Does Student Behavior Differ In Relation To Perception / Evaluation of Campus Environments? A Post-occupancy Research in Two University Campuses

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ABSTRACT

A Post Occupancy Evaluation (POE) survey was applied to 93 students at two universities; Dokuz Eylul University and Karadeniz Technical University. The survey consists questions on: (1) participants' characteristics, (2) physical environmental characteristics, (3) favorite places, (4) the most and the least liked features and possibilities for improvement, (5) physical activity engagement level, and (6) time spent in the campus. Results showed that users' subjective evaluations of their campuses are reflected in their behavior. The students of the negatively evaluated campus reported that they spent less time in campus compared to students of the more positively evaluated campus.

Keywords: post occupancy evaluation, campus setting, environmental evaluation, campus outdoor

1. INTRODUCTION

Built environments have been evaluated by designers, architects, and also by users in an informal manner all the time [1]. By the 1960s, with the rise of Environmental Psychology as an independent and interdisciplinary research area, built environments have started to be evaluated by users in a more comprehensive, systematic, rigorous and formal manner [2]. This formal evaluation of built environment is called "Post Occupancy Evaluation (POE)" and it is based on the evaluation of functional features rather than the aesthetics, technical and economical features alone. POE aims to enable clients, decision makers, and operators of various facilities to provide better environments for customers, occupants, and users. This systematic method evaluates the success and failures of completed design projects. Such information could be utilized (1) to improve the completed and future design projects, (2) to create an unbiased memory for specific types of design projects (such as hospital and airport design or design of a university campus), (3) to develop design guidelines for future design projects [1-6].

Studies listed numerous benefits of POE, such as validating the users' real needs, improving the fit between users and the physical environments, reducing maintenance costs, and providing feedback for a continuous improvement process [6]. A number of studies have explained how a POE should be conducted [1, 2, 4, 5, 7, 8]. Thus, discussing the benefits and barriers and the implementation process is beyond the scope of this study.

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In general POE studies have been carried out by academics and design students [9-19]. Recently, architects, landscape architects, interior designers, facility managers, and planners convince clients to conduct POEs and clients and private and public agencies have also shown interest in initiating POE studies [20 - 22]. In the last 20 years, government departments and private offices have often shown interest in funding POE research in the United States and Western Europe (see review in [1]). Although there has been a growing interest on POE of various environments in developed countries, such studies are limited in Turkey [3, 23 - 27]. Thus, this study aims to analyze the users' evaluation of completed design projects in Turkey.

A POE can be applied to buildings or open spaces. Although it has often been applied to various building types; such as residential buildings [28, 29], university buildings [4], hospital buildings [25], post office buildings [30], elementary and high school buildings [14, 31, 32], and work offices [15, 33]; it has been applied to urban open spaces [3, 26, 27, 34] and university campuses [35 - 39] rarely. As Salama [36] noted, very little is known about students' comprehension and perception of outdoor spaces within university campuses. Thus this study aims to investigate how the association between physical features and students' evaluations influence student's behavior in a university campus.

In brief, our literature review showed that there has been a growing interest on POE research in developed countries; however such studies are limited in Turkey. Although various types of educational buildings [4, 31] have been investigated separately, insufficient attention has been paid to evaluation of an university campus as a whole. Thus this study aims to conduct a POE on two university campuses, Dokuz Eylul University and Karadeniz Technical University, and highlight the importance of understanding the mutual interaction between campus outdoor spaces and students' needs.

2. METHODOLOGY

2.1. Settings

Dokuz Eylul University (DEU) is located on the south-east edge of Izmir far from the city center (about 20 km to the city center) and close to the intercity highway (Figure 1). Karadeniz Technical University (KTU) is located on the west side of Trabzon (about 6 km to the city center) close to an international airport (Figure 1). Although both cities have a sea-shore, DEU is located far from the sea-shore and KTU is located close to the sea-shore. Both campuses are comparable in size (Figure 2). The main road of DEU is about 2 km and the main road of KTU is about 1.5 km. At KTU, the 'Main Kanuni Campus' includes buildings for Rectorate, educational facilities (faculties of engineering, architecture, arts and sciences, forestry, economics and administrative sciences, medical school, dentistry, pharmacy, languages) and social facilities (buildings for cafés, student clubs, restaurants, dorms, hostels and sport facilities). The DEU `TinazTepe Campus` includes buildings for educational units (faculties of engineering, architecture, economics and administrative sciences) and social facilities (buildings for a library, sports center, cafés and restaurants). The DEU campus is located on a sloppy terrain without an alley for pedestrians. The connection between various educational buildings and social facilities is provided with the sidewalks by the main and secondary roads. The KTU campus is located on a relatively flat terrain. Yet, there is an elevation difference between some of the buildings and the main road. Although the connection between buildings is mostly provided with the sidewalks by the main roads there is also an alternative pedestrian path which connects the educational buildings, recreational areas and social facilities. Students living close but outside the campus could follow this path to reach their department. Finally, as the DEU campus is comparatively new compared to the KTU campus, the landscape in the DEU campus is poorer than KTU. Yet, the landscape in the surrounding area is quite impressive in both campuses. Both campuses are surrounded with a forest.

Figure 1. The location of Karadeniz Technical University in Trabzon and the location of Dokuz Eylul University in Izmir

Figure 2. The aerial view of Karadeniz Technical University and Dokuz Eylul University

2.2. Participants

Ninety three students from two universities (45 participants at Dokuz Eylul Univesity and 48 participants at Karadeniz Technical University) volunteered to participate in the study.

The distribution of participants' gender, age and department did not significantly differ across universities (Table 1). At both universities about an equal number of males and females participated, and the participants' ages ranged from 18 to 26 years with a mean of 21 years. At both universities about 5 % to 10 % of the participants did not respond to the question about their department and the responses of the remaining participants showed that they were studying in a range of programs. At Karadeniz Technical University (KTU) about half of the participants (46 %) were studying in Applied Sciences (eg. engineering, chemistry, geology, biology) and the other half (48 %) were studying in social sciences (eg. business administration, linguistics, international relations, tourism management), and at Dokuz Eylul University (DEU) slightly more participants (60 %) were studying in Applied Sciences (31 %) than those in Social Sciences.

Table 1.The demographic distribution of participants

	DEU (participant-percentage)	KTU (participant-percentage)
Gender		
Female	19 (42 %)	26 (54 %)
Male	26 (58 %)	22 (46 %)
Age	Mean = 21.71 years SD =1.73 years	Mean = 21.54 years SD = 2.00years
Department		
Applied Sciences	27 (60 %)	23 (46 %)
Social Sciences	14 (31 %)	22 (48 %)
Not Responded	4 (9 %)	3 (6 %)

2.3. Procedure

A post occupancy evaluation survey was applied to participants in the mid weeks of the 2009-2010 academic year, winter term. The survey consists of six types of questions: (1) demographic information (gender, age, major), (2) evaluation of physical environmental factors such as accessibility, size, safety, and aesthetics, (3) favorite open and built-up places, (4) the most and the least liked characteristics and the necessary impovements, (5) the level of physical activity engagement outside and inside the campus (in relation to participants' residence location and mode of transportation to campus), and (6) time spent in the campus for education and social activities.

At each university interviews took place in public open spaces and cafeterias on weekdays, from 10:00 am to 4:00 pm, in December 2010. The participants received a brief verbal and written description, which indicated that the study aims to understand students' honest opinion about their campus and there are no right or wrong answers. Participants filled the survey on their own and the interviewer gave verbal explanations about

survey questions only when help was requested. The survey took about 3 minutes to complete for each participant.

2.4 The research questions

The present study compares the two campuses on five issues: (1) evaluation of physical environmental factors, (2) evaluation of open and built-up social gathering places, (3) recognition of the most and the least liked characteristics and necessary improvements, (4) the level of physical activity engagement inside and outside the campus (in relation to participants' residence location and mode of transportation to campus), (5) time spent in the campus for educational and social activities. When the two campuses were compared based on a mean value of a factor (or when the measurement is numerical), t-test analyses were used. When the two campuses were compared based on the number of students giving a specific response (or when the measurement is categorical), Chi-square tests were used.

3. RESULTS

3.1 The physical environmental factors

First, the physical environmental factors including accessibility, size, safety, aesthetics, landscape and noise were considered. Each factor was evaluated by using a seven point scale (For all factors except noise: 1 = very bad, 7 = very good; For noise: 1 = not at all, 7 = very much). The two universities differed in the evaluation of all factors except the evaluation of entrances and accessibility to the campus. For both universities, the entrances (t = 1.08, df = 88, p = 0.28)

and accessibility to the campus (t = 1.78, df = 91, p = 0.08) were evaluated as neither bad nor good (Figure 3). *Acccesibility within the campus* was evaluated as "bad" at DEU and as "neither bad nor good" at KTU (t = 5.25, df = 89, p = 0.00). *Wayfinding* in the campus was evaluated as "neither bad nor good" at DEU and as "slightly good" at KTU (t = 4.41, df = 89, p = 0.00). *Campus size* was evaluated as "slightly good" at DEU and as "good" at KTU (t = 2.63, df = 89, p = 0.01). *Safety at day time* was evaluated as "neither bad nor good" at DEU and as "slightly good" at KTU (t = 2.17, df = 0.89, p = 0.03). *Safety at night time* was evaluated as "bad" at DEU and as "neither bad nor good" at KTU (t = 4.18, df = 85, p = 0.00). *Aesthetic look of the campus from outside* was evaluated as "bad" at DEU and as "good" at KTU (t = 8.85, df = 91, p = 0.00). *Inside aesthetics* was evaluated as "bad" at DEU and as "slightly good" at KTU (t = 12.89, df = 90, p = 0.00). *Coherence* of the buildings in the campus was evaluated as "slightly bad" at DEU and as "neither bad nor good" at KTU (t = 4.77, df = 89, p = 0.00). *Upkeep* in the campus was evaluated as "slightly bad" at DEU and as "neither bad nor good" at KTU (t = 5.45, df = 91, p = 0.00). *The pavement* of the pedestrian streets was evaluated as "bad" at DEU and as "slightly good" at KTU (t = 9.96, df = 90, p = 0.00). The *landscape* in the campus was evaluated as "bad" at the DEU campus and as "good" at KTU (t = 16.86, df = 91, p = 0.00). *Noise* within the campus was evaluated as "below average" at DEU and as "above average" at KTU (t = 2.20, df = 89, p = 0.03). *In general,* the campus was evaluated as "bad" at the DEU campus and as "slightly good" at KTU (t = 10.57, df = 91, p = 0.00). In brief, for almost all variables students at DEU evaluated their campus below average and students at KTU evaluated their campus as average or slightly above average.
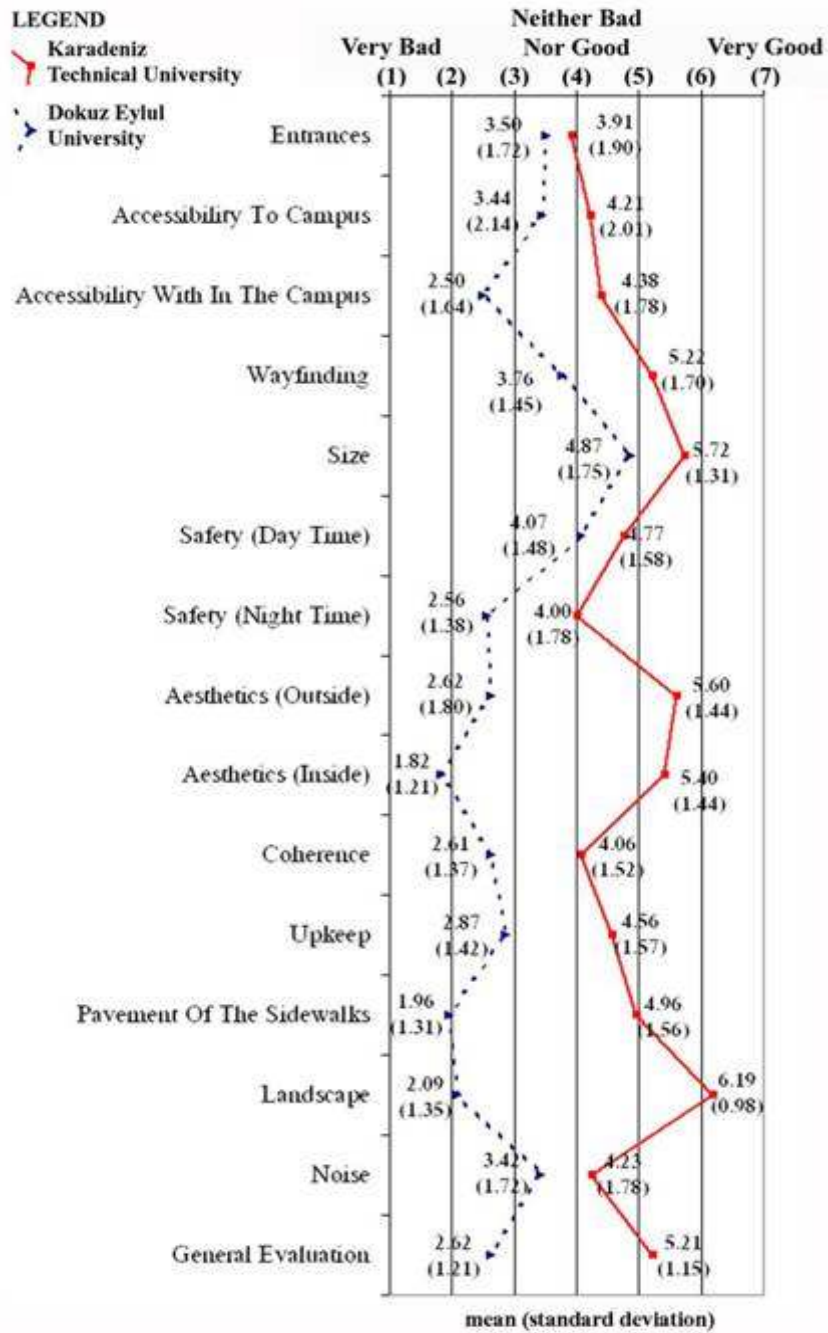
Figure 3 The evaluation of physical environmental characteristics at two university campuses

3.2 Open and built-up places

The uses of open and built-up places were evaluated with two types of questions. First, the students were asked to evaluate the presence of nice open and build-up places using a seven point scale (1 = there is not any, 7 = there are plenty). Second, the students were asked to pick favorite open and build-up places from a list of

choice. For the build-up places the list included (1) my department, (2) common social gathering places (such as cafeteria and club houses), (3) library. For the open places the list included (1) open area around my department, (2) common social gathering places, and (3) sports facilities

For the amount of open spaces where students can spend time after class, participants at KTU gave more positive responses (mean = 5.21, SD = 1.44) than participants at DEU (mean = 2.59, SD = 1.59) (t = 8.27, df = 90, p = 0.00) (see Table 2). In parallel to this finding, at DEU "open spaces around participants' department" was found to be the only favorite open space by a majority of the participants (about 80 %) and at KTU a majority of the participants (69 %) mentioned common social gathering places as the most favorite open space. The differences in favorite open spaces in two campuses were pronounced for all types of open spaces (Open spaces around participants' department: $\chi 2$ = 4.23, df = 1, p = 0.04, Common social gathering places: $\chi 2$ = 31.93, df = 1, p = 0.00, Sports facilities: $\chi 2$ = 6.59, df = 1, p = 0.01). The findings for the build-up places were parallel to those of open spaces. At KTU participants gave higher ratings (mean = 4.06, SD = 1.64) for the build-up places than participants at DEU (mean = 2.84, SD = 1.03) (t = 4.23, df = 90, p = 0.00) (see Table 2). Similarly, more participants at KTU (81 %) picked common social gathering places as favorite build-up place than those at DEU (27 %) ($\chi 2$ = 27.94, df = 1, p = 0.00). In brief common social gathering places were evaluated more favorably at KTU

Table 2. The evaluation of open and build-up places in two campuses

	DEU	KTU
Places to spend time after class (1 = there is not any, 7 = there is plenty)		
Open Spaces	M = 2.59 (SD = 1.59)	M = 5.21 (SD = 1.44)
Build-up Places	M = 2.84 (SD = 1.03)	M = 4.06 (SD = 1.64)
Favorite Open Space	number of participants (percentage)	
Around my department	36 (80 %)	29 (60 %)
Common social gathering places	5 (11 %)	33 (69 %)
Sports facilities	2 (4 %)	11(23 %)
Not specified	5 (11 %)	0 (0 %)
Favorite Build-up Place	number of participants (percentage)	
My department	20 (44 %)	26 (54 %)
Common social gathering places	12 (27 %)	39 (81 %)
Library	34 (76 %)	19 (40 %)
Not specified	7 (16 %)	2 (4 %)

3.3 The most and least liked characteristics

For the most and the least liked characteristics, participants commented on seven issues including landscape, upkeep, accessibility, location, size, and social gathering places (Table 3). At DEU a majority of the participants (27 students) referred to nothing and only a few of them referred to upkeep and location (5 and 4 students respectively) as the most liked features. On the contrary at KTU, the majority of the participants referred to landscape (26 students) and a few of them mentioned accessibility, location and social gathering places (6,5 and 5 students respectively) as the most liked feature. In parallel to this finding, compared to students at DEU, more students at KTU referred to nothing as least liked feature (10 versus 2 students). At DEU a majority of the participants (21 students) referred to accessibility as the least liked feature, and it was followed by location and social gathering places (11 and 9 participants respectively). Similar to DEU, accessibility was criticized by the majority of the participants at KTU (15 students) and a few participants mentioned upkeep and social gathering places (6 and 5 participants respectively) as the least liked feature.

Table 3. The participants' response for the most and the least liked features at two university campuses

	The Most Liked Features (number of participants)		The Least Liked Features (number of participants)	
	DEU	KTU	DEU	KTU
Nothing	27	6	2	10
Landscape	0	26	6	3
Upkeep	5	1	3	6
Accessibility	0	6	21	15
Location	4	5	11	1
Size	2	4	0	2
Social Gathering Places	1	5	9	5
Other*	8	3	8	8

* Other features include the aesthetic look, the academic personnel, education opportunities and limitations

The missing features

For the features that were missing in the campus, the students referred to six issues: social facilities, sports facilities, transportation, landscape, seating elements, and dormitory (Table 4). At both universities the majority of the participants (27 students at DEU and 25 students at KTU) mentioned social facilities as the missing element in the campus.

Table 4 The participants' response for the features that were missing in two campuses

	DEU (number of participants)	KTU (number of participants)
No Response	4	15
Seating	2	2
Social Facilities	27	25
Sports Facilities	7	0
Transportation	4	2
Landscape	8	3
Dormitory	3	2
Other Features*	5	2

* Other features include the internet access and better food

3.4 Necessary improvements in the campus

For the features that needs to be improved, students referred to nine issues; environmental quality, seating elements, social facilities, transportation, landscape, dormitory, upkeep, library and sports facilities (Table 5). At KTU more participants did not list a feature compared to students at DEU (11 versus 26 students). At DEU a majority of the participants mentioned environmental quality and social facilities as the most important features that need to be improved. Those features were followed by better transportation opportunities to and within the campus. A few students mentioned the need for a dormitory in the campus. At KTU a few participants mentioned that the administration should work on the environmental quality, the upkeep in the campus, the social facilities and the library to make the campus better for students.

Table 5.The response for the features that need to be improved

	DEU	KTU
	(number of participants)	(number of participants)
No Response	11	26
Environmental Quality	14	6
Seating Elements	1	1
Social Facilities	14	4
Transportation	8	0
Landscape	6	0
Dormitory	2	0
Upkeep	0	5
Library	0	4
Sports Facilities	0	1
Other Features	5	3

* Other features include the academic and administrative personnel and location

3.5 Activity engagement

The level of physical activity engagement inside and outside the campus in relation to participants' residence location and mode of transportation to campus was considered (Table 6). Participants' responses about residence location were re-coded in relation to campus location. Responses referring to the campus neighborhood were coded as "close vicinity" and the others were coded as "far vicinity". At DEU more participants (72 %) reported that they were living in "close vicinity". On the other hand, at KTU more participants (63 %) reported that they were living in the "far vicinity" ($\chi 2 = 11,04$, df = 1, p < 0.01) (Table 2). Although participants' location of residence differed significantly, the mode of transportation to campus did not differ. At both universities the most preferred mode of transportation was public transportation (DEU: 45 %, KTU: 43 %) and walking (DEU: 35 %, KTU: 32 %). Only a few students relied on school busses (DEU: 12 %, KTU: 15 %) and private cars (DEU: 8 %, KTU: 10 %) to reach the campus from their home. When

students' tendency for walking in and outside the campus were compared, at both universities students were reluctant to walk for transportation, recreation or exercise. For transportation and recreation purposes, students reported that on average they usually walk for about 30 minutes per day in and outside the campus, 12 to 13 minutes of which is executed inside the campus. The difference between the two universities did not achieve significance (Inside and outside the campus: t = -0.59, df = 85, p = 0.56; Inside the campus: t = 0.33, df = 81, p = 0.75). For exercise purposes, students reported that on average they usually walk for about 15 to 20 minutes per day in and outside the campus, 4 to 5 minutes of which is executed inside the campus. The difference between the two universities did not achieve significance (Inside and outside the campus: t = 1.24, df = 76, p = 0.22; Inside the campus: t = 1.11, df = 74, p = 0.27). In other words, for how long students tend to walk inside the campus does not differ by the proximity of their residence and by the most preferred mode of transportation. At both university campuses students do not walk enough to meet their daily exercise needs.

Table 6. Comparison of the students' level of physical activity engagement in two universities in relation to participants' residence location and mode of transportation to campus

	DEU number of participants (percentage)	KTU number of participants (percentage)
Location of Residence		
Close vicinity	31 (72 %)	17 (28 %)
Far Vicinity	12 (37 %)	29 (63 %)
Mode of Transportation to Campus		
Public Transportation	29(45 %)	26 (43 %)
Walking	23(35 %)	19 (32 %)
School Bus	8 (12 %)	9 (15 %)
Private Car	5 (8 %)	6 (10 %)
The level of physical activity (walking) for transportation and recreation purposes		
Inside and Outside	M = 29.98 (SD = 25.51) minutes per day	M = 26.67 (SD = 26.95) minutes per day
Inside	M = 12.51 (SD = 10.23) minutes per day	M = 13.64 (SD = 19.79) minutes per day
The level of physical activity (walking) for the purpose of exercise		
Inside and Outside	M = 13.22 (SD = 17.88) minutes per day	M = 20.81 (SD = 34.29) minutes per day
Inside	M = 4.38 (SD = 8.62) minutes per day	M = 7.22 (SD = 13.44) minutes per day

Times spend for education and social activities

Next analyses focused on the time spent in the campus for education and social activities (Table 7). For education, students reported to come to the campus for about 4 to 5 days a week and about 5 hours a day on average. The difference between the two universities did not show significance (Days in a week: t = 1.56, df = 87, p = 0.12; Hours in a day: t = -0.28, df = 87, p = 0.78). For recreational and social activities, KTU students reported to come to the campus more often then their peers at DEU. At KTU students reported to come to the campus for about 2 days a week and about 3 hours a day on average, while at DEU students reported to come to the campus for less than a day in a week and for about 2 hours a day on average. The difference between the two universities achieved statistical significance (Days in a week: t = 3.70, df = 81, p = 0.00; Hours in a day: t = 2.81, df = 85, p = 0.01).

Table 7. Comparison of the time spent in the campus for education, social and recreational activities in two universities.

	DEU	KTU
Time spent in the campus for education		
Days in a week	M = 4.41 (SD = 1.19)	M = 4.73 (SD = 0.72)
Hours in a day	M = 4.60 (SD = 1.45)	M = 4.52 (SD = 1.32)
Time spent in the campus for social and recreational activities		
Days in a week	M = 0.50 (SD = 1.33)	M = 1.88 (SD = 2.00)
Hours in a day	M = 1.52 (SD = 1.13)	M = 2.93 (SD = 3.06)

4. DISCUSSION

Designers' intentions and expectations do not usually fit the users' need in general and students' needs in particular [36]. Thus, it is necessary o evaluate, compare and discuss the physical quality of various university campuses from the students' perspectives and understand how students' evaluations affect their behavior.

In this study a POE was applied to two university campuses. The results showed that, students' evaluations differ in two university campuses. While one university campus received negative scores on the evaluations of accessibility within the campus, safety, aesthetic quality within and outside the campus, pavement of sidewalks and landscape, the other campus received about average or slightly above average scores on those issues. One university campus was criticized by more students than the other university campus. Students tended to criticize their campus for poor accessibility, inappropriate location, and lack of social gathering places. For the features to be improved, a majority of the participants commented on environmental quality, necessity for more open spaces and build-up places for social facilities, better accessibility to the campus and within the campus. When students' behavior was compared, the results showed that, the students of the negatively evaluated campus reported that they tend to spend less time in the campus for social and recreational activities compared to students of the more positively evaluated campus. The general knowledge suggests that the design of a university campus should encourage students to spend more time in the campus (not only in the department or in the class) where they can feel more comfortable to share and to learn from their peers and mentors. If students spend limited time in campuses and come to campus only for classes where they usually sit and listen to their mentor with low or no interaction, is it possible to foster their productivity and success?

In brief, this study did not aim to compare two university campuses to disapprove one and praise the other. Rather, it aims to investigate the relation between students' subjective evaluations of university campuses and their behavior. Discussing the specific physical features that lead to positive and negative evaluations are beyond the scope of this study. Yet it is necessary to address the basic suggestions that could improve the campuses that were investigated in this study and develop design guidelines for future campuses of similar sizes. A nice landscape, comfortable seating areas and community gathering areas could invite students to spend more time in the campus

environments. High accessibility between community gathering areas and educational facilities could be satisfied with nice alleys. Such alleys could encourage students' to walk for transportation and exercise. As Abu-Ghazzeh [39] noted outdoor areas in campuses should not be treated as leftover spaces between buildings, a special attention should be given to plan development. Campus plans should be based on scientific knowledge which could be derived from the analyses about the relationships between various university facilities. The location of each specific area, such as educational buildings, social gathering places, main plazas, outdoor study spaces, should be carefully selected with a comprehensive plan. Moreover, appropriate site selection for a campus is as important as the quality of the physical environment within the campus. To put it differently, accessibility to a campus is as important as accessibility within the campus.

The findings of this study have practical implications for university administrators. However, the methodological limitations of this study should be addressed to bring forth some future research areas. There were four limitations related to the experimental set up and the characteristics of the subject group. First, a POE was applied to two medium university campuses in two different regions. Whether the results apply to other university campuses in other regions remains to be seen. A more comprehensive study that compares a large number of university campuses is on call. Second, this study used the survey technique to analyze users' evaluations. However other techniques, such as preliminary observations by professionals, walk through evaluations by users and designers, behavioral mapping through unobtrusive observations should be incorporated to derive more concrete findings for specific settings. Subsequent work may use various measures of POE on one site to test whether the results vary with the method used. Third, this study is based on students' evaluations. A useful extension of this study may compare students', academics' and administrative people's perspectives about their campuses. Fourth, a limited number of students participated in this study. Subsequent work may conduct the test with a larger sample size.

As a concluding remark, better learning environments could foster students' and academicians' productivity and better learning environments could be created with the knowledge about the mutual interaction between people's behavior and physical environment. More research in this area may provide more concrete evidence and help to develop common design guidelines for university campuses of different sizes.

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