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The role of Sustainable Landscape in Enhancing the Mental Health Among Students: A comparative Study between The University of Baghdad and the University of Technology

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ABSTRACT

This research aims to examine how the landscape affects university students' psychological health, focusing on the University of Technology (UoT) and the University of Baghdad (UoB). A field survey of the green cover area of both sites, along with statistical analyses of the questionnaire administered to 400 students at each university in the fall semester for the academic year 2024-2025 to study the impact of green cover on psychological and mental health. The study found significant differences in campus time use and landscape engagement between UoB and UoT students. UoB shows that most students (82.75%) spend 4-6 hours daily, and 17.25% spend 6-10 hours on campus, whereas UoT shows a lower percentage of students (59.75%) who spend 4-6 hours daily and a higher percentage (32.75%) who spend 6-10 hours. UoB recorded 64.25% of students visiting the landscape 2-4 times weekly, whereas UoT recorded 81.5% of students visiting 2-4 times weekly. The results showed that exposure to green spaces improved mood in 93.3% of UoB students and 100% of UoT students. The average landscape evaluation scores at UoB and UoT were 4.42±0.78 and 4.70±0.61, respectively. Additionally, in UoT's landscape evaluation, 89.9% of students thought that green cover sustainability needed improvement. The results showed that UoB (87.3%) and UoT (98.5%) had a much better rate of reduction of stress, and the average psychological health scores at UoB and UoT were 4.55 ± 0.65 and 4.75 ± 0.49, respectively, indicating a stronger favorable influence at UoT. The study emphasizes how important it is to improve campus green spaces through more student involvement, sustainable maintenance, and thoughtful architectural changes by highlighting the need for campus-specific adjustments and maximizing green cover. The study suggests increasing accessible spaces, adding more shady areas, and incorporating student-led sustainability initiatives to improve mental health and enhance students' academic experience.

1. Introduction

The landscape of a university campuses is a vital component of open space, essential for creating an ideal environment that supports health, learning, creativity, and environmental sustainability. Amid escalating global mental health challenges among students, marked by rising stress, anxiety, and depression sustainable landscape emerge as critical therapeutic assets .These spaces, integrating natural and cultivated elements such as vegetation ,water features, and

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biodiverse habitat, are not merely aesthetic enhancement but foundational to fostering psychological resilience, academic performance and environmental stewardship (Al-Bawi, & Jasim, 2016; Gillis & Gatersleben, 2020). landscape include gardens, parks, water features , green squares, sports fields and botanical gardens, aimed at achieving environmental aesthetics (Ramadan, and Hassaan. 2018; Gifford, and Nilsson, 2020; Vargas-Hernández *et al*., 2023). By shaping eco-conscious behaviors and offering restorative environment, campuses hold unparallel potential to install lifelong sustainability practices while addressing urgent mental health needs (WHO, 2022).

A growing body of research underscores the symbiotic relationship between green cover and psychological well-being. Studies recommend that 22-40 % of green coverage optimizes thermal comfort, reduces urban heat island effects, and enhances cognitive function, with biodiverse landscape linked to stress reduction, mood improvement, and social cohesion (Zaki *et al.* 2020; Pathak & Jha, 2023). Biophilic design principles further amplify these benefits, as exposure to natural light ,vertical greenery, and sensory-rich plantings lower cortisol level, sharpen focus, and foster emotional stability (Gillis, & Gatersleben, 2020; She *et al*., 2025).Despite this evidence, disparities persist in translating frameworks into campus-specific interventions. Fragmented governance, resource constrains, and a lack of tailored strategies often hinder the integration of green spaces into academic settings, particularly in regions undergoing rapid urbanization (Zhang, *et al*., 2024; kadaverugu *et al*., 2022; Ramadan, and Hassaan. 2018).

This study addresses gaps through a comparative analysis of two Iraqi institutions: The University of Baghdad (UoB), a multidisciplinary hub with 42.5% green cover and the University of Technology (UoT), an engineering and IT focused campus with 10.7 % green cover. While UoB's expansive, diverse landscape reflect its broad academic scope , UoT's compact, resource-constrained environment highlights the challenges of balancing infrastructures demands with ecological and psychological needs. This research seeks to answer*?*.

Through mixed-methods analysis including spatial mapping, surveys, and statistical modelling – this study evaluates the interplay between green infrastructure, usage pattern, and mental health outcomes. Its finding aim to provide actionable insight for policy maker and urban planner, advocating for adaptive strategies that harmonize ecological sustainability with student wellbeing in academic environments.

Aims of the study

The study aims to explore how sustainable landscapes campus influence the psychological well-being of students at the University of Baghdad and the University of Technology. By assessing student feelings and well-being, the research looks to highlight the role of green spaces in enhancing mental health and informing future campus planning and development.

The problem of the study

Despite the established advantages of green space, there remains a gap in understanding the specific mechanisms through which these landscapes influence students' psychological health. Closing this gap is essential to creating focused treatments that use green spaces to promote the mental health of students.

Research Questions

1. How can sustainable design principles be adapted to divers' campus contexts to maximize psychological benefits?
2. How can institutions balance ecological sustainability with the creation of psychologically supportive environments?

Objectives of the Study

1. Assess perceptions: Measure student attitudes toward existing green spaces at UoB and UoT, focusing on accessibility, aesthetic, and usability.
2. Quantify Psychological Impacts: Correlate green space exposure with mental health outcomes (stress reduction, mood

enhancement, focus improvement) using validate metrics.
3. Evaluate Design Efficacy: Compare the effectiveness of UoB's expansive green cover and UoT's compact landscape in fostering psychological well-being.
4. Identify Barriers: Diagnose institutional, cultural, and environmental challenges hindering sustainable landscape implementation in both contexts.
5. Propose solutions: Develop tailored recommendations to enhance green infrastructure, prioritizing equity, ecological resilience, and student engagement.

Limitations of the Study

The study includes only two Iraqi universities, the University of Baghdad and the University of Technology, which may not apply to other regions or cultures. Seasonal variations in landscape utilization and psychological consequences may be missed. The psychological health assessment focuses on general well-being indicators, while environmental factors like noise pollution and air quality are not controlled.

Significance of the Study

There are several academic, environmental, and societal reasons why this study on how green cover affects students' mental health is important.

Contribution to Scholarly Understanding of the Advantages of Green Cover

This study provides a deeper understanding of the impact of green areas on students' mental health, highlighting stress reduction, mood enhancement, and increased focus, contributing to the growing research on urban green spaces and their psychological benefits.

Promoting the Welfare of Students

The campus green areas are crucial for students' mental health and may have an impact on their general well-being and academic achievement. (Lee and Maheswaran, 2021).

Greater Awareness of Mental Health's Impact on Society

The studies add to larger social conversations on the value of accessible green spaces in urban development by trying green to cover mental health advantages.

Methodology

A mixture of quantitative and qualitative methods was conducted to achieve the objectives of this study. The questionnaires were structured into multiple–choice questions and Likert scale items consisting of sections:

1- Time spent on campus on daily usage patterns of landscape.
2- Frequency of Landscape visits often per week.
3- Enhancement of landscape to optimize its positive effects on students' mental health
4- Psychological impact: questions exploring stress reduction, mood improvement, and social interaction.

Sampling

University of Baghdad (UoB) site the data collected from (n=400) responses to questions after from Scientific and Humanities Specializations: College of Engineering, Science, Media, Education, Political Science and Agricultural Engineering Sciences with area and considered biggest scientific institution in Iraq, and University of Technology (UoT) with covering an area of 221740 m^2 in the eastern part of Baghdad which specializes in engineering and applied sciences (n=400) respondents figure (1). A random sampling strategy (stratified random sampling with equal allocation) was used. Undergraduate program students were chosen with ages ranging from 19-25 in both sites. The survey was entirely anonymous and was not used to gather demographic or identifying information. Data collection was done during a study in the first semester of 2024-2025.

Data Collection Tools

An AutoCAD master plan was combined with a field survey to calculate the green cover area of both sites. Structured questionnaires will assess perceptions of green cover and mental

health impacts. Statistical tools and chi-square tests employed to analyse the collected data by SPSS v.26 program. The questionnaire was reviewed by experts from diverse disciplines including -Architecture, Agriculture, and psychology.

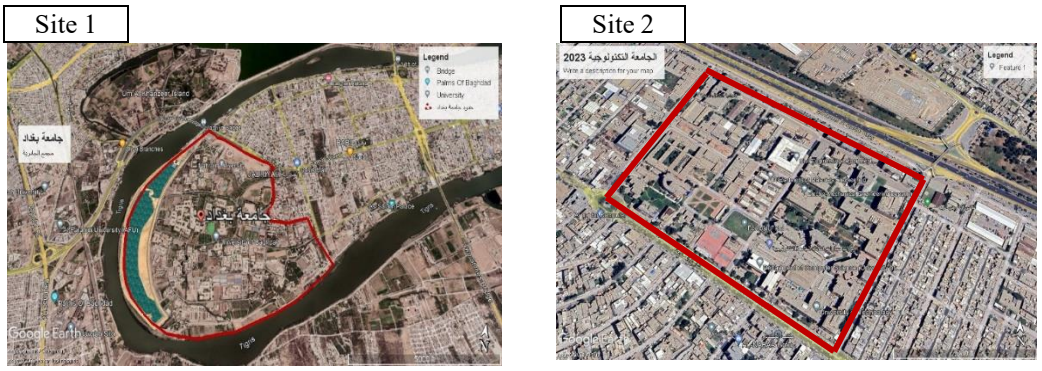

Figure 1: Aerial images of Site 1 (UOB) and Site 2 (UOT) by researchers. https://earth.google.com.

Study Sites Description

Site 1: The University of Baghdad is the second largest university in the Middle East and the largest university in Iraq with a total area of 3462300m^2, which is in the Jadriyah area in the city of Baghdad in 33° 16′ 26″ N, 44° 22′ 39″E″. Includes 6167 teachers and 71840 students. The green cover of UoB is around 1470600 m^2 42.5 % of the total Aara. The green cover consists of 5717 plants of trees, shrubs, Herbaceous plants, succulents, lawns, and cacti documented by field survey in addition to synthetic elements like seating, and fountains. It is located on a peninsula surrounded by the Tigris River on three sides and was designed with a methodology that promotes the concept of renewal and modernity in modern universities. The expansion and development strategy at the university has been planned so that it can be expanded and developed without affecting its basic design or the environmental and site character of the surrounding area. The design of the university according to Campus type reflects the idea of the university city where social, cultural, and public buildings and facilities are distributed in the center of the campus as well as the provision of recreational, service, and residential facilities at the ends of the ring track of the campus (Mahdi, and Jasim 2023;Mahdi and Jasim,2024). (Table 1).

Site 2: The University of Technology is in the Al-Wihda district of Al-Karrada, Rusafa, in Baghdad, covering an area of 202,590 square meters in the eastern part of Baghdad, at a latitude of 33° 18′ 40.75″ N and a longitude of 44° 26′ 51″ E. It includes 16 scientific departments, 115 specializations, and 6 centers, with 1,761 faculty members, 1,631 graduate students, and 8,690 undergraduate students (uotechnology.edu.iq). A large portion of the campus is dominated by buildings, roads, and parking areas. Plants were distributed throughout the university campus to enhance thermal comfort and visual sustainability. The green cover area amounts to 19,33 m², which constitutes 10.7% of the total university area. The green cover is diverse, with a total of 4,986 plants of trees, shrubs, Herbaceous plants, succulents, lawns, and cacti in addition to synthetic elements like seating, entrances, and circulation systems. (Table 1) Fig (1).

Statistical Analysis

The Statistical Packages of Social Sciences-SPSS V.26 program was used to detect the effect of different factors/ group levels in study parameters in both selected sites. A T-test was used to significantly compare the meanings. The chi-square test was used to significantly compare between percentage (0.05) probability. Estimate of the correlation coefficient between variables. Estimate the validity and reliability of questionnaire topics in the sample study according to Cronbach.

Table 1. Land use distribution in the University of Baghdad (UoB) and University of Technology (UoT).

Land Use	UoB (m²)	UoB (%)	UoT (m²)	UoT (%)
Buildings	900900	26	180884	81.6
Open Space	629849	18.2	4863	2.2
Green Cover	1470600	42.5	1933	10.7
Sports Fields	327907	9.5	3792	1.7
Parking	33118	0.9	16150	7.3
Movement System / Pedestrian Pathways	86297	2.5	3000	1.4
Water Channel Area	13629	0.4	0	0
Total Area	3462300	100	221740	100

Source: Researcher By AutoCAD master plan

Table 2: Likert scale with a weighted average was used in the study.

1-1.79	Strongly Disagree	5
1.80 – 2.59	Disagree	4
2.60 -3.39	Neutral	3
3.4 – 4.19	Agree	2
4.20 – 5.00	Strongly Agree	1

Results and discussion

1-Distribution of time spent on campus

The results showed a statistically significant difference in how students in UoB and UoT distribute their time across the categories of 4-6 hours, 6-10 hours, and more than 10 hours**.** UoB shows that most students (82.75%) spend 4-6 hours daily and (17.25%) spend 6-10 hr. on campus, whereas UoT shows a less percentage than most students (59.75 %) spend 4-6 hours daily, and higher percentage (32.75%) spend 6-10 hr. indicating greater use with 7.5 % reported more than 10 hours per day on campus which was not observed at UoB (Table 3). There are significant differences between the universities, the UoT students spend more hours per day. This suggests that green spaces encourage prolonged use due to the large number of students within the small area of the university, and the fact that the university specializes in engineering and applied sciences, which requires students to be present for a longer period in the laboratories and while UOB's diverse academic disciplines, including engineering, sciences, humanities, and agriculture, likely lead to varied schedules.

Table 3: Time Students Spend on the Campus (Hours Per Day).

No.	Statements	UoB		UoT	
		Students No.	%	Students No.	%
1.	4-6 hrs.	331	82.75	239	59.75
2.	6-10 hrs.	69	17.25	131	32.75
3.	More than 10 hrs.	0	0	30	7.5
	Total	400	100	400	100
	Chi-Square: (P-value)	---	457.37** (0.0001)	---	163.85** (0.0001)

** (P<0.01)., D. F= 3-1= 2

2- Frequency of Landscape visits often per week

Table 4. It showed that UoB recorded 64.25 % of students visiting the landscape 2-4 times weekly, while this reflects frequent engagement, it may be influenced by less emphasis on green space as a leisure or relaxation area whereas UoT recorded 81.5% of students visiting 2-4 times weekly, a significantly higher percentage. This difference may be attributed to the more

compact and efficient campus design of the University of Technology, allowing students to complete their activities within a shorter duration. In contrast, the larger campus area of the University of Baghdad might require more time for navigation and access to facilities. The smaller, engineering-focused campus layout, combined with more accessible green spaces, might encourage repeated visits for relaxation, study, or community interaction**.**

Table 4. Frequency of Landscape visits per week

		UoB		UoT	
No.	Statements	Students No.	%	Students No.	%
1.	2-4times	257	64.25	326	81.5
2.	more than 5 times	121	30.25	74	18.5
3.	never visit	22	5.5	0	0
	Total	400	100	400	100
	Chi-Square: (P-value)	---	208.83** (0.0001)	---	438.16** (0.0001)
		** (P<0.01)., D. F= 3-1= 2			

3. Landscape Evaluation

University of Baghdad Site 1

Responses were collected using a five-point Likert scale (Strongly Disagree to Strongly Agree). The results showed respondents' opinions regarding the adequacy and sustainability of landscape elements on campus. In **Green Cover Sustainability: 55.8 %, Rank (5)** most respondents strongly agreed, and **30.3%** agreed and in total (**86.1%**), agreed or strongly agreed that green cover sustainability needs more care and attention. This indicates a clear perception that existing green spaces require better maintenance and management. **Climbing Plants Integration : 52 %, Rank (8)** most respondents strongly agreed, **26.8%** agreed and total **78.8%** agreed that more climbing plants should be integrated into the landscape. This reflects strong preference to improve aesthetics appeal and mental well-being, aligning with biophilic design principles. **Colored Plants: 52.8 %, Rank (6)** most respondents strongly agreed, and **32%** agreed and in total **84.8%** of respondents supported the idea of increasing colorful plant varieties in the landscape. This highlights a strong desire to enhance the visual appeal of green spaces through diverse plant species. **Tree Variety Sufficiency: 52 %, Rank (7)** most respondents strongly agreed, and **32.3%** agreed, in a total large portion of respondents **84.3%**, agreed that the quantity and variety of trees on campus are sufficient, with a small percentage expressing neutrality or disagreement. **Sustainable Seating Needs: 63.7 %, Rank (3)** most respondents strongly agreed, and **29.3%** agreed with the **significant** majority (**93%**), agreed or strongly agreed that more sustainable seating is needed to improve the comfort and usability of outdoor spaces. This result agrees with Al-Ahbabi and Al-Alwan (2024). **Accessibility Enhancements: 67.5 %, Rank (1)** most respondents strongly agreed, and **29.3%** agreed **and** a total of **96.8%,** of respondents supported the need for additional entrances to facilitate easier access to campus green areas. This indicates a strong demand for better connectivity and accessibility. **Signage Improvements: 64.5 %, Rank (1)** most respondents strongly agreed, and **30.5%** agreed and a total of **95%,** of respondents agreed that better signage is required to organize traffic and safety on campus. **Circulation Enhancements: 53.3 %, Rank (1)** most respondents strongly agreed, **40.8%** agreed and a total of **94.1%** of respondents agreed that it is better to improve wayfinding within the landscape (Table 5).

Overall, Landscape Evaluation: Strongly Agreed **57.69%,** and agreed **31.38%** account for a high level of positive responses. Only **7.50%** were neutral, with negligible disagreement. Respondents overwhelmingly recognize the value of the campus landscape but suggest improvements in key areas, such as

adding seating, signage, and accessibility features. The high agreement rates reflect a strong consensus on the importance of enhancing and maintaining landscape elements.

Table 5: Landscape Evaluation at the University of Baghdad results.

	Statement	Scale	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Mean± SD	Rank
Landscape Evaluation	Green Cover Sustainability	Freq.	3	11	42	121	223	4.38± .84	5
		%	0.8	2.8	10.5	30.3	55.8		
	Vertical Greenery	Freq.	14	27	44	107	208	4.17±1.09	8
		%	3.5	6.8	11	26.8	52		
	Colored Plants	Freq.	13	11	37	128	211	4.28±0.97	6
		%	3.3	2.8	9.3	32	52.8		
	Tree Variety Sufficiency	Freq.	20	11	32	129	208	4.24±1.05	7
		%	5	2.8	8	32.3	52		
	Sustainable Seating	Freq.	0	0	28	117	255	4.57±0.62	3
		%	0	0	7	29.3	63.7		
	Accessibility Enhancements	Freq.	0	0	13	117	270	4.64±0.54	1
		%	0	0	3.3	29.3	67.5		
	Signage Improvements	Freq.	0	0	20	122	258	4.60±0.59	2
		%	0	0	5	30.5	64.5		
	Circulation enhancement	Freq.	0	0	24	163	213	4.47±0.61	4
		%	0	0	6	40.8	53.3		
Result		Freq.	50	60	240	1004	1846		
		%	1.56	1.88	7.50	31.38	57.69	4.42±0.78	
		%	0.33	0.00	6.42	38.33	54.92		

4. Psychological Health

This section evaluated how the campus green spaces influence the psychological well-being of respondents. Results in (Table, 6), **Mood Improvement:74%, Rank (1)** of respondents strongly agreed that spending time in green spaces improves their mood, and **19.3%** agreed, indicating that an overwhelming majority of **93.3%** experience positive mood changes (Aghabozorgi *et al.,* 2024). **Feeling Energized:67.8%, Rank (5)** strongly agreed, and **22.8%** agreed, with **90.6**% total positive response feeling revitalized in green areas, underscoring nature's role in combating fatigue. These findings mirror research linking campus greenery to heightened alertness and vitality (Aghabozorgi *et al.,* 2024).. **Relaxation: 65.5%, Rank (4)** strongly agreed **28%** agreed and **93.3%** of respondents feel more relaxed in green spaces, with a combined agreement of **93.5** noted reduced stress in green spaces, emphasizing their calming effect. Biodiverse environments, particularly, enhance relaxation through sensory engagement (Sun *et al*., 2024).**Stress Reduction: 54.5%, Rank (8)** strongly agreed and **32.8%** agreed and totally that their stress, anxiety, and fatigue were reduced after spending time in green spaces as shown in studies on academic stress relief (Aghabozorgi *et al*., 2024).

Focus Improvement: 60.3%, Rank (7) strongly agreed, and **27.8 %** with total **88.1%** linked greenery to better concentration, supporting evidence that nature exposure reduces cognitive fatigue and boosts academic performance. **Connection to Nature:58.3%, Rank (6)** strongly agreed and **33.8%** agreed, **92.1**% felt a strong bond with nature on campus, vital for psychological well-being. Regular interaction with green spaces fosters this connection, aligning with mental health research by Richardson *et al*., 2023. **Physical Activity:63.5%, Rank (2)** strongly agreed and **35.3%** agreed, **98.8%** associated shaded walkways with increased activity, highlighting how tree-lined paths promote exercise through thermal comfort and walkability, this result emphazied by Lee *et al*., 2022.. **Gardening Enjoyment 3.2%, Rank (3)** strongly agreed and **34.5%** agreed 97.7% found gardening

enjoyable, citing its stress-reducing and social benefits this agreed with Soga *et al*., 2017 findings which confirm its role as a low-cost health intervention in urban planning.

O**verall, the Psychological Health:** Strongly Agreed **63.38%,** and agreed **(29.25%)** account for a high level of positive responses . Only **6.66%** were neutral, with negligible disagreement. The results agreed with (Gola, *et al*., 2023; Wang, *et al*. 2023; Reid *et al*., 2022).

Table 6: Psychological health Dimension at the University of Baghdad.

	Statement	Scale	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Mean ±SD	Rank
Psychological Health	Mood Improvement	Freq.	0	0	27	77	296	4.67 ±0.60	1
		%	0	0	6.8	19.3	74		
	Feeling Energized	Freq.	2	2	34	91	271	4.57 ±0.71	5
		%	0.5	0.5	8.5	22.8	67.8		
	Relaxation	Freq.	0	3	23	112	262	4.58 ±0.64	4
		%	0	0.8	5.8	28	65.5		
	Stress Reduction	Freq.	2	4	45	131	218	4.40 ±0.77	8
		%	0.5	1	11.3	32.8	54.5		
	Focus Improvement	Freq.	3	3	42	111	241	4.46 ±0.77	7
		%	0.8	0.8	10.5	27.8	60.3		
	Connection to Nature	Freq.	0	4	28	135	233	4.49 ±0.67	6
		%	0	1	7	33.8	58.3		
	Physical Activity	Freq.	0	0	5	141	254	4.62 ±0.51	2
		%	0	0	1.3	35.3	63.5		
	Gardening Enjoyment	Freq.	0	0	9	138	253	4.61 ±0.53	3
		%	0	0	2.3	34.5	63.2		
Sector Result		Freq.	7	16	213	936	2028	4.55 ±0.65	-
		%	0.22	0.50	6.66	29.25	63.38		

University of Technology Site 2

Landscape Evaluation: The results showed respondents' opinions regarding the adequacy and sustainability of landscape elements on campus. In **Green Cover Sustainability: 77.3 %, Rank (6)** most respondents strongly agreed, and **12.5%** agreed and in total (**89.9%**), agreed or strongly agreed that green cover sustainability needs more care and attention. This indicates a clear perception that existing green spaces require better maintenance and management. **Climbing plants Integration: 62.5 %, Rank (8)** most respondents strongly agreed, **26.8%** agreed and about **78.8%** of respondents agreed or strongly agreed that more vertical greenery should be integrated into the landscape. This suggests a preference for enhancing vertical greenery to improve aesthetics and environmental benefits. **Colored Plants: 87.3 %, Rank (3)** most respondents strongly agreed, and **10.3%** agreed and in total **97.6%** of respondents supported the idea of increasing colorful plant varieties in the landscape. This highlights a strong desire to enhance the visual appeal of green spaces through diverse plant species. **Tree Variety Sufficiency:64.3 %, Rank (8)** most respondents strongly agreed, and **18%** agreed, in total a large portion of respondents **82.3%**, agreed that the quantity and variety of trees on campus are sufficient, with a small percentage expressing neutrality and **10.3 %** disagreed, this is probably too limited landscape in the campus. **Sustainable Seating Needs: 88.5 %, Rank (2)** most respondents strongly agreed, and **10.8%** agreed with a **significant** majority **(99.3%**), agreeing or strongly agreeing that more sustainable seating is needed to improve the comfort and usability of outdoor spaces. **Accessibility Enhancements: 88 %, Rank (1)** most respondents strongly agreed, and **12%** agreed **100%** of respondents supported the need for additional entrances to facilitate easier access to campus green areas. This indicates a strong demand for better connectivity and accessibility. **Signage Improvements: 79.8 %, Rank (5)** most respondents strongly agreed, **16.8%** agreed and a total of **96.6%** of

respondents agreed that better signage is required to organize traffic and safety on campus. **Circulation Enhancements: 82.4 %, Rank (4)** Most respondents strongly agreed, **15.3%** agreed and a total of **97.7%** of respondents agreed that it is better to improve wayfinding within the landscape (Table 7). O**verall, Landscape Evaluation:** Strongly Agreed **78.43%,** and agreed **14.98%** account for a high level of positive responses. Only **3.45%** were neutral, with negligible disagreement. Respondents overwhelmingly recognize the value of the campus landscape but suggest improvements in key areas, such as adding seating, signage, and accessibility features. The high agreement rates reflect a strong consensus on the importance of enhancing and maintaining landscape elements.

Table 7: Landscape Evaluation at the University of Technology.

	Statement	Scale	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Rank
Landscape Evaluation	Green Cover Sustainability	Freq.	1	29	11	50	309	4.59 ±0.87	6
		%	0.3	7.2	2.8	12.5	77.3		
	Climbing plants integration	Freq.	5	10	32	103	250	4.46 ±0.84	7
		%	1.3	2.5	8	25.8	62.5		
	Colored Plants	Freq.	0	0	10	41	349	4.85 ±0.42	3
		%	0	0	2.5	10.3	87.3		
	Tree Variety Sufficiency	Freq.	2	43	26	72	257	4.35 ±1.03	8
		%	0.5	10.8	6.5	18	64.3		
	Sustainable Seating needs	Freq.	0	0	3	43	354	4.87 ±0.40	2
		%	0	0	0.8	10.8	88.5		
	Accessibility Enhancements	Freq.	0	0	0	48	352	4.88 ±0.33	1
		%	0	0	0	12	88		
	Signage Improvements	Freq.	0	0	14	67	319	4.76 ±0.50	5
		%	0	0	3.5	16.8	79.8		
	Circulation enhancement	Freq.	0	3	6	61	329	4.80 ±0.45	4
		%	0	0.8	1.5	15.3	82.4		
Sector Result		Freq.	8	82	99	430	2251	4.70 ±0.61	-
		%	0.00	0.08	1.71	11.58	86.63		

Table 8: Psychological Health at the University of Technology.

		Scale	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Rank
Psychological health	Mood Improvement	Freq.	0	0	0	77	323	4.81 ±0.40	5
		%	0	0	0	19.3	80.8		
	Feeling Energized	Freq.	0	0	0	56	344	4.86 ±0.35	1
		%	0	0	0	14	86		
	Relaxation	Freq.	0	0	0	72	328	4.82 ±0.39	4
		%	0	0	0	18	82		
	Stress Reduction	Freq.	0	0	6	110	284	4.70 ±0.49	6
		%	0	0	1.5	27.5	71		
	Focus Improvement	Freq.	0	0	60	22	318	4.64 ±0.73	7
		%	0	0	15	5.5	79.5		
	Connection to Nature	Freq.	0	0	62	67	271	4.52 ±0.75	8
		%	0	0	15.5	16.8	67.8		
	Physical Activity	Freq.	0	0	0	60	15	4.85 ±0.36	2
		%	0	0	0	340	85		
	Gardening Enjoyment	Freq.	0	0	8	52	340	4.83 ±0.43	3
		%	0	0	2	13	85		
Sector result		Freq.	0	0	136	516	2223	4.83 ±0.	-
		%	0	0	4.73	17.95	77.32		

5. Psychological Health: the results showed that **Mood Improvement:80.8%, Rank (5)** respondents strongly agreed that spending time in green spaces improves their mood, and **19.2%** agreed, indicating that an overwhelming 100 **%** experience positive mood changes. **Feeling Energized: 86%, Rank (1)** strongly agreed, and **14%** agreed, showing that green spaces help in feeling energized with a 100 % total positive response. **Relaxation: 82%, Rank (4)** strongly agreed and **18%** agreed indicating that 100**%** of respondents feel more relaxed in green spaces. Suggesting a significant calming effect. **Stress Reduction:71%, Rank (6)** strongly agreed and **27.5%** agreed and **98.5%** indicated that their stress, anxiety, and fatigue were reduced after spending time in green spaces. **Focus Improvement: 79.5%, Rank (7)** strongly agreed, **5.5 %** agreed, **85%** total agreement that green spaces enhance their focus with neutral **15%**. **Connection to Nature:67.8 %, Rank (6)** strongly agreed **16.8%** agreed, and a total of **84.6%** indicated a strong sense of connection to nature. **Physical Activity:85%, Rank (2)** strongly agreed and **15%** agreed that walking under tree shade makes them feel active. **Gardening Enjoyment: 85%, Rank (3)** strongly agreed and **13%** agreed that gardening activities are enjoyable. O**verall, Psychological Health:** Strongly Agreed **77.32%,** and agreed **(17.95%)** account for a high level of positive responses (Table 8). Only **4.73%** were neutral, with negligible disagreement. The results indicated that the green spaces on campus significantly enhance psychological well-being, promoting relaxation, focus, and stress relief and agreed with Kabisch, *et al.,* (2021), Berdejo-Espinola, *et al.,* (2021), Zhang, *et al.,* (2022), Xu, *et al*., (2024).

Comparative Study Between the University of Baghdad and the University of Technology

Table 9: Landscape comparison between the University of Baghdad and the University of Technology.

Aspect	U o B %	Rank	U o T %	Rank	Comparison & Explanation
Green Cover Sustainability	86.1	5	89.9	6	Both universities recognize the need for better green cover maintenance, but the University of Technology has a slightly higher agreement rate. This suggests that green cover concerns are more pressing at Baghdad.
Climbing Plants Integration	78.8	8	88.8	8	Identical agreement levels suggest that respondents from both universities support the integration of Vertical Greenery for aesthetic and environmental benefits.
Colored Plants	84.8	6	97.6	3	The University of Technology shows a significantly strong preference for increasing colorful plant varieties, due to a lack of diverse plant species on its campus.
Tree Variety Sufficiency	84.3	7	82.3	8	While both universities consider their tree variety adequate, the University of Baghdad has a slightly higher agreement rate, suggesting that tree diversity is slightly better there.
Sustainable Seating Needs	93	3	99.3	2	Both universities strongly emphasize the need for more sustainable seating, but the demand is slightly higher at the University of Technology, indicating greater concern for outdoor comfort.
Accessibility Enhancements	96.8	1	100	1	Accessibility is the highest-ranked concern for both universities. The University of Technology has a perfect 100% agreement rate, suggesting that its current accessibility infrastructure may be even more inadequate than Baghdad's.
Signage Improvements	95	2	96.6	5	Both universities strongly support improved signage, with slightly higher demand at the University of Technology, indicating potential navigation challenges.
Circulation Enhancements	94.1	4	97.7	4	The University of Technology has a higher agreement rate, suggesting that wayfinding improvements are more necessary on its campus.

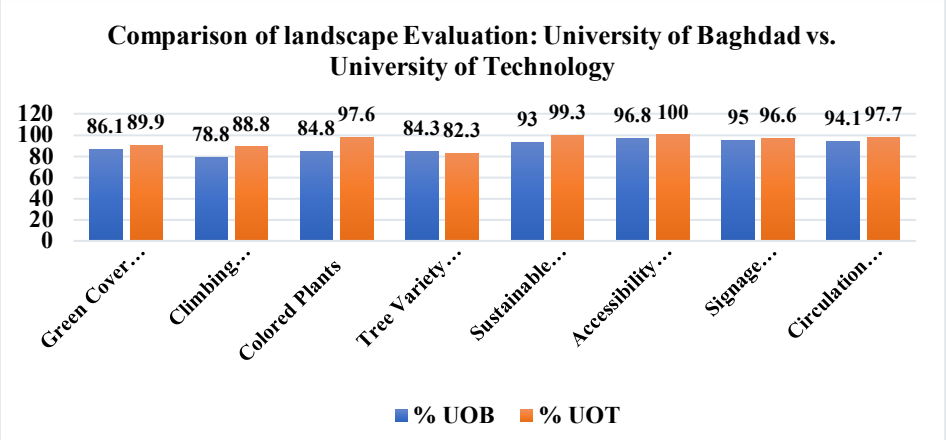

Figure 2: Graphical Comparison of landscape Evaluation: University of Baghdad vs. University of Technology.

Landscape Evaluation Comparison

Although they encounter different obstacles, both colleges place a high priority on accessibility and sustainable green cover. Due to its small, engineering-focused campus, the University of Technology urgently needs to diversify its plant life, upgrade its seating, and facilitate easier navigation in order to fill both aesthetic and comfort shortages. The University of Baghdad, on the other hand, needs to improve tree diversity and the coherence of its green infrastructure because of its multidisciplinary setting. Adapting interventions to the particular circumstances of each campus—for example, incorporating biophilic principles and student-driven design—can create academic settings that are both ecologically robust and psychologically restorative, thereby balancing sustainability and well-being. Table.9, Fig .2.

Table 10: Psychological Health Comparison between the University of Baghdad and the University of Technology.

Statement	University of Baghdad (Mean ± SD)	University of Technology (Mean ± SD)	Interpretation
Feeling better in mood	4.67 ± 0.60	4.81 ± 0.40	Higher positive impact on the University of Technology
Feeling energized	4.57 ± 0.71	4.86 ± 0.35	Stronger agreement on the University of Technology
Feeling relaxed	4.58 ± 0.64	4.82 ± 0.39	Higher impact on the University of Technology
Reduced stress and anxiety	4.40 ± 0.77	4.70 ± 0.49	Greater impact at the University of Technology
Focus Improvement	4.46±0.77	4.64 ±0.73	The higher focus at the University of Technology
Connection to nature	4.49±0.67	4.52 ±0.75	Higher connection to Nature at the University of Technology
Physical Activity	4.62±0.51	4.85 ±0.36	Higher preferences for Physical Activity at the University of Technology
Gardening enjoyment	4.61±0.53	4.83 ±0.43	Higher agreement to gardening at the University of Technology

Psychological Health Comparison: Compared to students at the University of Baghdad, students at the University of Technology (Table 10) report greater favorable psychological effects from their campus environment. The campus's small, green-integrated architecture, which promotes gardening and physical exercise, is probably the reason for the increased sense of calm, improved mood, less stress, and a closer bond with nature. The University of Technology should concentrate on preserving its healing spaces, while the University of Baghdad may enhance the integration of green spaces and academic areas, even if both

institutions acknowledge the positive effects of sustainable landscapes on mental health. These results emphasize the necessity of customized landscape solutions that promote sustainability and the well-being of students. Fig.3.

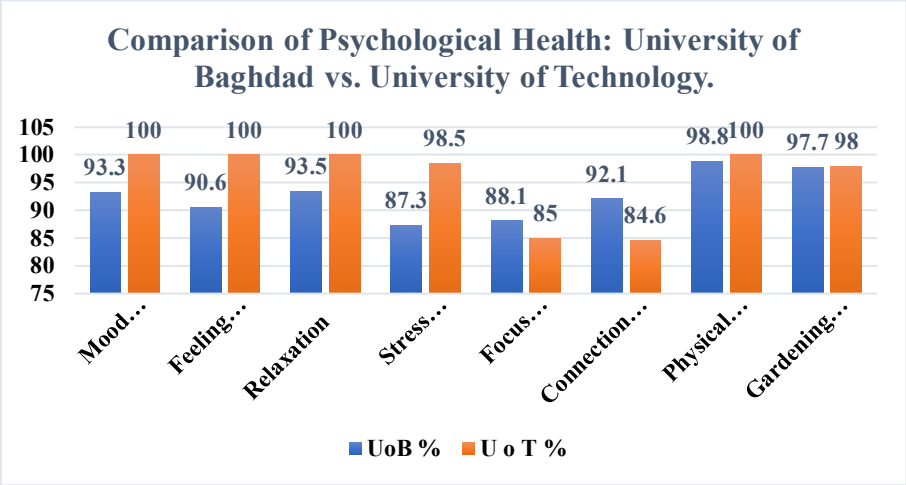

Figure 3: Graphical Comparison of Psychological Health: University of Baghdad vs. University of Technology.

Table 11: Sample of T-test between each category of the questionnaire between the University of Baghdad (UoB) and the University of Technology (UoT).

Statement	UoB Mean	UoT Mean	t-statistic	p-value
Mood Improvement NS	4.67	4.81	-1.392	0.166
Feeling Energized*	4.57	4.86	-2.807	0.006
Feeling Relaxed*	4.58	4.82	-2.169	0.032
Reduced Stress*	4.40	4.70	-2.552	0.012
Green Cover Sustainability NS	4.38	4.59	-1.615	0.109
Climbing Plants*	4.17	4.46	-2.230	0.028
Colored Plants*	4.28	4.85	-5.126	0.000
Tree Variety Sufficiency NS	4.24	4.35	-0.732	0.465
Sustainable Seating*	4.57	4.87	-3.279	0.001
Circulation Enhancements *	4.64	4.88	-2.450	0.016
Signage Needs NS	4.60	4.76	-1.619	0.108

* Significant Differences ($p < 0.05$), NS non-Significant ($p > 0.05$)

Comparative T-Test Analysis of Landscape Perception and Psychological Well-being Between University of Baghdad and University of Technology Students

The results in Table .11 showed that students at the University of Technology (UoT) generally report more favorable experiences in terms of psychological benefits (feeling energized, relaxed, reduced stress) and physical landscape features (climbing plants, colored plants, sustainable seating, and accessibility).Meanwhile, for some aspects like mood improvement, tree variety, and signage, students at both universities share similar perceptions, indicating that these areas are either well-developed or equally in need of enhancement. This analysis helps identify specific strengths and improvement areas for each university to optimize their campus landscape design in support of student mental health and well-being.

Table 13: Reliability and Validity of Questionnaire topics in samples study Cronbach's.

Questionnaire topics	Reliability	Validity
Total (32)	0.70	0.76

Conclusion

According to the research, green areas on college campuses greatly improve students' psychological health by lowering stress,

elevating mood, and encouraging relaxation. Compared to the University of Baghdad, the University of Technology demonstrated greater levels of student contentment and well-being due to its more condensed and organized green environment. Aspects such as stress reduction, entrances, and sustainable seating showed significant differences ($p < 0.05$), emphasizing the necessity of modifications unique to each school. Putting money into accessible, well-maintained green areas can help university students enhance their emotional health.

Recommendations

1. Improve Landscape Architecture: Multipurpose Areas Provide spaces that encourage both solo and group relaxation, like study lounges with flora surrounding them.
2. Improve Infrastructure and Maintenance: To improve usability and wayfinding, install better signage.
3. Improve Shaded Areas: To accommodate more students and raise the standard of green spaces, enlarge the seating areas and shaded walks.
4. Encourage Gardening Initiatives: To encourage participation and a feeling of community, plan gardening events and environmental initiatives.
5. Design for Comfort: To improve relaxation and reduce tension, include peaceful areas with natural features like water features.
6. Boost Aesthetic Appeal: To help pupils feel more connected to nature, add more flowering plants and natural components.
7. Sustainability Education: To increase student participation, include sustainability initiatives pertaining to landscapes in curricula.
8. Community Events: To improve ties within the community, use landscapes as locations for social and cultural gatherings.
9. Design Enhancements: To improve usage for educational, social, and recreational purposes, make the most of pathways, seating, and shaded places.

Suggestions for Further Studies

1- **Cross-Cultural and Regional Comparisons:** Examine how the psychological advantages of campus settings are influenced by cultural views of nature.

2- **Biophilic Design Element-Specific Studies:** Determine the effects on stress reduction and cognitive function of particular biophilic elements (e.g., vertical greenery, water features, shaded walkways).

3- **Neurobiological and Physiological Metrics:** Incorporate physiological markers (e.g., cortisol levels, heart rate variability) alongside self-reported surveys to quantify stress reduction objectively.

4- **Demographic and Socioeconomic Factors:** Analyze how the advantages of mental health differ depending on a person's gender, academic field, or socioeconomic status.

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دور المشهد الطبيعي المستدام في تعزيز الصحة النفسية للطلبة دراسة مقارنة بين جامعة بغداد والجامعة التكنولوجية

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الملخص

هدف البحث إلى دراسة دور المشهد الطبيعي في تحسين الصحة النفسية لطلبة جامعتي بغداد والتكنولوجية، باستخدام المنهج الوصفي التحليلي والمقارنة بين الجامعتين. تم جمع البيانات من خلال المسح الميداني واستبيان شمل 400 طالب من كل جامعة في خريف 2024. شمل الاستبيان أربعة محاور: مدة التواجد في الحرم الجامعي، عدد الزيارات الأسبوعية، تقييم المشهد الطبيعي، وتأثيره في الصحة النفسية. أظهرت النتائج تفوق الجامعة التكنولوجية في جميع المحاور. حيث يقضي 82.75% من طلاب جامعة بغداد 4-6 ساعات يوميًا داخل الحرم، مقارنة بـ 59.75% في الجامعة التكنولوجية، بينما يقضي 32.75% من طلاب الأخيرة 6-10 ساعات يوميًا مقابل 17.25% فقط في جامعة بغداد. كما سجلت جامعة التكنولوجيا نسبة أعلى من زيارة المشهد الطبيعي أسبوعيًا (81.5%) مقابل 56.25% في جامعة بغداد. تقييم المشهد الطبيعي كان أعلى في الجامعة التكنولوجية (4.70±0.61) مقارنة بجامعة بغداد (4.42±0.78). ووافق 89.9% من طلاب التكنولوجيا على أهمية تحسين استدامة المشهد. كما سجل محور الصحة النفسية نتيجة أعلى في الجامعة التكنولوجية (4.75±0.49) مقارنة ببغداد (4.55±0.65)، حيث أشار الطلبة إلى الشعور بالراحة وتقليل التوتر وزيادة النشاط. أوصت الدراسة بزيادة الغطاء النباتي، توفير مقاعد مناسبة، وتعزيز مشاركة الطلبة في تصميم المشهد الطبيعي لدعم الصحة النفسية وتحسين جودة البيئة الجامعية.

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