The Relationship Between Student Use of Campus Green Spaces and Perceptions of Quality of Life

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SUMMARY. Researchers have found that students' perception of their overall academic experience and the campus environment is related to academic accomplishment. Additionally, studies have found that the designed environment of the university can influence the degree of stress students may feel. The main objective of this study was to investigate the relationship between undergraduate university student use of campus green spaces and their perceptions of quality of life at a university in Texas. A total of 2334 students or 10% of the undergraduate student body received e-mails with information regarding the incentive for participation and instructions on accessing an online survey. The survey included questions that related to student use of campus green spaces, overall quality of life statements, an instrument to measure the quality of life of university students, and demographic questions. A total of 373 surveys was collected and analyzed to compare levels of quality of life of university students and the level of usage of campus green spaces. Demographic information collected allowed controlling for student grade classification, gender, and ethnicity. Frequency statistics determined that, on average, more than half the students were ranked as "high-users" of the campus green spaces, and very few students were considered "low-users." Frequency statistics also determined that most students rated their overall quality of life and quality of life of university students positively. Additionally, this study found that undergraduate student use of campus green spaces and perceptions of quality of life were related to each other.

Researchers have found that student perceptions of their academic experience are related to their academic accomplishment. Keys and Fernandes (1993) found that student interest in schoolwork, liking for teachers, internal value of school, as well as several other factors positively contributed to learning. Furthermore, Hendershott et al. (1991) argued that factors other than education contributed to student life, and that student happiness must be considered in relation to many other environmental factors.

There is a small but interesting set of studies investigating the relationship between physical environments and various aspects of quality of life. Kaplan and Kaplan (1989) reported that individuals who had access to natural settings were happier

with their home, job, and life in general. Such positive results have been found with views of vegetation, water, or nearby mountains (Heerwagen, 1990; Moore, 1981; Ulrich, 1981; White and Heerwagen, 1998).

People can interact with plants and nature actively or passively. Lewis (1994) explained that both types of interactions with natural areas had positive mental and physical effects on individuals. Individuals engaged in active interactions were directly involved with growing plants (Lewis, 1992). Research has shown that active interactions with nature have been related to improved psychological and physiological health, including increased self-esteem and reduced stress levels (Cammack et al., 2002; Kaplan, 1973; Lewis, 1978; Waliczek et al., 2005). Alternatively, passive interactions have included those that are visual and more observational

in character. The mere presence of plants has been found to improve life satisfaction environmentally, economically, socially, culturally, and physically (Zampini, 1994).

Some theorists have argued that universities should be designed to facilitate a certain quality of life (Caws, 1970). Griffith (1994) suggested that university priorities should include creating an attractive campus. Furthermore, she stated, "Attractively landscaped formal open spaces or habitats left in their natural form, as woods and gorges, help establish a venerable campus identity, stir alumni sentimentalism, create a strong sense of community, and curb escalating campus densities" (p. 648). Additionally, Boyer (1987) found that the appearance of the campus was the most significant factor for students in deciding which university to attend. Im (1984) found that vegetation coverage was one of three important predictors for visual preference of a familiar campus area for undergraduates and graduate students. Ulrich (1979, 1981) found that students felt more positive in stressed situations (i.e., test-taking situations) when viewing plants or other views of nature.

Understanding people/plant relationships from the perspective of a university planner could prove useful, as most colleges and universities do not emphasize the appearance of physical environment in relationship to learning (Sturner, 1972) even though research has shown that manipulating the physical environment to achieve specific results is viable (Drew, 1971). The main objective of this study was to investigate university student use of campus green spaces and perceptions of quality of life.

Materials and methods

SAMPLE. The sample used in this study was a random selection of students at Texas State University-San Marcos. Texas State University-San Marcos consists of a main campus of over 450 acres, with an additional outlying area of more than 5000 acres

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Units

To convert U.S. to SI, multiply by	U.S. unit	SI unit	To convert SI to U.S., multiply by
0.4047	acre(s)	ha	2.4711

used for recreational and instructional purposes (Texas State University, n.d.). The main campus is situated on a hill that inhibits large expanses of green spaces. However, the San Marcos River flows next to the main campus and includes several park areas. The university is currently focused on removing parking areas and replacing them with green areas while attempting to maintain a balance with the difficult parking situation on campus (Texas State University, n.d.).

From the overall population of students, 2334 ($\approx 10\%$) students were randomly selected to receive questionnaires via e-mail. This selection was stratified to include students from all undergraduate grade classifications. Of those sampled, 373 (16%) students responded to the survey. According to Krejcie and Morgan (1970), this sample size is sufficient to represent a population of $\approx 30,000$ individuals. The sample that responded appropriately reflected stratification by student grade classification (Table 1).

Data were collected using an online survey distributed via e-mail requesting participation in this study with the compensation of being entered into a drawing for a chance to win one of three prizes. This e-mail request simply stated the survey was regarding the "campus environment" and "campus experiences," and it did not mention green spaces or quality of life. Students accessed the survey from the link in the e-mail and then agreed to privacy and consent information and acknowledged that he/she understood that participation in the study was voluntary.

A second e-mail was sent out 1 week later to students who had not yet responded to remind them of the opportunity to participate to attempt to raise the response rate.

However, because of nonresponse and self-selection of respondents, the sample may differ from the target population (Frankel, 1983).

DEMOGRAPHICS. The demographic section of the instrument was modeled after similar instruments (Waliczek et al., 1996), and was reviewed by other researchers for content validity. This section of the instrument contained questions that asked for student grade classification, gender, marital status, and ethnic identity. Additionally, questions regarding how many hours per week respondents worked were asked, as well as how far they commuted to school.

STUDENT USE OF CAMPUS GREEN SPACES INSTRUMENTATION. The "green-user" section of the questionnaire was developed and validated by researchers of the horticultural and agricultural sciences. This section asked participants to rate the frequency in which they participated in various activities (walking to and from class, exercising, socializing with friends, etc.) outdoors on campus. For these questions, responses were on a Likert-type scale (Likert, 1967) ranging from 1 to 5. Lower scores indicated less frequent use of campus green spaces and higher scores indicated more frequent use for the specified activity. Also, one question asked generally, "how frequently do you spend time outdoors on campus?" This question was scored on a four-point scale. Green-user scores ranged from 8 through 47. Higher green-user scores indicated more frequent use of the campus green spaces and the arboretum and lower scores indicated less frequent use. Respondents were also asked to include any comments or suggestions regarding the campus environment.

QUALITY OF LIFE OF UNIVERSITY STUDENTS INSTRUMENTATION. The instrument selected to measure

quality of life of students consisted of two separate domains: an affective domain (Roberts and Clifton, 1992) and a cognitive domain (Clifton et al., 1996). The affective domain assessed how students felt about their educational experiences (Roberts and Clifton, 1992). The affective domain of quality of life of university students was measured using a series of 30 statements encompassing three dimensions (total positive affective, interaction with students, and interaction with professors). This section of the instrument asked students to rate their agreement with statements such as, "the things I learn are important to me," "I feel restless," and "I find it easy to get to know other people" (Roberts and Clifton, 1992). Scores on the affective domain ranged from 0 to 148. Scores on the three dimensions of the affective domain ranged from 0 to 80, 0 to 25, and 0 to 45, respectively.

The cognitive quality of life of university students measured the degree to which students felt that they were experiencing sufficiently "demanding cognitive challenges" (Clifton et al., 1996). This domain was measured using a series of 17 statements encompassing two dimensions (functional and structural). Each statement was preceded with: "At Texas State University, I have been challenged to..." and included statements such as, "demonstrate how theories are useful in real life," "identify organizing principles in my courses," and "remember an extensive number of new concepts" (Clifton et al., 1996). Scores on the cognitive domain ranged from 0 to 85. Scores on functional dimension ranged from 0 to 55 and scores on the structural dimension ranged from 0 to 30.

The statements on the affective and cognitive domains were all rated on a five-point, Likert-type scale, with

Table 1. Target population and sample group by student grade classification in the study of the relationship between student use of campus green spaces and the arboretum and perceptions of quality of life.

Student grade classification	Undergraduate enrollment ^a (no.)	Undergraduate enrollment (%)	Respondents (no.)	Respondents (%)
Freshmen	4,398	18.7	56	15.0
Sophomores	5,012	21.3	72	19.3
Juniors	6,072	25.5	112	30.0
Seniors	8,148	34.6	133	35.7
Total	23,568	100	373	100

^aTexas State University, 2006.

responses of 1 indicating “strongly disagree” and responses of 5 indicating “strongly agree” (Likert, 1967). Except for four statements on the total affective dimension, the statements were positive in nature, and scoring was equivalent to the responses, where a response of 1 scored 1 point and a response of 5 scored 5 points. On the negative statements, responses were reverse coded so that responses of 1 scored 5 points and responses of 5 scored only 1 point. Nonresponse to any question resulted in 0 points for that question. The scores were summed for the affective and cognitive domains, resulting in an overall quality of life score for each university student. Scores on the overall quality of life of university students scale ranged from 0 to 231.

OVERALL QUALITY OF LIFE. Two additional questions were asked about overall quality of life. These questions were “overall, how would you rank the quality of your life?” and “when all things in your life are considered, how do you feel today?” (Waliczek et al., 1996), and were rated on a five-point, Likert-type scale. On these questions, more positive responses scored more points. Therefore, the least positive response scored only 1 point, and the most positive response scored 5 points.

DATA ANALYSIS. After the survey was available for 2 weeks, data were automatically downloaded into an ExcelTM file (Microsoft Corp., Redmond, WA) and were then analyzed using SPSS[®] (version 11.5; SPSS, Chicago). Statistical analysis included descriptive statistics, frequencies, correlations, and analysis of variance (ANOVA). Post hoc analyses were done when necessary [Tukey’s honestly significant difference (HSD)]. Additionally, a Cronbach’s alpha reliability analysis determined the overall green-user and quality of life survey instrument to have high reliability ($\alpha = 0.91$; Gall et al., 2006).

Results and discussion

Respondents were classified as low, medium, or high users of the green spaces based on their responses to the green-user scale. Individuals with 20 or fewer points (indicating most responses were, on average, scored 1 or 2 points) were ranked as

“low-users,” individuals with 21 to 29 points (indicating most responses were, on average, scored 3 points) were “medium-users,” and individuals with 30 or more points (indicating most responses were, on average, scored 4 or 5 points) were “high-users.” Frequency statistics determined that more than half the students (66.8%) were ranked as “high-users” of the campus green spaces, and that most of those who were not “high-users,” were at least, “medium-users” (24.1%). Very few (9.1%) “low-users” of campus green spaces were identified through this study. Furthermore, mean scores to both overall quality of life questions were greater than 4, indicating most students had positive perceptions of their overall quality of life. This positive perception held true for quality of life of university students’ scale, where most students gave responses that were between neutral and agree about their affective and cognitive experiences in the university.

QUALITY OF LIFE OF UNIVERSITY STUDENTS AND GREEN-USE COMPARISONS. A Pearson product-moment correlation was run between respondents’ green-user scores, responses to overall quality of life questions, and their student quality of life scores (Table 2). Statistically significant correlations were found between green-user scores and responses to both of the overall quality of life questions ($P = 0.016$ and $P = 0.001$). The correlation between green-user scores and overall quality of life of university students was also statistically significant ($P = 0.004$). Statistically significant correlations were found between green-user scores and the affective domain of student quality of life ($P = 0.178$). Within the affective domain, statistically significant correlations were found specifically in the interaction with students dimension ($P = 0.000$) and the total positive affective dimension ($P = 0.003$). A statistically significant correlation was not found within the interaction with professors dimension ($P = 0.059$). No statistically significant correlations were found between the green-user scores and the cognitive domain ($P = 0.064$) or the structural dimension of the cognitive domain ($P = 0.377$). However, a statistically significant correlation was found between green-user

scores and the functional dimension ($P = 0.024$).

These findings indicated that within the overall sample of undergraduate students, those who used the campus green spaces more frequently rated their overall quality of life higher when compared with students who used the campus green spaces and the arboretum less frequently. These students who reported spending more time outdoors on campus green spaces also tended to rate their student quality of life as higher, particularly with regard to statements within the affective domain that measured how students felt about their experiences within the university. Finally, students who reported spending more time in campus green spaces also rated their functional dimension within the cognitive domain as higher than those students who spent less time outdoors on campus green spaces. Thus, these students rated their ability and challenge to apply knowledge learned in the university as higher when compared with low-users of campus green spaces.

Respondents were also given the opportunity to provide additional comments and feedback regarding the campus environment. A range of responses were given, many including information on the topic of green space specifically. For example, one student wrote, “being outside on campus puts me in a calm mood.” Another student wrote, “grass and plants are pretty and relaxing to have around the entire campus. Concrete isn’t relaxing.” One student made the comment that, “I did not choose Texas State for its physical beauty, but it makes going to school here so much more pleasant.” Finally, one student wrote, “the campus has a certain warmth to it, and it is very welcoming.”

DEMOGRAPHIC COMPARISONS. When taking demographic variables into consideration, ANOVA tests found statistically significant differences between quality of life scores and green-user scores based on comparisons of student grade classification and gender (Tables 3 and 4).

STUDENT GRADE CLASSIFICATION. Scores of freshmen, sophomores, juniors, and seniors were compared using a Pearson’s product-moment correlation to investigate any relationship between student grade classification

Table 2. Correlation matrix indicating the Pearson's product-moment correlation (Pearson correlation) between green-user score, overall quality of life, overall quality of life of university students^z, the affective domain of quality of life of university students (which included the total positive affective dimension, the interaction with students dimension, and the interaction with professors dimension), and the cognitive domain of quality of life of university students (which included the functional dimension and structural dimension), in the study of the relationship between student use of campus green spaces and perceptions of quality of life.

Scale		Green-user score
Overall quality of life		
When all things in your life are considered, how do you feel today?	Pearson correlation	0.125
	<i>P</i>	0.016*
	<i>N</i>	373
Overall, how would you rank the quality of your life?	Pearson correlation	0.174
	<i>P</i>	0.001*
	<i>N</i>	371
Quality of life of university students		
Overall quality of life of university students	Pearson correlation	0.163
	<i>P</i>	0.002*
	<i>N</i>	373
Affective domain	Pearson correlation	0.178
	<i>P</i>	0.001*
	<i>N</i>	373
Total positive affective dimension	Pearson correlation	0.151
	<i>P</i>	0.003*
	<i>N</i>	373
Interaction with students dimension	Pearson correlation	0.224
	<i>P</i>	0.000*
	<i>N</i>	373
Interaction with professors dimension	Pearson correlation	0.098
	<i>P</i>	0.059
	<i>N</i>	373
Cognitive domain	Pearson correlation	0.096
	<i>P</i>	0.064
	<i>N</i>	373
Functional dimension	Pearson correlation	0.117
	<i>P</i>	0.024*
	<i>N</i>	373
Structural dimension	Pearson correlation	0.046
	<i>P</i>	0.377
	<i>N</i>	373

^zRoberts and Clifton, 1991.

*Statistically significant at the 0.05 level.

Table 3. Analysis of variance test comparing mean scores on the green-user scale based on student grade classification and gender in the study of the relationship between student use of campus green spaces and perceptions of quality of life.

Demographic	Sample size (no. participants)	Mean score ^z	SD	df	F	<i>P</i>
Student grade classification						
Freshmen	56	35.5	6.0	3	6.344	0.000*
Sophomores	72	34.4	8.0			
Juniors	112	31.6	7.7			
Seniors	133	31.1	7.9			
Gender						
Males	122	34.0	7.6	1	6.207	0.013*
Females	247	31.9	7.8			

^zScores ranged from 8 to 47. Higher green-user scores indicated more use of campus green spaces and lower green-user scores indicated less use.

*Statistically significant at the 0.05 level.

and green-user score or quality of life. This correlation indicated a statistically significant reverse relationship between student grade classification and green-user scores (Table 5). Thus, as student grade classification moved from freshman to senior, green-user scores tended to decline.

It is interesting to note that student use of campus green spaces was positively correlated to the interaction with student dimension. This was indicative of a situation in which students use campus green spaces to socialize with friends. Abu-Ghazze (1999) found that "the activities engaged in at the campus outdoor spaces were essential to alleviate stress among students and university employees" (p. 795). Furthermore, he found that when participants were asked what attracted them to specific areas, an overwhelming pattern of response was social interaction (Abu-Ghazze, 1999).

An ANOVA test comparing mean green-user scores based on student grade classification further revealed statistically significant differences. Post hoc analyses (Tukey's HSD) indicated that freshmen had statistically significantly higher green-user scores when compared with juniors and seniors. However, an ANOVA test comparing mean quality of life scores based on student grade classifications revealed statistically significant differences where lower classmen (freshmen and sophomores) rated their quality of life on several measures lower when compared with upper classmen (juniors and seniors) (Table 4).

GENDER. A Pearson's product-moment correlation was run comparing gender and green-user scores. This analysis indicated a statistically significant relationship between gender and green-user scores ($r = -0.129$, $P = 0.013$) where men tended to have higher scores than women. Furthermore, an ANOVA test also compared gender and green-user scores. Again, statistically significant differences were found between the mean green-user scores for men and women ($P = 0.013$; Table 3). Descriptive statistics revealed that men tended to have higher green-user scores than women. This finding supports previous social scientific research in gender studies that found that gender (as well as other variables) is a significant

Table 4. Analysis of variance test comparing responses to overall quality of life statements and quality of life of university students^z scores based on student grade classification in the study of the relationship between student use of campus green spaces and perceptions of quality of life.

Overall quality of life statement	Sample size (no.)	Mean score	SD	df	F	P
Student grade classification						
When all things in your life are considered, how do you feel today?						
Freshmen	56	4.0	0.9	3	0.983	0.401
Sophomores	72	4.2	0.8			
Juniors	112	4.1	0.7			
Seniors	133	4.1	0.8			
Overall, how would you rank the quality of your life?						
Freshmen	56	3.8	0.9	3	2.408	0.067
Sophomores	71	4.2	0.8			
Juniors	111	4.1	0.7			
Seniors	133	4.1	0.8			
Overall quality of life of university students ^y						
Freshmen	56	174.0	18.5	3	2.950	0.033*
Sophomores	72	179.6	19.0			
Juniors	112	182.5	18.8			
Seniors	133	184.1	27.3			
Affective domain ^x						
Freshmen	56	113.1	11.1	3	3.560	0.014*
Sophomores	72	115.3	12.5			
Juniors	112	117.7	11.9			
Seniors	133	119.5	15.9			
Total positive affective dimension ^w						
Freshmen	56	60.3	6.2	3	3.496	0.016*
Sophomores	72	62.8	7.3			
Juniors	112	63.3	7.4			
Seniors	133	64.3	8.8			
Interaction with students dimension ^v						
Freshmen	56	18.7	3.0	3	1.311	0.271
Sophomores	72	18.9	3.2			
Juniors	112	18.8	2.9			
Seniors	133	19.4	3.2			
Interaction with professors dimension ^u						
Freshmen	56	34.1	4.8	3	3.471	0.016*
Sophomores	72	33.8	5.2			
Juniors	112	35.7	4.6			
Seniors	133	35.9	6.3			
Cognitive domain ^t						
Freshmen	56	60.9	10.5	3	1.645	0.179
Sophomores	72	64.2	9.5			
Juniors	112	65.1	10.4			
Seniors	133	64.6	14.9			
Functional dimension ^s						
Freshmen	56	38.9	6.7	3	1.478	0.220
Sophomores	72	41.2	6.8			
Juniors	112	41.6	6.9			
Seniors	133	41.1	9.8			
Structural dimension ^r						
Freshmen	56	22.0	4.6	3	1.499	0.214
Sophomores	72	23.0	3.8			
Juniors	112	23.6	4.5			
Seniors	133	23.5	5.7			

^zRoberts and Clifton, 1991.

^yScores on the overall quality of life of university students scale ranged from 0 to 231.

^xScores on the affective domain ranged from 0 to 148.

^wScores on the total positive affective dimension ranged from 0 to 80.

^vScores on the interaction with students dimension ranged from 0 to 25.

^uScores on the interaction with professors dimension ranged from 0 to 45.

^tScores on the cognitive domain ranged from 0 to 85.

^sScores on the functional dimension ranged from 0 to 55.

^rScores on the structural dimension ranged from 0 to 30.

*Statistically significant at the 0.05 level.

Table 5. Correlation matrix indicating the Pearson's product-moment correlation (Pearson correlation) between green-user score and student grade classification for undergraduate students in the study of the relationship between student use of campus green spaces and the arboretum and perceptions of quality of life.

		Student grade classification ^z
Green-user score	Pearson correlation	-0.212
	<i>P</i>	0.000*
	<i>N</i>	373

^zStudent grade classifications ranged from freshmen (coded as 1) through seniors (coded as 4).

*Statistically significant at the 0.05 level.

predictor in participation in outdoor activities and sports as well as preference for natural environments (Barnett, 2006).

Although men tended to have higher green-user scores than women, there were no statistically significant differences found with regard to the overall quality of life of university students, the affective domain of quality of life of university students (which included the total positive affective dimension, the interaction with students dimension, and the interaction with professors dimension), or the cognitive domain of quality of life of university students (which included the functional dimension and structural dimension). However, statistically significant differences were found with regard to the overall quality of life statement "overall, how would you rank the quality of your life?" ($P = 0.018$). It was found that women responded more positively than men to this question. However, no statistically significant difference was found with regard to the overall quality of life statement "when all things in your life are considered, how do you feel today?" It is unclear why women may respond differently to just one of the two questions.

ETHNIC GROUP. An ANOVA test compared ethnic groups and green-user scores. There were no statistically significant differences between groups ($P = 0.570$), indicating that no specific ethnic group appeared to use campus green spaces more than any other ethnic group. Additional ANOVA tests comparing ethnic groups on the various quality of life measures also revealed no statistically significant differences on any quality of life measure.

Conclusions

Of respondents in this study, 66.8% of students were ranked as

high-users of campus green spaces. This study found that undergraduate student use of campus green spaces and perceptions of quality of life were related to each other. Statistically significant Pearson's product-moment correlations were found between green-user scores and various measures of quality of life and quality of life of university students. Positive student perceptions of experiences within the university have been found to be important for universities interested in retaining and attracting high ability students (Groen and White, 2003).

Furthermore, the overall results from this study indicated that, in general, students who used the campus green spaces more frequently perceived their quality of life as higher when compared with those students who used green spaces less frequently. Additionally, undergraduate student use of campus green spaces was correlated with the individual areas of overall quality of life, the affective domain of quality of life of university students, and, specifically, the total positive affective dimension and the interaction with students dimension. These results suggested campus green spaces and their availability could potentially be a contributing factor in student retention, particularly among students new to the university (i.e., freshmen). Finally, student use of campus green spaces did not appear to benefit any particular gender or ethnic group more than others.

Future directions for research in this area might include replication of the study on a nationwide scale including campuses with different physical qualities, seasons, and climates.

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