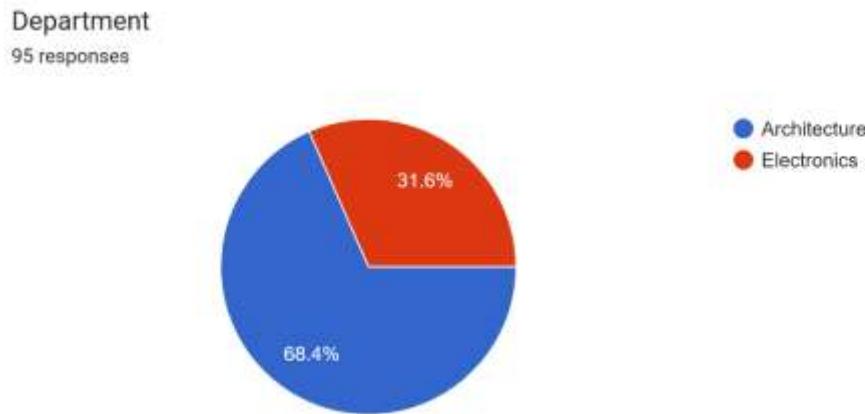


Figure 3: Department wise Responses

In response to the query regarding the frequency of using open spaces in UET Abbottabad campus, a significant majority, comprising 68.4% of the surveyed population, affirmed use of the open spaces at campus on daily basis, while 16.8% indicated weekly usage. Illustrative depiction of these data is presented in Figure 4. These findings highlight the importance of designing campus open spaces with consideration for their frequent daily use by students.

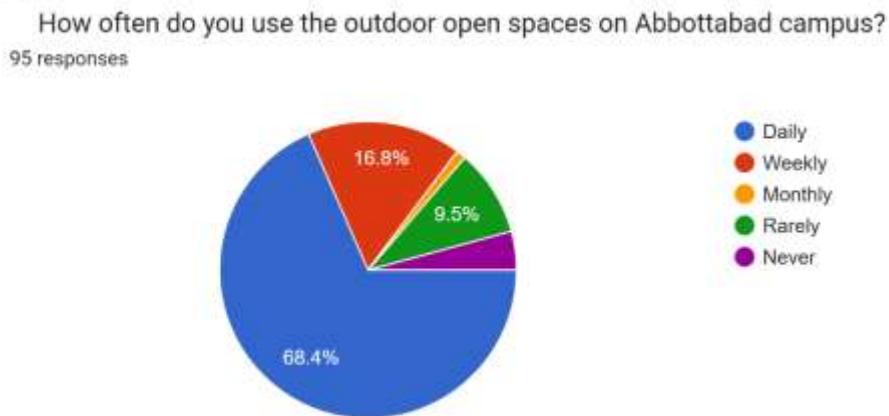


Figure 4: Frequency of Using Open Spaces by Students

Open spaces. The data reveals that the majority of students (68.4%) primarily use these areas for socializing and relaxation. A significant portion (16.8%) uses them weekly, indicating a regular but not daily engagement. Monthly usage is the third most common, followed by rarely (9.5%) and never (0.6%).

What activities do you typically engage in while using these outdoor spaces? (Select all that apply)
95 responses

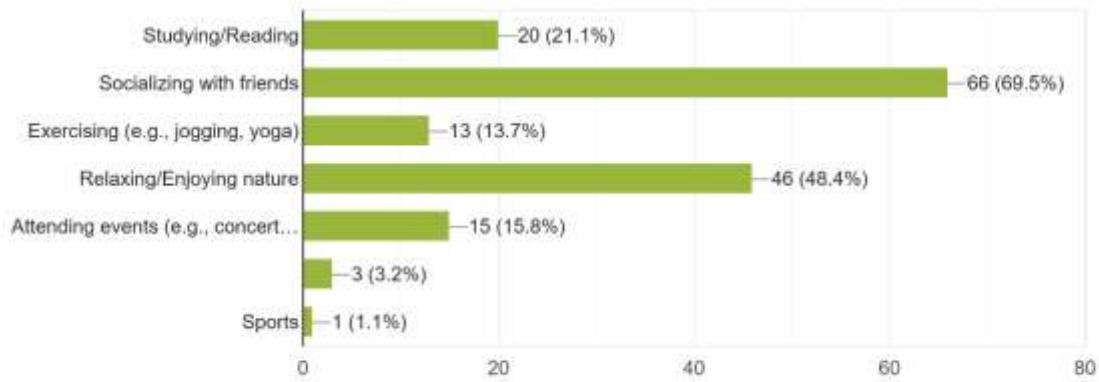


Figure 5: Activities Students typically engage in Campus Open Spaces

Figure 6 illustrates the percentage data related to most appealing current outdoor feature of the campus. Many respondents (75.8%) identified the greenery and landscaping of UET Abbottabad's open spaces as the most appealing feature—one that should be preserved in future design plans. Seating areas ranked second (41.1%), followed by shade structures (26.3%).

What features of the outdoor spaces do you find most appealing? (Select all that apply)
95 responses

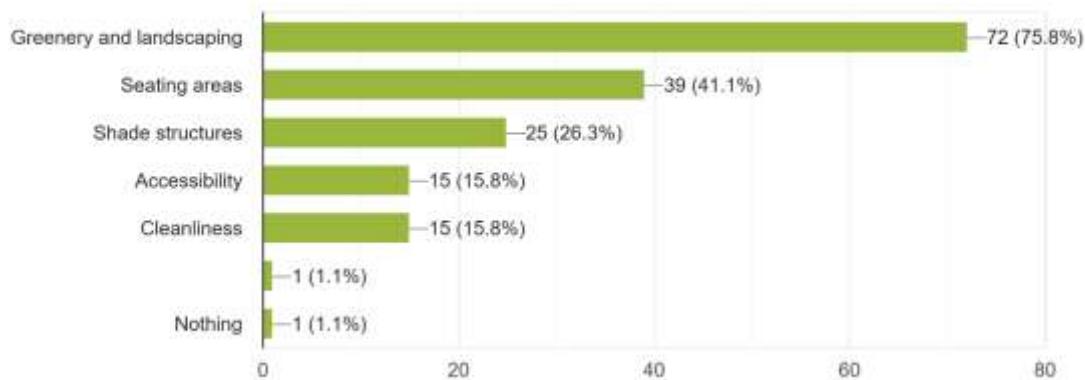


Figure 6: Most appealing Features of Open Spaces at Campus

Figure 7 illustrates the students' responses regarding design elements lacking in the existing campus open spaces. A majority (78.9%) identified the need for additional seating areas as the top priority, followed by proper weather protection or sheltered spaces (54.7%) and the inclusion of water features for aesthetic enhancement (52.6%). These findings emphasize that future open space designs at UET Abbottabad should prioritize increasing seating capacity, provide adequate shade, and integrating visually appealing water elements.

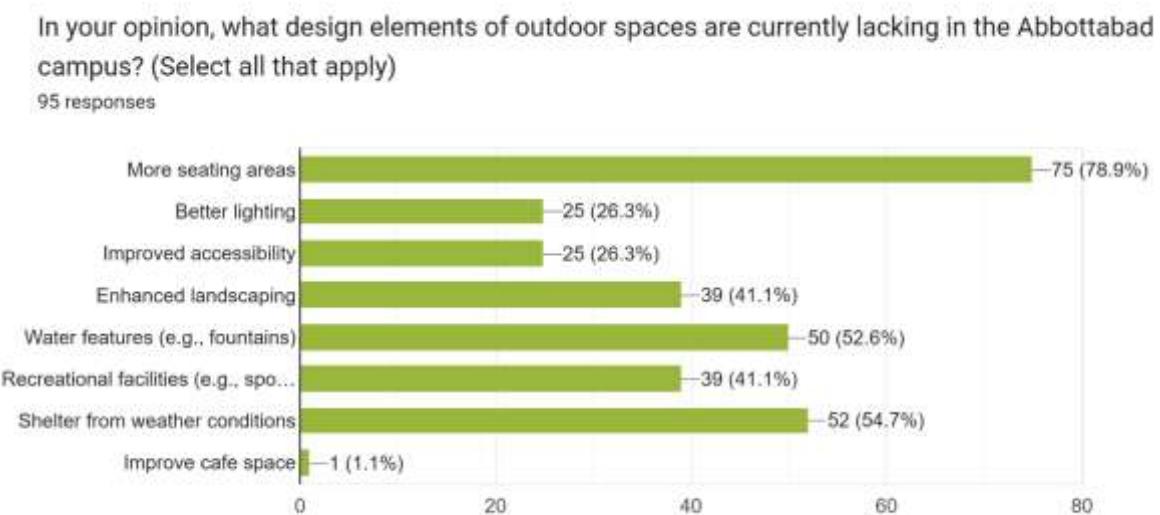


Figure 7: Design Elements Missing in Existing Campus Open Spaces

As illustrated in Figure 8, surveyed student responses regarding desired improvements in campus open spaces highlight key priorities such as the addition of more seating and tables (66.3%), shaded areas (62.1%), and outdoor study spaces equipped with power outlets (48.4%). There is also considerable interest in improving pathways and walkways (46.3%), enhancing recreational facilities (44.2%), diversifying plantings and green spaces (43.2%), and installing better lighting for evening use (36.8%). Addressing these specific needs will significantly improve the functionality, comfort, and overall usability of outdoor areas for students.

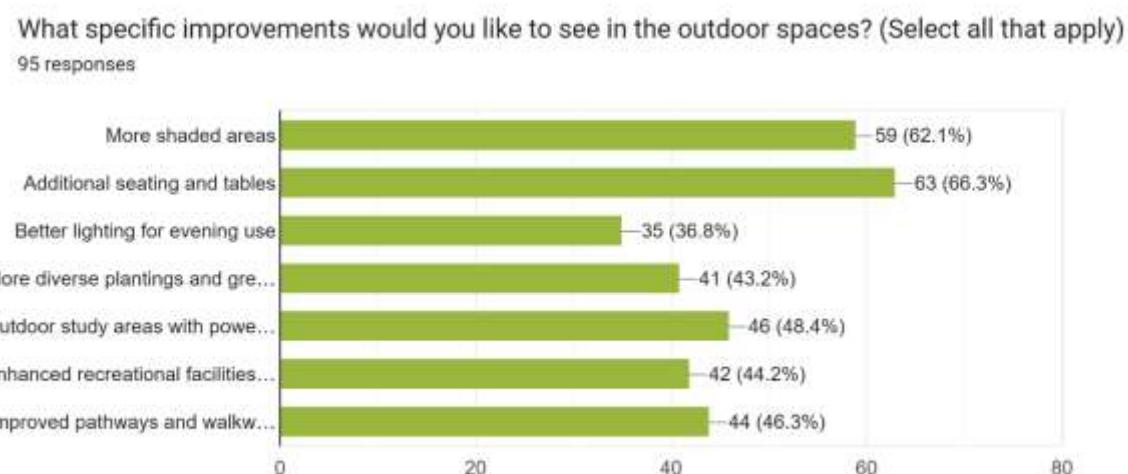


Figure 8: Specific improvement in outdoor open spaces in Campus

In terms of introducing cultural elements into the design of outdoor spaces (closed ended question), the following were highlighted:

As shown in Figure 9, responses to the question on incorporating cultural elements into outdoor space design reveal strong student interest in integrating cultural identity across the campus environment. The most preferred feature was art and sculptures reflecting cultural heritage (56.8%), followed by spaces for cultural events and performances (48.4%), indicating a clear desire for expressive and participatory cultural environments. Additionally, students highlighted the importance of cultural paintings and artwork on walls (42.1%) and cultural-themed gardens and landscaping (41.1%) to enhance visual appeal and embed local traditions within the landscape. Furthermore, dedicated areas for traditional activities (38.9%) and information boards about cultural history (32.6%) were also emphasized, suggesting a strong inclination toward educational and interactive spaces that celebrate and preserve cultural heritage.

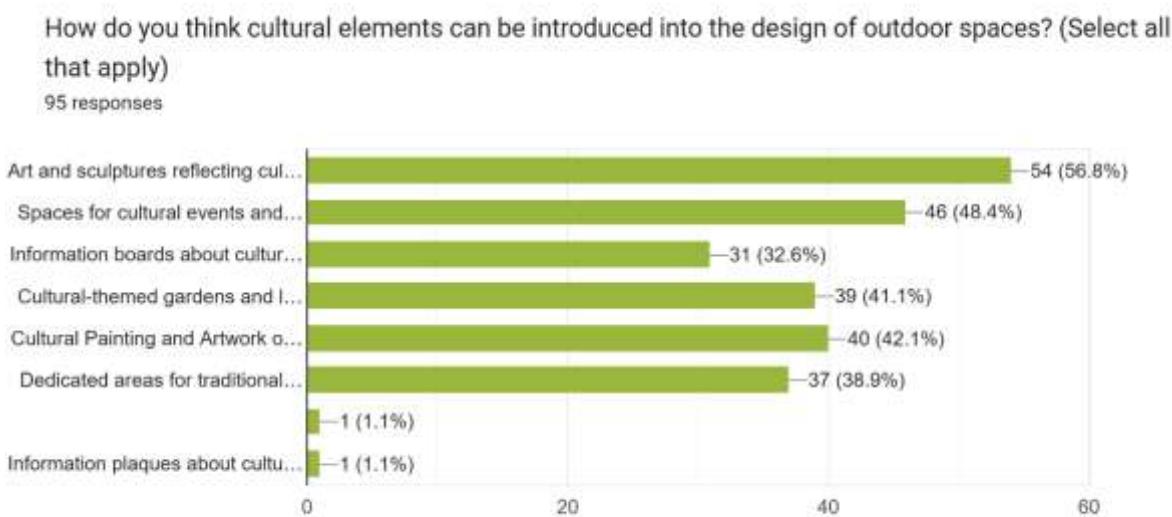


Figure 9: Preference of Cultural elements in the Design of Open-Door Spaces

In response to the two open ended questions regarding suggestions for improvements for current outdoor open spaces on campus and recommendations for designing outdoor open spaces, students recommended increasing seating capacity with shaded, comfortable, and safe study or gathering zones, enlarging cafeteria seating, and creating activity-specific outdoor spaces. Female students emphasises that they would benefit from dedicated or separate seating areas to ensure comfort and privacy.

For sports and activities, suggestions included expanding grounds, adding more courts, and introducing jogging tracks and fitness areas, while also designing flexible spaces that could host both games and events. Female students also noted the importance of designated or reserved times and areas for their active participation.

To strengthen safety, comfort, and accessibility, students proposed better outdoor lighting, additional shaded shelters, and the inclusion of ramps and wide pathways.

They also valued enhancing the natural environment with evergreen, allergy-friendly plants, water features, and a balanced mix of greenery and functional landscaping. To reflect cultural identity, students suggested incorporating traditional design elements, sculptures, and art installations that promote inclusiveness.

Further, students encouraged the development of interactive outdoor learning spaces and flexible zones to support collaboration and cultural exchange. For upkeep, they emphasised regular maintenance, sufficient trash bins, and consistent administrative oversight. Finally, they suggested addressing infrastructure needs by expanding parking facilities and redesigning open spaces for more efficient, multifunctional use.

From the survey responses, five main themes emerged: seating, safety, sports, cultural elements, and maintenance. Within these themes, students consistently suggested expanding shaded and comfortable seating zones, improving outdoor lighting and accessibility for safety, enlarging sports grounds and facilities, incorporating cultural identity through art and design, and ensuring regular upkeep of existing infrastructure.

By addressing these diverse and detailed preferences, the design of outdoor open spaces at academic campuses can significantly enhance student well-being, foster a more inclusive and engaging environment, and promote a healthier, more dynamic campus life. These improvements will not only contribute to the aesthetic and functional quality of the campus but also support the holistic development of students by providing them with spaces that cater to their educational, recreational, and social needs.

Conclusion of Questionnaire:

The online questionnaire was designed to capture students' perspectives on the use and improvement of outdoor open spaces, focusing on their current utilization patterns, desired improvements, and opportunities to integrate cultural elements.

The following section consolidates the findings and interprets them in relation to the study objectives: (ii) to assess the potential for developing additional green spaces within the campus; and (iii) to propose culturally sensitive design strategies.

Utilization of Existing Outdoor Spaces

Questionnaire results reveal that over 60% of students use campus open spaces daily, emphasizing their central role in student life. Socializing with friends, relaxation, and stress relief emerged as the main activities, highlighting these areas as vital for emotional and social well-being. The greenery and natural setting were consistently valued, suggesting that these elements should be preserved in any future landscape improvements.

Design Priorities and Green Space Development

Students identified several gaps in the current campus landscape, including a need for additional seating, shaded and weather-protected areas, and improved pathways and lighting. Requests for outdoor study zones with power outlets, recreational facilities, water features, and aesthetic landscaping demonstrate the potential to develop functional green spaces that support both learning and leisure. These findings directly address the study objective of assessing opportunities to enhance campus outdoor spaces, showing where underutilized or poorly equipped areas could be upgraded into vibrant, multi-functional environments.

Culturally Sensitive Design Strategies

Students articulated clear preferences for embedding cultural identity into campus outdoor spaces. Prominent suggestions included art and sculptures reflecting cultural heritage, spaces for cultural events and performances, and themed gardens inspired by local traditions. Additional recommendations involved murals and wall paintings with cultural

motifs, informational boards showcasing cultural history, and the use of traditional materials in landscape features. These strategies demonstrate how outdoor environments can be transformed into culturally resonant spaces that strengthen students' sense of identity and belonging.

Inclusivity Considerations

Female students highlighted the importance of inclusive design within campus outdoor spaces. They emphasized the need for dedicated or separate seating areas to ensure comfort and privacy, as well as designated times and areas for active participation in sports. These insights underscore the importance of addressing gender-specific needs to create equitable, welcoming, and inclusive environments that cater to all students.

Broader Student Suggestions

Beyond green space expansion and cultural integration, students proposed practical improvements to enhance usability and functionality. These included waste and recycling bins, water coolers, jogging paths, and sports courts. They also emphasized the need for regular maintenance and cleanliness to ensure long-term sustainability. Collectively, these suggestions highlight that successful campus improvements require not only thoughtful design interventions but also consistent management practices to maintain a safe, functional, and welcoming environment for all students.

Redesigning campus outdoor spaces should combine functional improvements, culturally and aesthetically enriching elements, practical infrastructure, and gender-sensitive features. Such an approach will support social, recreational, and academic activities, enhance student well-being, and strengthen campus identity, inclusivity, and a sense of community, fully aligning with the study objectives.

5.2 Participant Observation

For Objective (i), which aimed to evaluate the applicability of the Healthy Campus Framework in relation to the existing spatial and landscape conditions (outdoor open spaces) at UET Abbottabad, data was collected using participant observation and GIS-based mapping. Open spaces across the campus were identified and demarcated in QGIS (Figure 2), followed by systematic observation of their utilization during peak hours (12 PM–2 PM), June-July 2024.

The *Healthy Campus by Open Space Design* framework (Figure 1) was employed as the basis for analysis, outlining key elements under three approaches: Landscape Design, Spatial Design, and Green Design. These elements provided the criteria for comparison with the open spaces available at UET Abbottabad. The identified open spaces—such as the cafeteria lawn, staff parking lawn, Jalal Baba boys hostel courtyard and front yard, the basketball court, and the new academic block front yard—were assessed against these design guidelines. This comparative assessment was compiled into Table 2, linking each selected open space of campus with its surroundings, landscape features, spatial attributes, green design considerations, and observed main activities.

Observations during peak hours indicated that nearly half of the student population actively engages with open spaces after classes, with the cafeteria lawn, staff parking lawn, and basketball court emerging as the most frequented areas, highlighting the crucial role these spaces play in daily campus life. These spaces were used as multifunctional hubs for relaxation, dining, social interaction, and sports activities. The cafeteria lawn serves as a central gathering spot where students engage in social interactions, enjoy meals, and take breaks from their academic schedules. The staff parking lawn, though primarily designated for staff parking, is also used by students for relaxation due to its open space and available seating. Meanwhile, the basketball court is a hub for sports activities, where students participate in games and physical exercise, as well as a casual meeting point for socializing.

This observation highlights the importance of these open spaces as versatile environments for relaxation, recreation, and social engagement for the student body. However, the limited incorporation of diverse design elements results in underutilization of other potential open spaces, such as the new academic block front yard, which currently lacks functional landscape or green features.

Additionally, architectural features across the campus, such as the orientation of windows in both academic and residential blocks, generally provide visual connections to outdoor green areas. This design aspect aligns with the Healthy Campus Framework by supporting restorative experiences through window views, although the absence of complementary outdoor interventions reduces its overall impact.

The analysis revealed that while several open spaces at UET Abbottabad incorporate landscape elements such as trees, hedges, shrubs, and lawns, integration of spatial and green design strategies remains limited. For instance, the cafeteria lawn and staff parking lawn support social interaction and outdoor activities, yet lack dedicated green design features such as rain gardens, biodiversity enhancement, or microclimate-sensitive landscaping. The basketball court demonstrates strong use for sports but offers minimal connection to landscape or green design principles.

Conclusion of Participant Observations

In summary, the comparison of UET Abbottabad's open spaces with the Healthy Campus Framework highlights both strengths and gaps. While existing lawns and courtyards contribute to social and recreational needs, the absence of integrated green design strategies—such as biodiversity, microclimate control, and cultural landscape elements—limits the potential of these spaces. The findings point toward the need for a more holistic and multi-dimensional approach to open space design, combining landscape, spatial, and green principles to fully realize the objectives of a healthy and culturally sensitive campus environment.

Table 2. Assessment of open spaces in the UET Abbottabad Campus

ASSESSMENT FOR OPEN SPACES IN THE UET ABBOTTABAD CAMPUS					
SELECTED OPEN SPACES	SURROUNDINGS	MAIN DESIGN ELEMENTS			MAIN ACTIVITIES
		LANDSCAPE DESIGN	Spatial Design	Green Design	
Cafeteria Lawn	Cafeteria, Electronics Department	Trees, Hedge	A lawn for outdoor lunch	N/A	Sitting, Lunch, Eating
Staff Parking Lawn	Parking, Lab, Storage	Trees, Shrubs, Hedges, Flowers, Water Ponds	Courtyard for outdoor activities	Microclimate (Sunny and Shade)	Gathering, Survey Practicals, Chatting, Sitting
Jalal Baba boys hostel courtyard	Boys hostel	Trees	Courtyard for ventilation	N/A	Laundry
Jalal Baba boys hostel frontyard	Boys hostel	Trees Hedges shrubs Landform pathways	Circulation	Landform	sitting, circulation
Basketball Court	main campus, student parking, cafeteria, volleyball court.	Concrete floor, basket ball poles, hedges.	circulation, sports	N/A	sports
New academic Block front yard	New academic block	N/A	N/A	N/A	N/A

pathways, recreational facilities, better lighting, water features, waste management, and regular maintenance. Cultural enrichment was also prioritized through art installations, sculptures, cultural-themed gardens, informational boards, and spaces for events, fostering a deeper connection to heritage. Inclusivity considerations were highlighted, particularly by female students, who requested dedicated seating, privacy, and designated opportunities for

sports participation. Addressing these functional, aesthetic, cultural, and inclusive needs can transform campus open spaces into vibrant, equitable, and engaging environments, promoting student well-being, social interaction, academic support, and a healthier, more dynamic campus life.

3. Future Recommendations for Campus Outdoor Spaces

Following are the recommendations for enhancing the campus outdoor open spaces at UET Abbottabad, aimed at improving students' well-being, fostering inclusivity, and creating culturally enriched, functional, and engaging environments that support both academic and recreational activities.

Increase Seating and Shaded Areas:

Add benches and tables throughout the campus, with shaded zones using trees, pergolas, or umbrellas to accommodate different group sizes and activities

Enhance Green Spaces:

Introduce diverse regional, low-pollen plants and landscaped areas reflecting local ecosystems and cultural aesthetics.

Improve Infrastructure:

Upgrade pathways and walkways for accessibility and safety and install proper lighting to support evening use.

Create Functional Outdoor Study Areas: Provide outdoor study zones with power outlets and quiet areas, ensuring inclusive spaces that accommodate privacy needs, particularly for female students.

Incorporate Recreational Facilities:

Develop or enhance sports courts and recreational areas with safe, well-maintained, and gender-inclusive access.

Introduce Water Features:

Add fountains, ponds, or other water bodies to enhance aesthetic appeal and create calming outdoor environments that support relaxation and mental well-being.

Promote Cultural Awareness:

Integrate art, sculptures, murals, cultural-themed gardens, and spaces for cultural events to celebrate heritage and enrich the campus environment. Spaces for cultural events and performances can further celebrate and preserve cultural identity, while cultural-themed gardens and landscaping can highlight regional flora and traditional design elements. Additionally, wall paintings and informative displays can enrich the visual environment and provide educational value, fostering a deeper connection to heritage among students.

Maintenance, Waste Management, and Activity Zones

To ensure outdoor spaces remain functional, attractive, and inclusive, it is important to implement effective waste management by increasing the number of waste and recycling bins, promoting cleanliness and sustainable habits among students. Regular maintenance schedules should be established for all areas, complemented by active administrative oversight to support long-term upkeep and improvements. Additionally, designing diverse activity zones for socializing, relaxation, studying, sports, and cultural engagement can cater to the varied needs of the student body. Incorporating interactive and traditional learning areas further enhances educational and cultural experiences, while ensuring that all zones provide equitable access and comfort, particularly for female students and other underrepresented groups.

By implementing these recommendations, UET Abbottabad campus can significantly improve its outdoor spaces, making them more functional, enjoyable, and supportive of student well-being and academic success.

Declaration

During the preparation of this work, the authors used ChatGPT 5.0 to support the writing process, specifically to enhance the readability and language of the manuscript. Following its use, the authors thoroughly reviewed and edited the content as necessary and assume full responsibility for the final version of the published article.

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