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ENHANCING QUALITY OF LIFE IN THE CAMPUS COMMUNITY: THE EFFECTIVENESS OF THE GREEN CAMPUS INITIATIVE

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Abstract

This study seeks to investigate the existing green practices implemented at UniSZA to achieve sustainability and enhance the quality of life for campus society. This study employs quantitative methodologies, specifically utilizing questionnaire survey techniques to gather empirical data. The Pearson Correlation and Cluster Analysis were utilized to determine the correlation among the questions. The result indicates that there is a positive correlation between all questions. Only some questions have weak correlations which correlated to the recognition of the significance of sustainability and the adoption of tangible measures to translate its principles into reality. The cluster analysis successfully sorted the 20 questions related to green campus and perceived quality of life into three distinct clusters: high perceived quality of life, moderate perceived quality of life, and low perceived quality of life. The findings indicated that the UniSZA society expressed a good perceived quality of life regarding their mean score. However, in terms of satisfaction with their campus society, UniSZA still lacks the green campus aspect implementation. Therefore, it is imperative to heighten awareness of the green campus aspect through the collaboration of the entire campus society, emphasizing the importance of green technology in achieving sustainable development.

Keywords*:* Cluster Analysis; Green Campus; Pearson Correlation; Sustainability; Quality of Life

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INTRODUCTION

Sustainable Campus Development in Malaysia

Promoting awareness of green technology and its societal application has the potential to enhance understanding and mitigate adverse environmental effects (Ismail et al., 2023). In the realm of strategic significance, Institutions of Higher Education play a pivotal role in augmenting awareness surrounding sustainable development. The development of campus sustainability involves integrating sustainable environmental practices into institutional processes at the higher education level. The execution of environmentally conscious initiatives in higher education, aimed at fostering sustainability achievements encompassing waste reduction, energy efficiency, diminished water utilization, the promotion of healthy working environments, and the enhancement of indoor air quality (Gomez & Yin Yin, 2019).

The issue of sustainable campus development is emerging as a pivotal concern in Malaysia. To facilitate sustainable campus development, various components necessitate consideration, taking into account the specific needs and requirements distinctive to the university in question (Nifa et al., 2016). The concept of sustainability in higher education institutions was initially broached during the Stockholm Declaration of 1972, where the central focus was on environmental protection. This declaration also introduced the concept of "environmental education" (Sadeli et al., 2002). Fostering a connection between humanity and the environment, and acknowledging their interdependence, is essential for achieving environmental sustainability (see Azinuddin et al., 2022; Azwar et al., 2023). This involves exploring approaches through which universities, including administrators, faculty, researchers, and students, can leverage their resources to tackle the challenges associated with reconciling human endeavours for economic and technological progress with the imperative of environmental conservation (Saad et al., 2023; Salleh et al., 2023; Dawodu et al., 2022; Zhu et al., 2020).

Despite the slower adoption of the green university concept in Malaysia compared to other nations, an increasing number of universities in the country are actively participating in assessments for environmentally-friendly campuses In alignment with the support provided by the Malaysian government for the advancement of green university campuses in the nation (Anthony Jnr, 2021; Nifa et al., 2016). In the challenges encountered during the establishment of green campuses in universities, researchers have identified that the primary reason for the majority of institutions not embracing green practices is a deficiency in understanding green campus paradigms among Malaysian university management, stakeholders, and practitioners. (Anthony Jnr, 2021; Zhu et al., 2020) and inadequacy of campus infrastructure (Muhiddin et al., 2023).

The UI Green Metric Ranking

The consideration of sustainability aspects has emerged as a crucial determinant, even influencing university rankings. In 2010, Universitas Indonesia, aspiring to attain world-class status, established an online "green" ranking system for global universities. This initiative aimed to provide an overview of the prevailing conditions and policies concerning green campus and sustainability across universities worldwide (Gomez & Yin Yin, 2019; Suwartha & Sari, 2013). The UI Green Metric World University Ranking evaluates the sustainability of universities across environmental, economic, and social dimensions (Muhiddin et al., 2023; Pereira Ribeiro et al., 2021). The UI Green Metric World University Ranking relies on six primary criteria derived from information provided by participating universities, showcasing their dedication to environmental sustainability (Gomez & Yin Yin, 2019; Tiyarattanachai & Hollmann, 2016). These criteria encompass environment and infrastructure, energy and climate change, waste management, water supply, transport, and education (Abakumov & Beresten, 2023). Consequently, these initiatives have the potential to yield an ameliorated quality of life (Qol) for all stakeholders, bolster economic vitality, and contribute to a diminished environmental footprint (Anthony Jnr, 2021).

Enhancing the Qol for the campus society is imperative to support the mindset of the entire academic community and stakeholders in implementing the sustainable development policy for green campuses (Bakaruddin & Idris, 2022). Therefore, this study aimed to examine the existing green initiatives implemented at UniSZA regarding the quality of life of the campus society.

RESEARCH METHODOLOGY

Study Design

This study employs a quantitative approach, utilizing primary data collection through the use of questionnaire techniques. The participants included in this study were randomly chosen from the community of UniSZA. Presently, UniSZA functions across three campuses: the primary campus located at Gong Badak as the main campus, the Medical Campus, and the Besut Campus. The university is currently focused on achieving sustainability with the motto “Green Campus, Bright Minds”. From the overall population of campus society, respondents were randomly selected to receive questionnaires via e-mail. Of those sampled, 420 campus society responded to the survey. Per the criteria established by Krejcie and Morgan (1970), the determined sample size is deemed adequate for effectively representing the population.

The survey comprised two sections. The demographic segment of the instrument comprised inquiries about the participants' educational attainment, gender, marital status, and ethnic identity. Furthermore, participants were queried about their experiences in undertaking courses related to green campuses and

participating in sustainability-focused activities. The answers were gauged through the use of multiple-choice queries. The second section of the survey, Part II, comprised 20 questions aimed at eliciting information on Green Campus aspects and gauging respondents' perceptions of quality of life. Primarily, these questions were formulated based on the six categories outlined in the UI Green Metric criteria. To guarantee accurate comprehension and interpretation of the inquiries, all questions were presented in English, accompanied by Malay translations provided beneath each question. The answers were assessed utilizing a five-point Likert scale, where the alternative items were designated from 5 (strongly agree) to 1 (strongly disagree).

Statistical Analysis

Pearson Correlation Analysis

The gathered data underwent entry into an Excel file and subsequent analysis utilizing the XLSTAT software. The demographic information of the respondents was examined and presented through the utilization of descriptive analysis. The determination of the average response level on the five-point Likert scale involved employing the arithmetic mean. The Pearson correlation analysis was then analysed to establish a connection between the questions and define the relationship between them.

The association, or correlation, between the two variables, is represented by the symbol '*r*' and expressed as a numerical value ranging from -1 to +1. A value of zero indicates no correlation, while 1 signifies a complete or perfect correlation. The sign of '*r*' indicates the direction of the correlation, with a negative '*r*' implying an inverse relationship between the variables. The magnitude of the correlation strengthens as it moves from 0 to +1 or 0 to -1 (Kamarudin et al., 2017; Akoglu, 2018).

Cluster Analysis

Cluster analysis (CA) serves as a method to amalgamate observations into groups or clusters, ensuring homogeneity or compactness concerning specific characteristics. This implies that within each group or cluster, the observations exhibit similarity to one another (Toriman et al., 2015). Each group should exhibit dissimilarity from other groups concerning the same characteristics; specifically, the observations within one group should differ from those in other groups. Hierarchical agglomerative cluster analysis was conducted on normalized datasets employing the Ward's method, utilizing single Euclidean distances as a metric for assessing similarity. Subsequently, the classification of objects can be visually represented in a dendrogram to evaluate the cohesion of the formed clusters (Novák et al., 2017). The cluster analysis serves as a complement to Peason correlation analysis.

ANALYSIS AND DISCUSSION

Socio-Demographic Conditions

The demographic details of the participants were gathered and displayed in Table 1. Respondents were drawn from diverse demographic backgrounds and characteristics, ensuring that the sampling represents the UniSZA society in a random manner.

Table 1: Profile of the respondents

Respondents Profile	**Percentage (%)**
Sex	
Male	29.286
Female	**70.714**
Age	
18-24	**46.429**
25-34	17.857
35-44	24.286
45-54	10.000
55-64	1.429
Educational Level	
Diploma / DKM 4 / DKLM 5	3.571
Postgraduate (Master's Degree /PhD)	37.857
Sijil Tinggi Pelajaran Malaysia (STPM)	0.714
Undergraduate (Bachelor's Degree)	**57.857**
Experience of taking courses related course ("green campus")	
No	**68.571**
Yes	31.429
Experience of enrolling activities focused on sustainability	
No	30.714
Yes	**69.286**

Table 1 presents the percentage distributions based on gender, indicating a higher representation of female respondents (70.71%) in comparison to male respondents (29.29%). A predominant portion of the respondents falls within the age range of 18-24 years old, accounting for 46.43%. It is noteworthy that this age range is indicative of respondents being students at UniSZA. In the realm of education, a significant proportion of the respondents (57.86%) held bachelor's degrees, signifying a relatively high level of education among the

respondents. In this study, it was discovered that despite the majority of respondents not embracing a green campus-related course (68.57%), a higher percentage of them engage in activities associated with environmental sustainability (69.29%). This suggests their keen interest in actively contributing to the success of environmental preservation efforts.

Green Campus and the Perceived QOL

A statistical analysis was conducted to assess the correlations among various facets of the green campus through the utilization of Pearson correlation coefficient (*r*) model with statistical significance set at P>0.05. This examination was executed employing statistical software, specifically XLSTAT. The correlation matrix in Table 2 Shows all green campus aspects had a significant positive relationship with all other green campus aspects. In the context of this study, we interpret a correlation coefficient surpassing 0.7 as indicative of a robust correlation between the variables (Schober & Schwarte, 2018). From the Pearson correlation, we identified there are strong positive correlation between some questions, SB2 with SB4 (*r*=0.763) and SB13 (*r*=0.720), SB6 with SB9 (*r*=0.748), SB9 with SB10 (*r*=0.821), SB11 (*r*=0.720), SB12 (*r*=0.770), SB10 with SB12 (*r*=0.726) and SB15 with SB16 (*r*=0.765).

The highest strong positive relationship is between SB9 and SB10 (*r*=0.821). The inquiries pertain to how the university's management of a green campus may contribute to the improved Qol within the community. The lack of significant difference in mean scores between question SB9 (*r*=4.48) and SB10 (*r*=4.58) as shown in Table 3, suggests a shared awareness regarding the implementation of green campus practices at the university. The results specify that the proportion of the university's adoption of environmental sustainability management is a contributing factor to the improvement of the Qol life within its community.

Table 2: Pearson's Correlation Matrix Among Green Campus Aspects in The Study Area

	SB 1	**SB 2**	**SB 3**	**SB 4**	**SB 5**	**SB 6**	**SB 7**	**SB 8**	**SB 9**	**SB 10**	**SB 11**	**SB 12**	**SB 13**	**SB 14**	**SB 15**	**SB 16**	**SB 17**	**SB 18**	**SB 19**	**SB 20**
SB 1	1																			
SB 2	0.2	74	1																	
SB 3	0.5	61	0.3	26	1															
SB 4	0.2	58	0.7	63	0.2	45	1													
SB 5	0.5	43	0.2	87	0.5	14	0.2	91	1											
SB 6	0.4	31	0.4	23	0.4	16	0.4	16	0.4	65	1									
SB 7	0.4	95	0.2	23	0.3	95	0.1	63	0.6	22	0.4	06	1							
SB 8	0.4	35	0.2	96	0.3	67	0.2	88	0.6	23	0.4	21	0.6	89	1					
SB 9	0.4	07	0.3	76	0.4	25	0.3	50	0.4	74	0.7	48	0.4	51	0.5	92	1			
SB 10	0.4	66	0.3	10	0.4	69	0.3	43	0.4	76	0.6	21	0.4	65	0.5	71	0.8	21	1	

Continued…

SB	0.3	0.4	0.4	0.3	0.5	0.6	0.3	0.3	0.7	0.6																					
11	60	20	67	83	25	11	53	98	20	57	1																				
SB	0.3	0.3	0.4	0.3	0.5	0.6	0.3	0.4	0.7	0.7	0.6																				
12	81	62	48	57	39	58	67	27	70	26	99	1																			
SB	0.1	0.7	0.2	0.6	0.2	0.3	0.1	0.2	0.3	0.3	0.4	0.4																			
13	99	20	90	87	59	89	16	25	26	72	86	17	1																		
SB	0.4	0.2	0.6	0.2	0.5	0.3	0.3	0.3	0.3	0.3	0.5	0.3	0.2																		
14	04	92	09	73	12	26	33	79	32	72	04	89	98	1																	
SB	0.5	0.3	0.6	0.3	0.5	0.5	0.3	0.4	0.5	0.5	0.6	0.5	0.3	0.5																	
15	15	21	23	64	60	17	53	53	69	54	35	04	19	61	1																
SB	0.5	0.2	0.6	0.2	0.5	0.4	0.4	0.5	0.5	0.4	0.5	0.5	0.2	0.5	0.7																
16	12	23	11	71	72	17	50	13	65	95	86	14	42	91	65	1															
SB	0.2	0.5	0.3	0.5	0.4	0.4	0.1	0.3	0.4	0.4	0.5	0.4	0.6	0.3	0.4	0.4															
17	65	41	95	46	06	88	83	61	84	33	06	85	66	74	82	38	1														
SB	0.2	0.4	0.3	0.4	0.3	0.4	0.2	0.3	0.4	0.4	0.4	0.4	0.5	0.2	0.4	0.3	0.6														
18	84	78	31	36	78	54	38	22	07	51	24	82	71	95	04	41	02	1													
SB	0.1	0.5	0.2	0.4	0.2	0.3	0.1	0.2	0.3	0.4	0.4	0.4	0.5	0.3	0.3	0.2	0.5	0.6													
19	65	43	81	79	95	55	64	72	96	66	35	61	63	29	52	88	25	49	1												
SB	0.2	0.4	0.3	0.4	0.2	0.3	0.1	0.2	0.3	0.3	0.4	0.3	0.5	0.2	0.3	0.2	0.5	0.5	0.6												
20	23	47	05	01	48	70	41	04	46	64	00	53	52	94	45	44	62	77	67	1											

Table 3: Comparison of mean score regarding to perceived Qol

Item	Question	Mean Score	SD
SB1	Environmental management is important for the university's campus	4.864	0.482
SB2	You are satisfied with the environmental management of your university	3.643	0.987
SB3	The university's available green campus region is important for you	4.543	0.670
SB4	Your university provides enough green space to support a high quality of life/	3.657	1.007
SB5	Energy saving is a very important practice for your university	4.550	0.670
SB6	The university's energy saving practices do support a high quality of life	4.436	0.768
SB7	Climate change mitigation programs (greenhouse gas emission reduction) are very important practices for your university	4.393	0.735
SB8	Waste management (for example, waste separation, waste reduction) is very important for your university	4.593	0.727
SB9	The university's waste management (for example, waste separation and waste reduction) does support a high quality of life	4.479	0.771
SB10	University's water management (water sources saving) does support a high quality of life	4.557	0.721
SB11	The university's transportation conditions (such as the amount of traffic and availability of public transportation) do support a high quality of life	4.264	0.868
SB12	The university's environmental education (academic courses and activities related to environmental issues) does support a high quality of life	4.414	0.775
SB13	You are satisfied with the overall quality of your life on campus	3.707	0.931
SB14	If you are a university applicant, "green campus" status would be one of your selection criteria	4.236	0.790
SB15	University's Green Campus does support a high quality of life on campus	4.457	0.741
SB16	The participation in any sustainability-focused programmes or activities on campus will be give many benefits of having a progressive green university campus both for students and for the broader community	4.500	0.682
SB17	Livable communities: University Sultan Zainal Abidin (UNISZA) community is good and secure has affordable and proper acommodations and transportation choices and offers a steady community features and services	4.043	0.886
SB18	Indoor Air Quality (IAQ): The quality of Indoor air within University Sultan Zainal Abidin (UNISZA) is healthy and comfortable for students and staff	4.057	0.894

Continued…			
SB19	Water conservation: There is adequate preservation, control, and development of water resources at University Sultan Zainal Abidin (UNISZA) such as surface water and groundwater	3.836	0.892
SB20	Energy efficiency: University Sultan Zainal Abidin (UNISZA) uses optimum energy to perform the same task. For example, use of a compact fluorescent bulb than a traditional incandescent bulb, located windows that aid ventilation	3.871	0.902

This study supported by Bakaruddin & Idris (2022) and Tiyarattanachai & Hollmann (2016), where the findings suggest that incorporating sustainable green campus management contributes to improving the quality of life within the community. The highest mean score by question 1 (4.86), verify that environmental management is important for the university's campus and exhibited a slightly more favourable perception of quality of life. The outcome aligns with the findings of the study by Tamiami et al. (2018). SB9 has highest correlation with SB10, SB11 and SB12 signifying an interconnection between these questions. The questions related to the university's management of green technology imply a positive influence on improving the quality of life within the campus society. The mean score of these questions ranging from 4.41 to 4.56 signifying the campus society expressed greater satisfaction with the aspects of sustainability management on their campus and reported a higher perceived quality of life.

The correlation analysis revealed the absence of negative correlations among the questions. Nevertheless, a few questions exhibit a weak correlation among them. The relationship of SB1 with SB 19 (0.165), SB4 with SB7 (0.163) and SB7 with SB13 (0.116), SB17 (0.183), SB19 (0.164) and SB20 (0.141) had weak correlation which indicates campus society express satisfaction with the institution's environmental management, yet there is a lack of understanding regarding the university's environmental sustainability program. This is supported by numerous scholarly investigations where the campus society perceive sustainability as crucial, yet they do not perceive themselves as sufficiently acquainted with its conceptual framework. This discernible discrepancy suggests a gap between the acknowledgment of the importance of sustainability and the implementation of concrete measures to actualize its principles (Choi et al., 2017; Pereira Ribeiro et al., 2021).

Classification of Green Campus and Perceive Quality of Life

The hierarchical representation of the green campus dendrogram, correlating with the perceived quality of life, as illustrated in Figure 1, has been categorized into three distinct clusters denoted as High Perceived Quality of Life (HPQol),

Moderate Perceived Quality of Life (MPQol), and Low Perceived Quality of Life (LPQol).

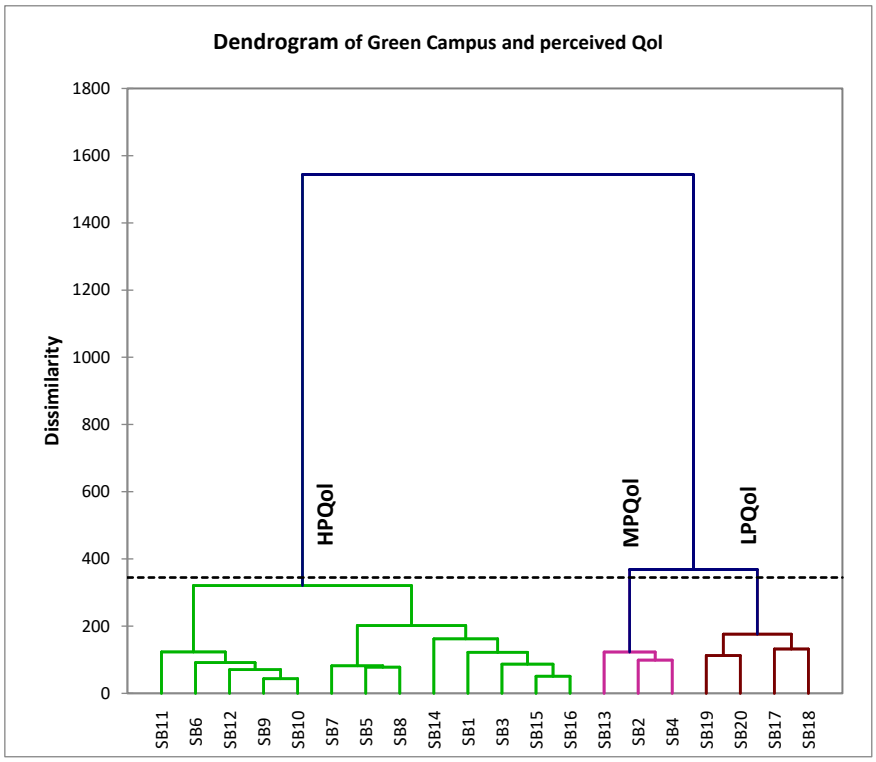

Figure 1: Dendrogram of Green Campus and perceived Qol

The HPQol was found for 13 questions (SB1, SB3, SB5, SB6, SB7, SB8, SB9, SB10, SB11, and SB12). This cluster has the highest mean score among the other cluster which indicate a good perceived quality of life among UniSZA society. The questions are about the management of UniSZA practising a good green campus practice. Many studies reported that a campus designed with green initiatives has the potential to offer comfort to its inhabitants, fostering an improved perception of their quality of life (Bakaruddin & Idris, 2022; Tamiami et al., 2018). In line with the study by Tiyarattanachai & Hollmann (2016) stated that green campus practice exhibited a markedly superior perceived quality of life.

The second cluster (MPQol) characterized by a mean score ranging from 3.83 to 4.04, with four questions (SB17, SB18, SB19, SB20) reflect the extent of UniSZA society's awareness regarding the implementation of green campus practices at the university. Their awareness level concerning UniSZA

practices is notably commendable. To augment the awareness of campus society regarding the incorporation of green campus practices in the university, certain studies propose disseminating information to all individuals through the integration of a green curriculum (Muhiddin et al., 2023). A preceding investigation revealed that students who had previously enrolled in courses pertaining to sustainability or actively participated in sustainable student activities exhibited a higher level of knowledge regarding green campus strategies and initiatives (Choi et al., 2017).

The designation of the lowest mean score for green campus and perceived Quality of Life as LPQol (SB2, SB4 and SB13) signifies the contentment of the UniSZA society with the implementation of green campus practices at UniSZA. The mean score within the moderate range (3.64 to 3.71) signifies that the UniSZA society expressed a less-than-fulfilled sentiment regarding the green campus practices. According to Tamiami et al. (2018), the concept of quality of life pertains to present contentment. They observe that a Green University not only enhances comfort but also has the potential to significantly improve the quality of life for its society. This study posits the necessity to enhance green campus practices in order to uplift the quality of life within the respective society. These three types of classes (HPQol, MPQol and LPQol) were utilized as reference points for grouping the similarities in variation among 20 questions can be condensed to just three questions for future research. Streamlining and reducing the number of questions related to the green aspect and perceived quality of life will yield efficient outcomes, saving both costs and time.

CONCLUSION

The current investigation has tackled the green campus initiative strives for Qol among UniSZA society is at a level deemed satisfactory. It is noteworthy that the implementation of the green campus aspect at UniSZA remains at a moderate level. In the UI GreenMetric Ranking 2023, UniSZA is positioned at number 245, attaining a total score of 7550 for the comprehensive assessment of established aspects. Hence, UniSZA ought to endorse and strive to incorporate the criteria outlined in the UI GreenMetric World University Ranking for their campuses which requires support from all stakeholders within the university.

This study suggest that the university campus should adopt a resilient green design strategy with the intention of enhancing the quality of life for campus society and fostering an elevated sense of comfort among them. This can be achieved though the optimal collaboration amongst different stakeholders within the realm of university. Such collaboration is important since any university relies on the interdependency of actors within the university system as they need to work together in producing a cohesive output in terms sustainability

derived from the green campus initiative (see Azinuddin et al., 2023). A university integrating a green design concept is poised to enhance the quality of life. A Green University provides heightened comfort and can significantly improve the overall well-being of its community.

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