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Role of Landscape Elements in Enhancing Microclimate Comfort for Students: A Case Study of Jinnah Hall, University of Agriculture Faisalabad

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ABSTRACT

This case study was conducted to investigate student's perception on surrounding residential landscape at Jinnah Hall, University of Agriculture Faisalabad. The study was conducted to evaluate a student's perception on the effectiveness of landscape design, on students' academic and social life; determine the association between student preference to a particular plant and their ages and to showcase the role of campus landscape on students physical and mental health. The research methodology incorporates a combination of qualitative and quantitative approaches, including surveys and interviews. A total of 200 students participated in this study through the completion of the questionnaire, and interviews were conducted to supplement the quantitative data. Collected data was analyzed through SPSS (Statistical Package for Social Sciences) and Chi square test, at 5% probability level. The findings showed that large portion of the students were within the age bracket of 20-21 years, with 46.3% belong to rural areas. The results showed that about 60% of respondents prefer flowering plant. In terms of color most of the respondents had preference for red and white color flower the result of the Chi-square test showcased that student preference to color is independent to their ages. In relation to satisfaction about half of the respondents were satisfied with the current hall landscaping. Similarly, majority 56% of the students are aware of the therapeutic Effect of Horticulture to improve mental health. Provision of more foot path, red flowers as well as ornamental plants are here by recommended.

***Keywords*:** Landscape element, Microclimate.

INTRODUCTION

The landscape, encompassing outdoor spaces. Greenery, and architectural design, plays a pivotal role in shaping the educational environment. The realization that the surroundings in which knowledge are impacted can profoundly affect cognitive, social, and emotional aspects of students and teachers has sparked a growing interest in the role of landscapes within educational frameworks (Souter-Brown, 2014). The landscape of an educational institute contributes to the overall learning atmosphere. Beyond traditional considerations of aesthetics, the synthesis of research in this field reveals a dynamic interplay between environmental psychology, academic performance, social dynamics, health and well-being, creativity, sustainability, and cultural identity (Masterson et al., 2019). Studies (Crow et al., 2006; Swanwick, 2009; Ayeni et al., 2011; Aretano et al., 2013) have shown that Good landscape creates a conducive atmosphere that calms the mind of students and increases concentration, in-addition to that, it provides spaces for leisure, interaction with landscape components, and outdoor lessons and revisions

Campus is a place for knowledge, a place where leaders are made, behavior is shaped; hence has a predominant potential for promoting sustainability practice. In this regard, a sustainable campus environment creates opportunities for higher academic institutions to experiment, teach, practice and exhibit a typical model of sustainable community to larger society (Alshuwaikhat and Abubakar, 2008). Well-designed educational institute helps to improve university's

academic, activity and service operations with its learning services and increase education performances. Students spend a lot of their time at the university's campus with various activities, which need constant attention. They gain huge benefits from campus landscapes such as restoration opportunities, which aid them to engage with mental activity and scientific work (Hami and Abdi, 2021). Landscaping is known to relieve students from stress, anxiety and mental fatigue (Li and William, 2016). Human mental capacity could be improved after connection with nature. Green Care is health promoting, as green spaces can contribute to mental as-well as physical and social health. Studies on restorative environments have shown that green spaces are more likely to relieve stress than interior spaces and urban areas, even though urban inhabitants enjoy better health services than rural inhabitants. Further studies have shown that natural environments lead to a reduction in pulse and of stress hormones as well as an improvement in mood (Douglas et al., 2017). Gardening is reported to be meaningful and restful. It has been shown that even a view of nature can improve postoperative convalescence. The university student perceptions about the university landscape is principally and importantly valuable since they are the major party involved inside the university. Their opinions and contributions not only support the physical development of the university but also stimulate the conceptual, social and intellectual improvement for effective learning. Keeping in mind the significance of landscape in enhancing learning and its impact on students' cognitive development and overall academic performance; this study is design to;

1. evaluate a student's perception on the effectiveness of landscape design, on students' academic and social life.
2. determine the association between student preference to a particular plant and their ages understand the role of campus landscape in student lifestyle to promote their physical and mental health.

MATERIAL and METHODS

Study Area

The University of Agriculture (UAF) is a public research university in Faisalabad, Pakistan. It is the largest university of Pakistan by area, with a covered area of 2,550 acres. It is ranked as a top university of Pakistan for Agriculture/Veterinary and is ranked among top ten Pakistani universities in general category. The university was established in 1906 as the first major institution of higher agricultural education in the undivided Punjab. Currently the university has seven faculties with more-than 30 departments and about 5 institutes. The University of Agriculture Faisalabad is a major centre for research; as of 2017 it was the largest of the agricultural research universities in Pakistan.

The study was conducted at Jinnah Hall, University of Agriculture Faisalabad. This selection was made possessively because the hostel was newly established and it has large capacity accommodating a total of 1800 students divided into Block A and B with each having the capacity of 900 students.

Sampling Procedure/ Method of Data collection

The study used yemane's formula to select 200 respondents 100 students from each block. 7% error margin was used. According to the formula 186 respondents are sufficient, however 200 were used. The respondents were selected randomly since they are assumed to be homogeneous.

$$n = \frac{N}{1 + N(e)^2}$$

n= sample size
N=population of the study 343
1=constant
e=error

$$n = \frac{1800}{1+1800(0.07)^2} = 186 \text{ respondents}$$

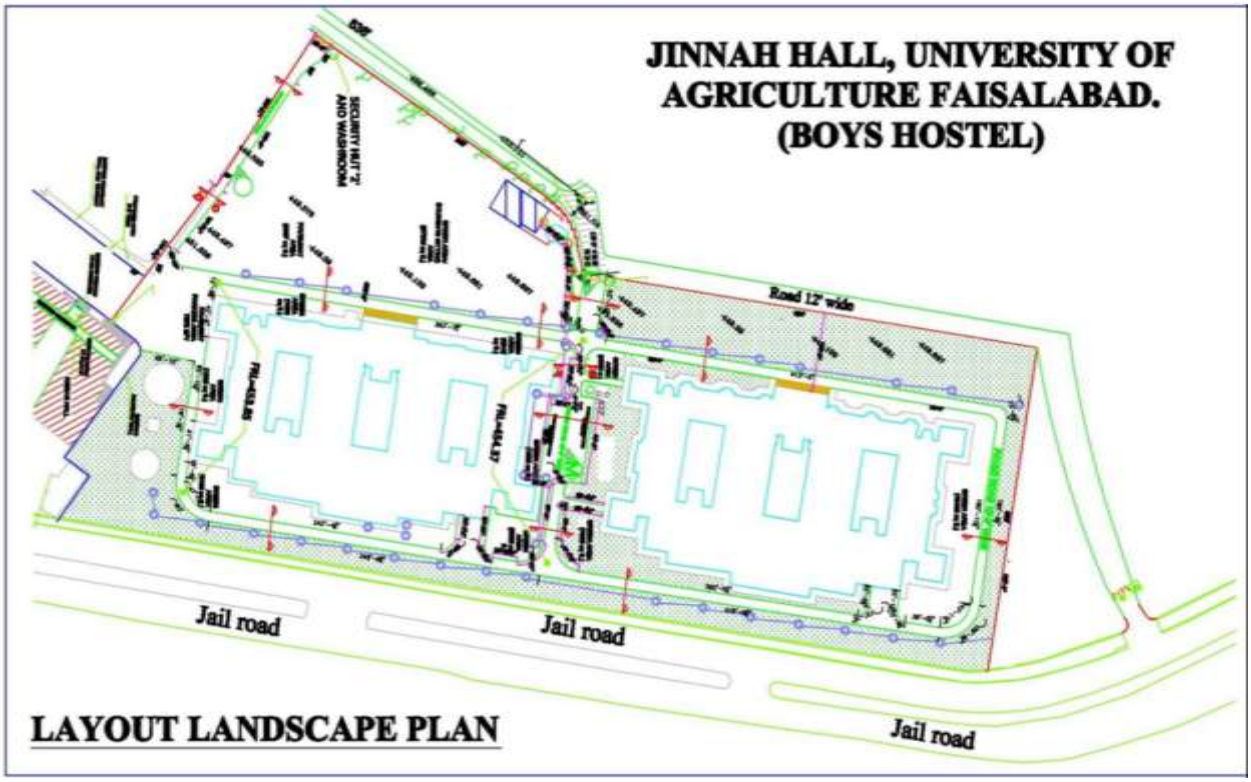
The data was conducted through interviews and questionnaire. A semi structured questionnaire was developed and administrated to the respondents. The data were collected between 1st and 23 rd March 2022. the content of the questionnaire includes information about the demographic characteristics of the respondents, Perception of students about importance of landscape, Perception based on Student choices (Elements in the surrounding landscape and their plant choices) and benefits they acquired to different treatment.

Qualitative data

In addition to the 200 samples for quantitative analysis, another sample were randomly selected for qualitative data collection. The aim was to validate the quantitative findings and to aid generalization of the study findings. Five students each from block A and B making a total of 10 students were used for the qualitative analysis.

Reliability of the research instrument

Before collecting the actual data, the instrument (questionnaire) was pre-tested on 26 respondents to check any necessary corrections for the final research instrument items. To further validate the reliability of the measurement, instrument a reliability test was conducted with the help of the Statistical Package for Social Sciences by using a computer (Taber, 2018) and Cronbach alpha of 0. 73 was obtained.



Map of the study Area

Design of the study area using AutoCAD

Plate 1:Front view on Real-time

Plate 2: Back side view

Data analysis

The collected data was coded, decoded and arranged statistically for analysis. Data after tabulated was analyzed through SPSS (Statistical Package for Social Sciences, data analysis toll) Descriptive statistics and Chi square test was used for the analysis. The Chi square test was used for non-parametric population and nominal variables. The data was analyzed at 5% significance level (Steel et al., 1997). For the quantitative responses, the respondents' views were reported in its original form.

The Chi-square formula is calculated as $\chi^2 = \sum \left(\frac{O-E}{E}\right)^2$

Where: χ^2 = chi-square,
O= Observed Frequency
E= Expected Frequency

RESULT AND DISCUSSIONS

Demographic Characteristics of the Respondents

The participants in this study had different backgrounds in terms of age, and back ground. From the analysis, respondents who are between 16–18 years are 26 representing 13%, followed by 19–21 years who are 97 representing 48.5% of the respondents, those within the age group of 21- 23 are 65 representing 32.5%. lastly those above 24 years are only 12 representing 6% of the participants. The majority of participants were between 19 and 21 years old (Table 1). This question examines how respondents' long-term residential backgrounds influence their perceptions. The results in Table 1 further showed that a notable 37% of respondents have primarily resided in urban areas, in contrast, only 6.0% are from suburban areas. Moreover, , 11% have predominantly lived in peri-urban areas, offering insights from environments blending urban and rural characteristics. The largest cohort, comprising 46 % of respondents, originates from rural areas.

Respondents from urban areas are likely to prioritize modern, well-maintained landscapes featuring amenities aligned with their urban lifestyle expectations. These may include well-paved pathways, seating areas, and decorative plantings. Suburban respondents may value landscapes that strike a balance between urban conveniences and natural elements, seeking a harmonious landscape design. Those from peri-urban backgrounds, familiar with both urban and rural settings, may prefer versatile landscapes that combine aesthetic appeal with practical spaces for various activities. Respondents hailing from rural areas may have distinct preferences, favoring more naturalistic landscapes that resonate with their rural surroundings. They may appreciate green spaces that offer tranquility and a deep connection to nature (Ojobo et al., 2024).

Table 1: Demographic characteristics (n=200)

Participant	Frequency	Percentage
Age		
16-18	26	13.0
19-21	97	48.5
21-23	65	32.5
24 and Above	12	06.0
Students residency		
Urban Areas	74	37.0
Sub-Urban	12	6.0
Peri-Urban	22	11.0
Rural	92	46.0

Source: Author's computation

Students Perception about plant they prefer the most

This question examines the types of plants that students prefer on campus, providing insights into their appreciation for various plant categories. Understanding these preferences can inform the selection of plants for landscaping in educational settings, enhancing the aesthetic and psychological benefits of green spaces.

Table 2: Respondents Preference about plant

Plant Types	Frequency	Percentage	Cumulative Frequency
Flowering Plants	119	59.5	59.5
Fruit Plants	65	32.5	92
Cacti and Succulents	1	0.5	82.5
Indoor Plants	15	7.5	100
Total	200	100	

The result showed that more than half of the respondents (119) representing 59.5% preferred flowering plants. This indicates a strong attraction to plants that offer visual and sensory appeal by their blooms. 32.5% of students favored fruit plants, reflecting a significant interest in plants that provide edible benefits alongside their aesthetic value. Only 0.5% of the respondent showed a preference to cacti and succulents, suggesting limited interest in these low-maintenance, drought-resistant plants. 7.5% of students preferred indoor plants, indicating some appreciation for plants that can thrive indoors and enhance interior spaces. The strong preference for flowering plants underscores their visual appeal and the sensory benefits they provide through their colorful and often fragrant blooms. This finding is similar to that of Moya et al., (2019) who reported that students prefer flowering plants due to their color attractiveness.

Color and Age Cross Tabulation

This question examines the preferences of students for various flower colors. Understanding the preferences for flower colors among students can significantly enhance landscape and garden planning in educational institutions. The result of cross tabulation between age and plant color preference shows that out of the 59 respondents representing 29.5% that are within the age bracket of 16-18, majority of them (33) have preference for red color plant. Similarly,

students within the age bracket of 19 to 20 also shows most preference to red plant. The overall result also demonstrated that 44% representing 88 respondents preferred red color plant to any other. This is closely followed by white with 28.5%, yellow and purple color represent 14 and 13.5% respectively. Students' likeness of red and yellow flower is probably due to the believe that Red is often associated with energy, passion, and excitement, making it a popular choice for visually engaging landscapes. And white flowers for calm areas for spaces intended for relaxation and quiet reflection, white flowers can be used to create a serene and elegant atmosphere. White flowers are often associated with tranquility, peace, and elegance.

Table 3: Cross Tabulation between Age and plant color preference.

Color	16-18	19-20	21-23	24 and above	Total
Red	33	40	11	4	88
white	13	26	12	6	57
yellow	7	10	5	6	28
purple	6	15	3	3	27
Total	59	91	31	19	200

Source: Authors's computation

Chi-square test of Association between Age and plant color Preference

To test whether color preference is associated with the age of the respondents, a Chi-square test was conducted. Based on the hypothesis that color preference depends on the age of the student. The result shows a Pearson Chi-square value of 13.373 with 9 degrees of freedom. This value is lower than the tabulated value 14.68 at 5% significance level. Hence null hypothesis is rejected. This result can be interpreted to mean that students color preference is independent with their ages.

Table 4: Chi-square test of Association between Age and plant color Preference

	Value	DF	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.327[a]	9	.148[NS]
Likelihood Ratio	12.696	9	.177
Linear-by-Linear Association	4.932	1	.026
N of Valid Cases	200		

Source: Author's computation

Preference for the 'landscape patterns' of the Hall

This question examines students' preferences for various types of gardens on campus, shedding light on their appreciation for different garden styles and how these preferences might inform landscape planning and development in educational settings. The result in Table 4, showed that nearly half of the students, 49.5%, expressed a preference for fruit gardens. This suggests a strong inclination towards gardens that provide edible produce and possibly an interest in sustainable and productive landscapes. A close 47% favored ornamental gardens, indicating a high appreciation for aesthetically pleasing spaces that enhance the visual appeal of the campus. Only 4.0% preferred vegetable gardens, showing a comparatively lower interest in gardens focused on growing vegetables (Table 4).

The preference for fruit gardens by nearly half of the students underscores a significant interest in gardens that provide edible produce. This could reflect a broader trend towards sustainability and self-sufficiency. Community gardens, especially those that produce food, contribute positively to community well-being and sustainability, suggesting that fruit gardens on campus might offer similar benefits (Turner et al., 2022). The high preference for ornamental gardens indicates that students place significant value on visually appealing green spaces that contribute to the beauty of the campus. Kaplan and Kaplan (1989) in "The Experience of Nature: A Psychological Perspective" emphasized the importance of visually pleasing natural environments in enhancing satisfaction and well-being. The relatively low preference for vegetable gardens suggests that while functional, these gardens might not be as attractive to the general student population. Vegetable gardens in urban settings often require higher levels of community engagement and interest, which might not be as prevalent in a campus setting compared to other garden types.

Table 4: Distribution of Respondents based on the Preference for the 'landscape patterns' of the Hall

Garden type	Frequency	Percentage	Cumulative Freq
Fruit Garden	99	49.5	49.5
Ornamental Garden	94	47	96.5
Vegetable Garden	7	3.5	100
Total	200	100.0	

Students Satisfaction about hostel landscape

This question examines the perceptions of students regarding their satisfaction with the landscape around their hostels. The result in Table 5, showed that some 19.4% of the respondents report a low level of satisfaction, 30.8% were moderately satisfied. However, 33.8% of the respondents expressed their satisfaction while 15.9% reported that they are highly satisfied. This indicates that about 50.2% of the respondents feels that the current landscape does not meet their expectations or needs. This suggests that a substantial portion of students find the landscape somewhat

acceptable but believe there is room for improvement. Enhancing green spaces, adding aesthetic features, or improving the maintenance of existing landscapes could address the concerns of these students and boost their satisfaction (Speake et al., 2013).

Table 5: Students Level of Satisfaction about current hostel landscaping exercise

Satisfaction level	Frequency	Percentage
Not satisfied	39	19.4
Moderately satisfied	62	30.8
Satisfied	68	33.8
Highly satisfied	32	15.9
Total	200	100

Source: Authors computation

Perception of students about therapeutic Effect of Horticulture to improve mental health.

Horticulture therapy involves engaging individuals in gardening and plant-based activities to improve their well-being. Analyzing students' engagement in HT can provide insights into its acceptance, benefits, and potential areas for development in educational and therapeutic settings. The results in Table 6 showed that slightly more-than half of the students, 56 %, have engaged in horticulture therapy. 44% of students have not practiced horticulture therapy. This result indicated that about half of the students do not practice horticultural therapy. However qualitative data were gathered to understand the reason for not engaging in horticultural therapy. The finding from the qualitative data showed that:

I am not aware of any therapeutic effect of horticulture. Another respondent exclaimed that “are you sure horticulture has any impact on mental health?” Another respondent also claimed that he is not aware of the usefulness of horticulture towards improving mental health. From this Analysis we can understand that it is essential to create awareness among students about the significance of horticulture in enhancing mental health.

Table 6: Perception of students about therapeutic Effect of Horticulture to improve mental health

Responses	Frequency	Percentage
Yes	112	56.0
No	88	44.0
Total	201	100.0

Source: Author’s computation

Views of JInnah Hall After Landscaping

Plate 1: Canteen and Parking of Jinnah Hall After Landscape.

Plate 2: Front and view of A-Block Jinnah Hall After Landscape.

Qualitative Responses

Question: Are **there any outdoor amenities or facilities you would like to see added to the hostel's landscape?**

General response

The respondents' opinion showed that the students interviewed indicated their interest on ornamental plants. On student responded that "You see ornamental plant are critical in beautifying the campus". I also want the management to intensify plantation of Fruits plants and flowering plants are also very important. They relieved tension and depression. Another respondent says "I personally like ornamental plant and I can assure you this is the opinion of vast majority of us". For me water I preferred water features the most. I like them because of their r calming effects and ability to enhance the natural ambiance of an environment. The university management should give more emphasis on the additional walking paths. They are inadequate there are multiple places that doesn't have and you know when it rains moving on sand is not comfortable and our shoes normally get dirty and uncomfortable. The preference for footpaths highlights the importance of designing pedestrian-friendly environments that facilitate easy and safe movement. This could include wide, well-maintained pathways, clearly marked routes, and integration with green spaces.

Conclusions

Green spaces have great value in creating a positive community atmosphere. Several benefits were derived from green spaces, including environmental amelioration neighborhood satisfaction, economic impact such as improved residential property values and values to recreation, physical and mental health. The research study was aimed to investigate student's perception of outdoor learning space in a sustainable academic environment, the study further examines the adequacy and provision of physical infrastructural facilities on-campus outdoor space sustainability. The study was done at Jinnah Hall University of Agriculture Faisalabad. A total of 200 respondents were interviewed for research purposes. Stratification of the respondents was done based on age. The findings showed that large portion of the students were within the age bracket of 20-21 years, with 46.3% belong to rural areas. The results showed that about 60% of respondents prefer flowering plant. In terms of color most of the respondents had preference for red and white color flower. The result of the Chi-square test showcased that student preference to color is independent to their ages. In relation to satisfaction about half of the respondents were satisfied with the current hall landscaping. Similarly, majority 56% of the students are aware of the therapeutic Effect of Horticulture to improve mental health. At the end it can be concluded that respondents reveal a strong positive perception among students towards the outdoor green spaces on campus, highlighting their significant role in enhancing physical and mental well-being. Most respondents actively engage with these green spaces, and expressing a general satisfaction with their conditions. In conclusion the finding advocate for continued investment in and attention to campus green spaces to foster a more supportive and health-promoting environment for students.

Future research direction

This study is restricted to only one hall (Jannah Hall) of the university. Future study should focus on the entire university environment. And it should also consider female hostel. This will give room for generalization and caparison of the result. Similarly, it is also important for the future study to extend the study to the foreign students hostel so as to see the impact of diversity on the attitude of students towards landscaping in the university.

Declarations

Funding: This study didn't receive any funding from any agencies in the public, commercial, or non-profit sector.

Conflicts of Interest: Authors have no conflicts of interest.

Data Availability: Data will be available from the corresponding author upon request.

Ethics Statement: This work involved human data. The work was approved by University of Agriculture, Faisalabad, Pakistan.

Authors' Contribution: Mirza Abdul Saboor; Data Curation, Methodology, Wiring Original draft, Adnan Younis: Conceptualization, Supervision, Editing, Irfan Yaseen: Formal Data Analysis, Ahmed Faiz Akbar; Writing, Review and Editing, Muzamil Ijaz: Data Analysis and Data Collection, writing, Faisal Rafi: Writing, Review and Editing, Faisal Rafiq: Writing, Review and Editing, Abida Parveen: Writing, Review and Editing, Hafiz Muhammad Kashif: Writing, Review and Editing

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