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The Effect of the Physical Environment on Social Interaction: The Case of Educational Campuses

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1 ABSTRACT

Social interaction is an essential component of the collegiate experience. Studies presume that the provision of appropriate space for interaction enhances its possibility. This study aims to reveal the effect of physical urban design elements on the quantity of social interaction between students on their university campuses. It takes place on the Faculty of Engineering campus in Alexandria University. Student questionnaires investigate students' sense of ownership, their satisfaction with their current campus and the features that would make them spend more time on campus. Furthermore, they reveal common movement patterns around campus throughout a standard day, and highlight the common gathering spaces. The on-site observation investigates the urban design components of these spaces. Based on the space syntax theory, which proposes that movement can be a good predictor for social encounters, the results are compared with integration and choice analyses maps along with the physical setting for each gathering space. From this analysis, the physical elements with the highest influence on social interaction are determined and modifications are recommended to the current campus setting. Students were found to be walking the routes that showed high integration values in the space syntax analysis and that these routes were also used for their gatherings. The result will help design better campuses in the future or alter current designs to enhance social interaction. Further research seeks to validate the results by applying the study on more campuses in Egyptian universities.

Keywords: University Campus, Design Elements, Social Interaction, College, Urban Design

2 INTRODUCTION

Time has demonstrated many examples of well-designed spaces, which gained them the privilege of being "places" (Gehl, 1987; Whyte, 1980). Generating chances for social interaction in its many forms is one of the essential goals for most well-designed spaces. The higher the opportunity for social interaction, the more diverse relationships are bound to be established. Social connectedness is then shaped leading to a higher sense of community and belonging. The sense of belonging to a community is seen to be a life motivator and a catalyst for happiness and health. Consequently, this sense of belonging is transferred from the community to the place (Hall, 2014; The Fullframe Initiative, 2013).

Every urban setting has its own identity and characteristics. However, social interaction is mostly essential to all settings. In educational settings, social interaction can be regarded as a necessity. Expanding the circle of relationships and making more contacts with people is one of the main purposes for most university students. University campuses provide three of the most important catalysts for interaction mentioned by Sears, Peplau, & Taylor (1991): similarity, familiarity and physical proximity.

The study aims to reveal the effect of physical urban design elements on university campuses on social interaction between students. It utilizes on-site observation, student questionnaires, and space syntax analysis to reach its objective. The research is carried out on the Faculty of Engineering campus in Alexandria University. It is a part of a more comprehensive plan to study the same factors on two other campuses in Egypt. All three campuses have common attributes being that they belong to a faculty of engineering in a public Egyptian university and that each is dedicated only for that faculty and not a multidiscipline campus.

3 PHYSICAL SOCIAL EXPERIENCE

3.1 Social Interaction

Interpersonal Attraction or Liking is a process where people are bound to approach and interact with each other upon formulating a positive attitude towards each other (Aron & Lewandowski, 2001). In addition to personal characteristics, research suggests that other factors such as similarity, familiarity and physical

ISBN 978-3-9504173-8-8 (CD), 978-3-9504173-9-5 (print)
Editors: Manfred SCHRENK, Vasily V. POPOVICH, Peter ZEILE, Pietro ELISEI, Clemens BEYER, Judith RYSER, Christa REICHER, Canan ÇELIK

proximity are great contributors to interpersonal attraction (Aron & Lewandowski, 2001; Freedman, Carlsmith, & Sears, 1974; Harvey & Omarzu, 1998; Sears, Peplau, & Taylor, 1991). Most of these factors are considered interrelating and can or have to be affected by the physical environment. Sears et al. (1991) explain similarity as when people tend to have common interests, backgrounds, goals or personality. Familiarity is built upon the repeated exposure to a certain person. It increases preference to that person and likeability. People who live, study and work in the same place, are usually exposed to the same others due to physical proximity.

Social relations between strangers can be categorized into passive and active relations (Aelbrecht, 2016). On one hand, the unplanned unintentional encounter of people is considered a passive social interaction (Abu-Ghazzeh, 1999; Kuper, 1953). On the other hand, active interactions involve a conversation between two or more people and occurs on many levels which are transformational and have a fluid nature (Lofland, 1998). The repeated passive interactions can be transformed into active ones, based on the three previously explained concepts of similarity, familiarity and physical proximity. Additionally, in (Abu-Ghazzeh, 1999), Fleming, Baum, and Singer (1985) suggest that opportunity for contact, proximity to others and the appropriate space to interact enhance the possibility for social interaction.

In the higher education environments where campuses are dedicated for one single faculty/discipline, students could have similar or interconnected fields of studies, which delivers the concept of similarity in one of its forms. Students are daily exposed to each other on campus, building up familiarity. And since the students are on the same campus, physical proximity is definite which provides a solid base for interaction. The provision of chances to interact and a physical environment which supports engagement, students will be encouraged to interact frequently and regularly. Higher opportunities for social interactions create chances for the establishment of more diverse relationships. This results in the reinforcement of social connectedness leading to a higher sense of community and belonging which are seen to be life motivators and catalysts for happiness and health (Hall, 2014; The Fullframe Initiative, 2013).

3.2 Campus Physical Environment

Literature and previous research on the physical environment constructing urban spaces in general (Ewing, Hajrasouliha, Neckerman, Purciel-Hill, & Greene, 2015; Ewing & Handy, 2009; Gehl, 1987; Whyte, 1980) and campuses specifically (Dober, 1992; Eckert, 2012) were reviewed. Many design elements were found essential to the existence of people in spaces. The more a space is frequented the more it is transformed into a place with an identity. This existence could be transformed into frequented visits by the same or different users, which in its turn transforms the space to a place with an identity. Dober (1992) argues that placemaking and campus planning are two faces to the same coin, which expresses how important placemaking is on campuses.

The retrieved elements can be categorized into natural elements such as sun, wind and trees and man-made ones. Man-made elements comprise sitting space, food options, art items and surrounding buildings to name a few. Each of these elements can be found in many forms; For instance, sitting space be found as benches and chairs designed and placed in a space for that purpose or steps that are originally designed for movement, however serve interestingly as a sitting and gathering space. Due to technological advancement and search for constant connectivity, Wi-Fi was also considered as a design element. Although intangible, concepts such cleanliness and safety are effective in people's comfort and existence in spaces.

The literature describing and analyzing American campuses (Dober, 1992, 1996) show critical differences between those campuses and many of public and private universities campuses in Egypt. These differences include access hours to campus buildings and landscape, personnel allowed on campus, layout, life on campus in general to list just a few. All of which could be crucial factors to the student's lifestyle, and perception of his university.

4 METHODOLOGY

The study aims to reveal the effect of physical urban design elements on social interaction between students on university campuses. The study utilizes many methods to achieve its aim such as on-site observation, student questionnaires and the use of software programs to graphically represent data. To construct the basis for the on-site observation and student questionnaires, a literature review was carried out to reveal the physical elements discussed in previous research. Data collection is done through handout student

questionnaires. In some cases, a short interview was held while the student was answering the questionnaire. All questionnaires were filled by the participants while on campus for more involvement and relatability to the questions.

The questionnaire was formed of two major sections. The first is mostly to collect ordinal and scale data related to each student's personal experience on campus. The second is a faculty campus map where students were asked to draw paths and nodes. On one hand, the ordinal and scale data were analyzed via the software IBM SPSS. On the other hand, the graphical data retrieved from the hand drawn paths were first transferred to Microsoft Excel as values. Each path was given an ID and a value of 1 if it had been used, and a value of 0 if not. Hence, preventing any data loss. QGIS along with AutoCAD were used to represent the maps' data digitally. The software DepthmapX was used to perform angular segment analysis based on the space syntax theory. The analysis was performed with a metric radius of 'n' relating each segment on the campus to all the other segments, to determine their to movement (integration) and through movement (choice/betweenness). The results from these analyses were then compared with the students' drawn paths.

5 CASE STUDY

5.1 Setting: Faculty of Engineering, Alexandria University

Alexandria University is a public university in the city of Alexandria, Egypt. It has multiple campuses that are either occupied by one faculty like the case of the Faculty of Engineering, or many faculties like on the Humanities and Social Sciences campus. The Faculty of Engineering campus covers an area of approximately 26 feddan and mainly consists of ten buildings built throughout the years starting 1942 (Figure 1). There are over 20,000 students enrolled in the faculty. The faculty has a five academic years study plan, where students first register in a preparatory year followed by four years in one of the faculty's main ten departments (Alexandria University Team, 2019). Specialized Scientific Programs (S.S.P) are four additional mixed discipline departments where students pay higher fees. Some students enroll in the S.S.P in search for a higher socio-economic group to be part of .

Due to security reasons, only students and affiliated personnel to the faculty are allowed on campus. This not only separates the students entirely from the street and the surrounding community, but also from other students of the same university, but in different campuses. Nevertheless, it could also create a strong identity for each faculty. The campus has gates on three different streets. Students are allowed entrance from four out of six gates yet allowed exit out of all six (Figure 1). Gates close at different times of the day which accordingly affects the students' pattern of movement on campus.

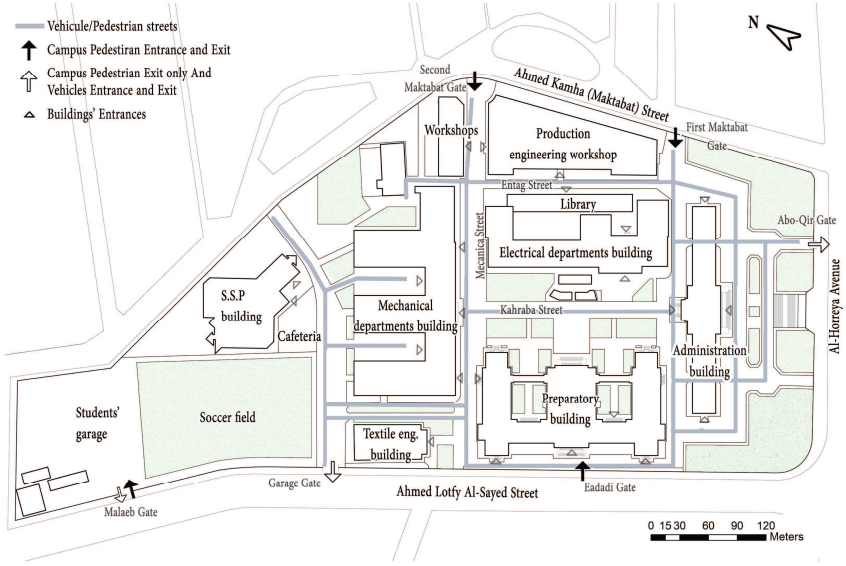

Figure 1 The Faculty of Engineering campus, Alexandria University.

Most of the streets inside the campus are shared between pedestrians and vehicles. Streets have common names between students usually based on the names of the building dominating the street. For example, the central street connecting the entrances of the Administrative building and the Mechanical departments

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building is called Kahraba (Electricity) Street, referring to the Electrical departments building standing along the street. Ahmed Kamha Street outside of the campus is also called Maktabat (Stationeries) Street, hence the naming of the gates falling on it. The street includes many stationaries in addition to some fast food outlets frequented by the students.

Existence on campus is mainly during daytime. The campus closes its gates after the last class of the day, which is usually only an hour or two into the evening. The campus does not house dormitories on its grounds. Therefore, absolutely all students have to do some sort of commuting every day. Between the main and the S.S.P. departments, the faculty holds fourteen scientific departments ranging from architectural and civil engineering, to electrical and mechanical engineering just to name a few. Many of the faculty departments house their students in only one building like the Department of Architecture. However, other departments' classes are spread out to multiple buildings. This is the case of the Specialized Scientific Programs (S.S.P). Although there is a building dedicated to these programs, students still use it in conjunction with other campus buildings.

5.2 Participants

All participants in the study were undergraduate students in the faculty. The questionnaire was handed out and explained personally to each student, especially the second part containing the map. Students gladly participated in the questionnaire once they knew it was related to their own campus, hoping the research would be future cause of improvement. A total of one hundred questionnaires were handed out. Three of the forms came back with incomplete answers and/or maps, rendering them invalid. The survey was mainly held for architecture students for the ease of communication between the researcher and the participants. The final sample was 61 percent females and 39 percent males. A total of 53.6 percent of the participants study in the Architectural Engineering Department, while 44.3 percent of them are enrolled in the Architecture and Construction program of the S.S.P, studying both architectural and civil engineering, and only 2.1 percent were participants from the Electromechanics program of the S.S.P. Students were from the first, second, third and fourth year, with a participation rate of 12, 23,34 and 28 percent respectively.

5.3 Measurements

In the survey, the demography section revealed the students' gender, academic department and year. Four intervals of time were used to determine the amount of time students take for commuting from home to campus, as well as the amount of time they spent interacting on campus while not in class, ranging from up to 15 minutes to more than 60 minutes. Students were given four choices as to where they usually spend time between lectures or after class: outdoors (between campus buildings), in a building's ground floor, in a building's upper floors, and outside the campus. Another question investigated with whom students spent time, whether alone, with one other person, in a group from the same department or in a group from different departments.

A scale of 1 to 10 (10 being the highest) was used to examine the students' sense of ownership and sense of control over what they could change on campus. The same scale was used to test the concept of familiarity, where one should be encouraged to talk to people he does not know, but whom he faces regularly. And one last time, the scale was used to test whether the students favor or avoid coincidental meetings with friends.

To evaluate the campus' physical environment quality, students were asked to indicate their level of satisfaction for sixteen urban design elements. The scale used for this evaluation included five options: being very dissatisfied, dissatisfied, neutral, satisfied or very satisfied. Survey takers were then asked to check from a list the items that would make them spend more time outdoors on campus, with an option to specify any other recommendation.

The main second part of the survey is composed of a simplified map of the faculty campus, representing the surrounding streets, gates, buildings, and green areas. The respondents were asked to draw their usual - most taken - routes from the campus entrances to their destination buildings, and mark the spots where they unintentionally run into friends. They were also asked to circle the spots where they usually hang around with friends, later referred to as hotspots. The hotspots were investigated for their physical and social setting to determine which elements would most affect social interaction presence in a space.

6 ANALYSIS AND DISCUSSION

6.1 Sense of Ownership

During the short interviews held with the students while filling out the forms, students have shown knowledge of the sense of ownership concept. On the scale of 1 to 10, the mean score for the sense of ownership is 5.84, which is slightly above average. The three highest chosen scores were 5,6 and 7 weighing 19.6, 14.4, and 14.4 percent respectively. Meanwhile, on the same scale, the mean score for the sense of capability to make changes on campus is 3.75, with the scores 1,2, and 5 as the highest three scores acquiring 21.6,17.5, and 14.4 percent respectively. A Pearson correlation analysis with a positive hypothesis assuming that the sense of ownership and the sense of capability to make changes on campus was performed. The correlation was positive and significant at the 0.05 level with a significance of 0.035.

The fact that the correlation between the sense of ownership and the sense of capability to make changes on campus was significant, means that enabling students could increase their sense of ownership. The more students are supported to make positive changes, the more they will feel like they have to preserve their environment and make it better, which in turn makes them feel like they belong to that place. Simple features such as the existence of movable furniture or dedicated gathering spots with flexible settings could prove useful. Nevertheless, the results show that the sense of ownership was slightly above average while the capability of making changes on campus was remarkably below average. This shows that other factors play a role in the students' sense of ownership. It is worth mentioning and examining that one of the gravest problems that could be facing students might be the difficulty of issuing permissions to participate in or initiate their desired activities on campus.

6.2 Familiarity

Familiarity was tested with ratings from 1 to 10 with a question about how much students are encouraged to talk to people they do not know that they face regularly on campus. The result gave a median of 5.28 which is below average. Using independent t-tests, it was found that there is no significant difference between males and females, nor between students enrolled in the general architecture program and the ones enrolled in the Architecture and Construction Specialized Scientific Program. Meaning all faculty students similarly are less prone to interact with people they do not know even if they see them regularly.

It was assumed that the time students spend in commuting would affect how long they would stay on campus after class, supposing students who spend less time in transport would have more time to spend on campus. A Spearman correlation test was conducted with a negative correlation hypothesis. The result produced was insignificant at 0.05 proving no correlation.

6.3 Time Measurements

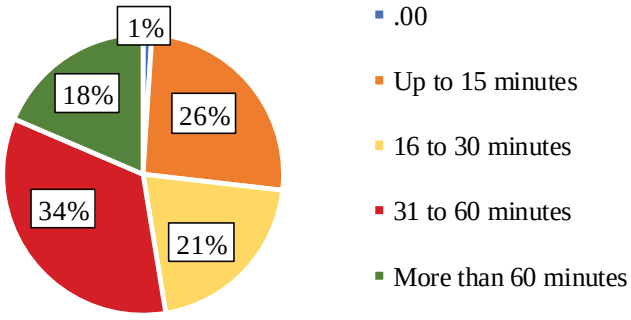

Figure 2 Time spent after class on campus based on 97 students.

Figure 2 shows the percentage of participants based on the time they spend on the campus' outdoors after class, whether socializing, studying, playing, or participating in activities on campus. There appears to be no clear distinction between the intervals. Nevertheless, the highest share with 34 percent was for students who spend more between 30 and 60 minutes on campus. This period comprises between 8 and 14 percent of their daily existence in the faculty, with classes assumed to occupy 6 hours of the day.

A Spearman correlation test was conducted to examine the probable association between the time students spend on campus and their satisfaction of the campus physical environment. The result showed a significant

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correlation at the 0.05 level. Therefore, the more students are satisfied with their campus the more time they will spend on it. This proves that the physical environment has a positive effect on students' presence on campus.

The relationship between the time students spend commuting and the time they spend interacting on campus everyday could be truly insignificant but some other factors could be affecting it. An example for these factors could be that some students who live further could be spending more time on campus to avoid the rush hour. Another considerable factor could be the question form in the questionnaire itself not giving accurate results because it asked students how long it takes them to get from home to campus not the opposite.

6.4 Campus Physical Elements

The overall mean satisfaction with the campus physical environment is 2.73 on the scale from 1 to 5 (1 being very dissatisfied, and 5 being very satisfied) which shows students' dissatisfaction with their physical environment. It is worth mentioning that the option 'neutral' in the questionnaire was either used if the respondent wanted to give an intermediate answer between satisfied and dissatisfied or if the item being rated was not of relevant importance to their personal experience. Table 1 displays the mean result for each of the sixteen examined elements. The elements with the highest satisfaction rate are highlighted in green while the ones with the lowest are highlighted in red.

Campus physical elements	Mean Satisfaction Score (1 to 5 Scale)
Amount of open accessible green spaces	3.39
Amount of trees on campus	3.72
Amount of art items	2.35
Amount of meeting spaces	2.79
Amount of benches	2.68
Quality of benches	2.06
Amount and quality of sitting places in general (e.g., steps)	2.70
Amount of trash bins	3.14
Sidewalks (Safe walking away from vehicles)	3.25
Food options	1.63
Sports fields	2.19
Changing rooms associated to sports	1.70
Attractiveness of buildings' design	3.40
Cleanliness of campus	3.16
Safety of campus	3.33
Campus WI-FI	2.16
Overall	2.73

Table 1 Campus physical elements mean satisfaction scores from students' questionnaires.

Only a few campus features were awarded a score above neutrality. On one hand, the three highest scores were given to the campus landscape and buildings' design, which basically establish the campus physical environment. On the other hand, students were most dissatisfied with the food options on campus. In his book, "The Social Life of the Small Urban Spaces", Whyte (1980) argues that food is an essential element to a lively social life. This is proven drastically in the survey part where students are asked to choose from a list of elements that would make them spend more time on campus (Table 2). On the investigated campus, two of the elements were expected to have a very low score for their non-existence, these elements being art items and changing rooms associated with sports.

The results shown in Table 2 are for the query where students were requested to check all the elements would make them spend more time outdoors on campus from a list. Normally, the percent of cases would relate the N (Number of students choosing the element) to the entire 97 valid questionnaires. However, three questionnaire takers did not pick any answers, making the valid surveys only 94 for this question. The three most desired elements that, in their opinion, would enhance the students' experience on campus are food and drink options, access to Wi-Fi, and shaded seating.

Desired campus elements	Responses		Percent of Cases
	N	Percent	
Open green spaces	54	12.1%	57.4%
Food and drink options (Cafeterias/Restaurants)	76	17.0%	80.9%
Shaded benches/seating (Under trees or sheds)	64	14.3%	68.1%
Outdoor tables for studying or meeting	55	12.3%	58.5%
Sports Fields	14	3.1%	14.9%
Sports changing rooms	7	1.6%	7.4%
Access to WI-FI	67	15.0%	71.3%
Electrical outlets	36	8.1%	38.3%
A clean campus	44	9.9%	46.8%
Activities on campus	21	4.7%	22.3%
Other	8	1.8%	8.5%
Total	446	100.0%	474.5%

Table 2 Campus physical elements that 97 students stated would make them spend more time on campus.

6.5 Movement paths and Gathering spaces

6.5.1 Current movement paths

The paths routinely used were drawn manually on a map handed out as part of the questionnaire. The respondents' illustrations varied from one direct route from a gate to a specific building used for both their entrance and exit to more complex routes going through many of the campus' streets. The paths drawn in the 97 valid questionnaires were agglomerated into one map showing the most and least frequented routes (Figure 3 - Left). The same was done for the spaces students circled as the spots where they gathered to hang around (Figure 3 - Right). Classification of paths and gathering spaces was done according to the natural breaks method. Paths were given letters and nodes determining their start and end, while gathering spaces (G.s.) were given Roman numerals.

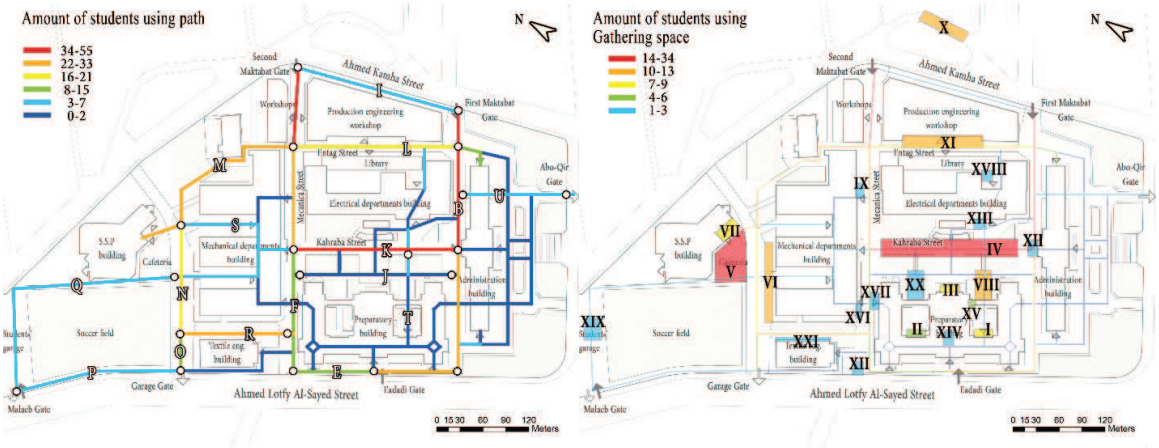

Figure 3 (Left) Students current movement based on the questionnaire. (Right) Current gathering spaces as indicated by the surveyed students.

Figure 4 (left) Kahraba Street [Path K and Gathering space IV], (middle) Entag Street [Path L and Gathering space XI], (right) Mecanica Street [Path F, G and H]

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Figure 5 (left) Gathering space VIII, (middle) Gathering space X, (left) Gathering space

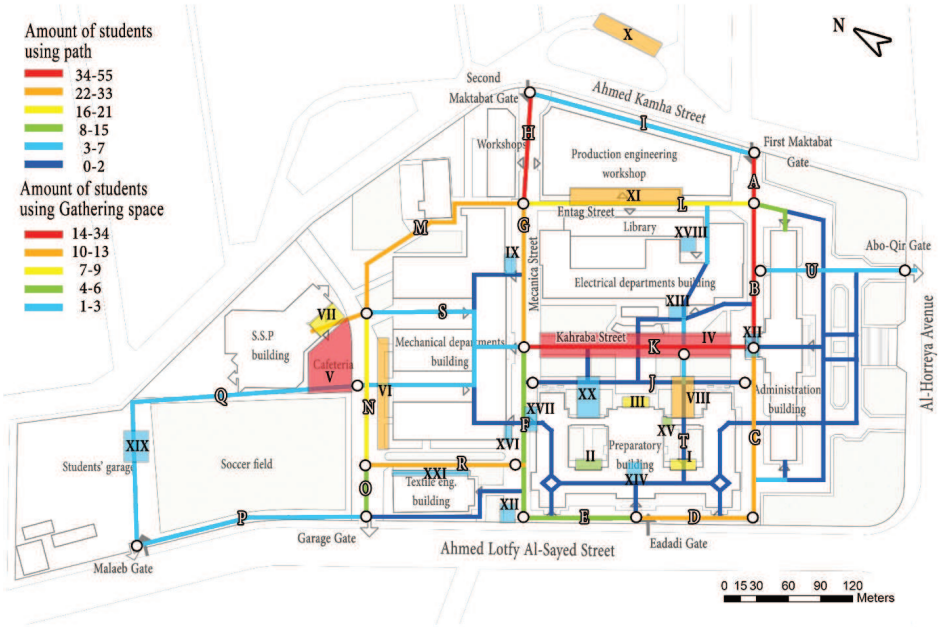

Figure 6 Students current movement paths and gathering spaces.

The Architectural Department to whom half the respondents belong to is housed in the Administration building. While the S.S.P. Architecture and Construction students (44.3 percent of the sample) travel mainly between the administrative building and the S.S.P. building, with some of their courses being in the Electrical departments building and Preparatory building as well.

The fact that the Administration building is the most used by the sampled students explains the intensity of movement in Paths A and B being the shortest route from any of the entrances to the building. Some movement can also be spotted from Path A to the side entrance of the destination. Another frequently used is Path H, distributing and gathering its movement to and from Path H, G and M. It has been previously stated that students are not allowed entrance from all gates. It is also worth noting that some gates close earlier than others. During the interviews, students expressed that they exit through the Second Maktabat gate when the First is closed, which explains some of the movement on Path H and also L. The intense activity on the eastern side of the campus can also be explained by the existence of the stationaries and restaurants outside the campus on that side.

Kahraba Street (Path K) was one of the most walked paths. It is considered among students to be the main campus street. It's been already shown that a large number of students sit along that street and that is considered an important gathering space (Figure 3 - Right). During the questionnaire, students were asked whether they prefer to walk in spaces where there is a higher chance of meeting a friend. They were asked to rate this preference on a scale of 1 to 10. The mean result was 6.85, which sheds more light on the frequented use of that path.

Three of the campus' buildings have their main entrance on that street which can also be used to justify the high movement as well as it being an important gathering space as shown in Figure 6. When examined for its urban design features, Kahraba Street (G.S IV) got a score of 7 which is considerably and only surpassed by Entag Street (G.s. XI) with a score of 8 (Figure 7). Both streets along with Mecanica Street which was also one of the highest walked paths can be seen in Figure 4.

It can be noticed that gathering spaces with high numbers of occupiers fall either on a path with a high movement rate or at least near one as is the case with Gathering spaces IV, V, VIII, and XI.

Urban design features		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	XXII	Score (22)
Green Space		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	0
Around landscape elements		●	●	○	●	○	●	○	●	●	●	●	●	○	○	●	●	○	○	○	●	●	○	13
Art Items		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	0
Formal or Informal Meeting Space		●	●	●	○	●	○	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	5
Sitting Spaces	Benches/Chairs	○	○	○	●	●	●	○	●	○	○	●	○	○	○	○	○	○	○	○	●	○	○	6
	or Stairs/Ledges	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	○	○	●	●	●	20
Trash bins		○	○	○	●	○	●	○	●	●	○	●	○	●	○	○	●	○	○	○	●	○	○	8
Food options		○	○	○	○	●	○	○	○	○	●	○	○	○	○	○	○	○	○	○	○	○	○	2
Wi-fi Coverage		●	●	●	●	○	○	○	●	●	○	●	○	●	●	●	●	●	●	○	●	○	●	15
Shade		●	●	○	●	●	●	○	●	●	●	●	●	○	●	●	●	●	●	○	●	●	○	17
On one of the most used movement paths		○	○	○	●	●	●	●	○	●	○	●	○	○	○	○	●	●	○	○	○	●	●	10
Score (11)		5	5	3	7	6	6	2	6	6	4	8	3	3	3	4	6	4	2	0	6	4	3	

Figure 7 Gathering spaces urban design features.

According to Figure 7, which investigates the urban design elements in the students' choices for hanging around, the existence of somewhere to sit no matter its quality or form proved to be the most important feature in gathering spaces. Since the weather in Alexandria is usually sunny and hot during a long period of the academic year, the provision of shade has come second with a score of 17 out of 22. Although Wi-fi coverage came third, it might not actually be used since Wi-fi got a really low mean satisfaction score from students shown in Table 1. Spaces that had 6 or more out of 11 investigated urban design features were usually also the spaces students used most often to hang around and interact. This is proven in Gathering spots IV,V,VI,VIII,and XI. Although space X scored only 4, it has a considerably high activity, this is because it has food outlets, which are scarce on campus. It had previously been discussed that food options are the most asked for requirement for spending time in a place.

6.5.2 Space Syntax angular segment analysis

In the space syntax theory, spaces and streets could be ranked from most integrated to most segregated based on the Integration analysis. The more integrated a space or a street is the more likely it is to be a destination location for it is easier to reach from/closer to all other spaces or streets (Hillier, 2007). Research in different cultural settings, scales and environments have shown a clear correlation between the integration of a street and the number of people using it (Bafna, 2003). Another analysis is the Choice analysis (Betweenness) that shows how much a street could be used as the shortest path from and to all other streets, predicting through movement in that street or space (Al-Sayed, 2018). Segment maps are used for finer grained representation where each segment/street is defined by its intersection points with surrounding streets rather than axial maps where streets are represented as continuous lines based on the longest line of sight.

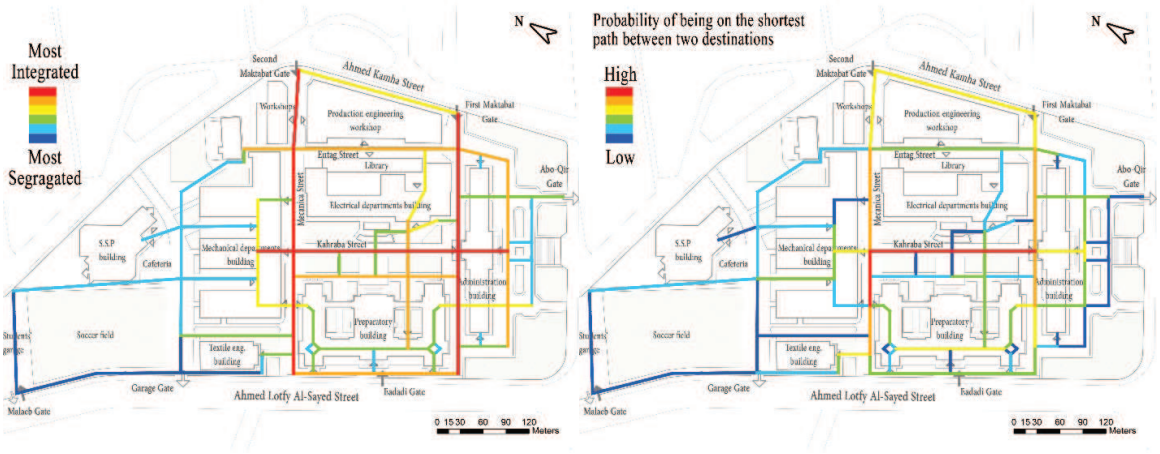

Figure 8 (Left) Space syntax segment Integration map. (Right) Space syntax segment Choice (Betweenness) map.

Comparing between the integration and the choice (Betweenness) maps, the integration map displays a closer result to the routes actually used by the students. It is mainly because the choice map measures the shortest

ISBN 978-3-9504173-8-8 (CD), 978-3-9504173-9-5 (print)
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paths from each segment to its surrounding ones. While a truer representation would have examined the shorter paths from the segments on the edges of the map to all other segments since students were asked to draw their paths from entrances to destination buildings.

According to both Integration (Figure 8 – Left) and Choice (Figure 8 – Right) analyses, Kahraba Street (Path K) shows the highest values, predicting that it will be home to the highest both to and through movement. The model was indeed proven accurate according to the left of Figure 3 which represents the actual movement. The integration analysis has shown an adequate correlation with the actual current investigation predicting high movement patterns on many other paths such as Path A, B, C and D. This shows their connectedness to the system and ease of movement in these paths.

On the actual movement map, Path M - connecting between Mecanica Street and the S.S.P. building - shows a high movement rate. This activity was unmatched in neither the integration nor the choice analyses. That unrelatedness could be due to the many turns one has to make on that path, which lowers its integration value. This path is usually walked by S.S.P. students as it is the shortest path from an accessible gate to their building.

7 CONCLUSION AND RECOMMENDATION

The study of movement on campus supported by the investigation of gathering spaces is essential to understanding students' needs. Providing students with a proper physical environment to interact will draw them to spend more time on campus. In this study, movement results cannot be generalized on the whole campus because the study was mainly focused on architecture students which restricts their movement to two buildings. However, these two buildings sit on two ends of the campus which stretched the movement patterns along the whole campus area. It was found that students that are more satisfied with the campus' features are bound to spend more time interacting with others. Students were found dissatisfied with their campus physical environment in the Faculty of Engineering in Alexandria University, which in turn affects their sense of ownership, sense of capability of making change, and most definitely the time they spend on campus.

Gathering spaces with more urban design features were found to be more attractive to students. Sitting spaces were found to be a common feature between almost all the gathering spaces. Food and drinks options are most required on the studied campus as they were found to be a very attractive element to students. They were also voted to be the most important factor for students spending more time in a place. Although the cafeteria is considerably far from the campus' main axis revealed from students' movement and space syntax analysis, it still had high activity. Which in turn proposes that providing students with an activity center where multiple food options are available at the far northern end of the campus could expand the movement patterns and increase its dynamic.

Space syntax analysis has proven useful in small urban places such as the investigated campus to predict and determine the most important movement paths. The campus' formal arrangement of buildings could have been an important factor in the successful prediction. The axis created from this arrangement in the center of the campus was found to be the most active movement path and gathering space. The existence of alternative streets for vehicles could be a motivator to turn this street into a pedestrian only street. Implementing ideas envisioned by the students for such a spine to fit their needs will enhance their sense of ownership and belonging.

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