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STUDENTS' PREFERENCES FOR SITTING PATTERNS OF UNIVERSITY CAMPUSES

Ahmad Hami[1*], Maryam Bayat[1], Naser Bayat[2]
[1]Landscape Engineering Department, Faculty of Agriculture, University of Tabriz
[2]Faculty of Command and Staff, Amin Police University, Tehran

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ABSTRACT

The main aim of the present research was to recognize the different types of sitting patterns in the academic campus. The data were collected via simulated photo-survey, and SPSS software was employed for the analysis procedure using descriptive analysis, explorative analysis, chi-square, and clustering methods. Recreation (n= 247), Social interactions (n= 243), and study (n= 165) were the most repeated activities in university campuses. From the results, circular (mean= 3.80), followed by Homolographic and Regular (3.50), and rectangular (mean= 3.40), irregular (mean= 3.10), and partial circle (mean= 3.10) were the most preferred sitting pattern on the campus. In addition, the clustering analysis bared that in three clusters students prefer to use the circular sitting pattern for leisure purposes. These findings can be used to better designing of university campus. Also, sitting tables and gathering spaces forms might be designed using the finding of the study.

1. INTRODUCTION

Performance of an academic campus will be good when it supports students' preferences (Wang and Han, 2021). Green spaces and parks are important public spaces for relaxing and having fun. Most people tend to spend their leisure time sitting with others in a social gathering in public spaces (Luximon et al., 2015). The features of elements in urban parks can play an important role in citizens' decision to choose a place to sit. For example, in parks, around the pools are the most important spaces that citizens choose to sit (Hami et al., 2014). The quality and quantity of green spaces in university campuses are effective factors on vitality of educational open spaces (Wang, et al., 2021). These places play a crucial role in improving the environment and apparent beautification of universities and faculties and create a dynamic realm for social interaction of the academic community, especially students. The design quality of the composing elements in these spaces such as facilities (Ellis & Goodyear, 2016) affects their quality and attraction (Zhang et al., 2013). Give the educational performance of universities and sociological and demographic specificities of the academic community, which is dominated by young groups (Viebahn, 2002), the design of academic campus furniture requires following a special pattern based on different social and geographical conditions. Routine and inflexible design of green space furniture, especially in academic environments, results in a limitation of sitting pattern and consequently reducing people's satisfaction (Luximon et al., 2015).

Different methods have been used to recognize various sitting patterns in urban parks and public places. Most of the research results indicate the significant role of social and cultural variables, interaction and communion methods, and group leadership in sitting patterns. Sommer (1967) analyzed individuals' tendencies and behavioral patterns based on the sitting pattern around a table. He evaluated the effect of sitting position on an individual's role, such as talkativeness, persuasiveness, dominance, leadership, self-confidence, and awareness. Circular, linear, arc-shaped, semi-circular, U-shaped, triangular, rectangular, and a mix of other geometric shapes are the best-known shapes of sitting in green spaces (Luximon et al., 2015). The quality and quantity of sitting pattern-based furniture require understanding the users' behavior in various green spaces, including educational-academic spaces. The main aim of the present research is to recognize the different types of sitting patterns and analyze them on the academic campus. The present research results can be helpful in designing campus furniture and develop social relationships and students' comforts.

*Corresponding author: hami@tabrizu.ac.ir

1.1 Literature Review

Few studies have evaluated the individuals' behavior in choosing the sitting pattern in a public place, and the recognition of patterns in this field has been less considered. Besides, most of the findings and results of the research have been limited to places such as halls, public places, and urban squares (Carstensdottir et al., 2011). Moreover, only a few pieces of research have been conducted on behavioral patterns in choosing the sitting pattern in public open spaces, and there is a lack of research about university campuses. Here, the most important research that deals directly and indirectly with the subject of research is presented.

Luximon et al. (2015) aimed to recognize users' priorities in Hong Kong's urban parks to predict their sitting pattern. They found that although the park benches were designed for more people, the visitors preferred to sit on the ground to have face-to-face interaction and direct eye contact. To have more natural and deep interactions, individuals decreased the distance by changing the sitting pattern from linear to circular. As the number of people in the groups increased, the tendency towards the circular patterns was increased, and sometimes, integrated patterns could be formed. Luximon et al. (2015) also indicated that a circular or flexible sitting pattern could be appropriate for urban furniture design. Today, since in many urban parks, linear bench pattern is used, which does not meet the users need, the circular and other geometrical patterns can help the environmental dynamization of social interaction in green spaces and raise the level of citizens' satisfaction by providing a good platform for in-group interaction. Based on the findings of Luximon et al. (2015), the sitting patterns are divided into four types, including linear, arc-shaped, circular, and integrated patterns. The linear pattern means that individuals sit in a line and look forward. This pattern is selected when people not only want to communicate but also enjoy the green landscape. "Arc" pattern as a part of a circle and is a tendency from linear to the circular pattern, which results in making eye contact. In circular form, individuals make a circle form together.

Rutherford (2006) suggests citizens' sense of belonging and a strong sense of spaces to urban parks as fundamental sustainability issues. He also believed in the key role of proper design of urban parks' elements, which met the needs of citizens, in attaining desired goals. In this regard, urban parks furniture was considered as one of the most important and effective components. In the case of providing different sitting patterns for urban park furniture, citizens' sense of belonging to such public spaces would be increased. Movable and flexible seats and benches were suggested as a good option to meet the needs of a variety of social groups needs because they could help citizens adjust their sitting patterns in line with their needs. The other study investigated the citizens' behavior to choice sitting patterns in parks and city squares (Whyte, 1988). Whyte found that locating movable seats and enough benches with a variety of arrangements and designs could meet the needs of citizens. Besides, in his study, locating part of the public space furniture under the canopy spaces and creating cozy furnishings for the comfort of the citizens is proposed as other options for increasing the efficiency of sitting patterns in urban parks and squares.

Another study aimed to recognize citizens' behavior in choosing seating positions in public spaces (Carstensdottir et al., 2011). According to field observations, an algorithm was designed for the simulation of sitting patterns. The results indicated the effect of different factors such as the number of people, group combination, bench position, and personality of individuals on choosing a sitting pattern. Besides, the value of a bench or seat in the choice of sitting place depends on two factors: 1) location of the seat in an environment or public space (a seat around the considered environment is better than a seat in the center of that place); 2) size and the number of bench or seat. Carstensdottir et al. (2011) also indicated that the other factors such as the distance of seats from each other, landscape, micro-climate (Sunbathing or having a canopy), distance from the entrance, the way of occupying the space by other users, access status, and presence of family and friends. This research aimed to reduce the realism of virtual space by designing virtual spaces based on principles and rules governing acute spaces. It should be noted that the results of this research could be used to design the public spaces.

Some researchers studied the effect of sitting positions on the behavioral pattern of individuals. Strodbeck and Hook (1961) demonstrated that people, who occupy terminal positions, speak more than others and play an important role in decision-making. In general, based on the empirical and theoretical achievements of conducted research on the field sitting patterns in public green spaces, one can say citizens as users of public spaces, including green spaces, urban parks, public areas, such as university campuses, have different behavioral patterns in choosing a sitting pattern. These patterns can be influenced by factors such as personality traits, the nature of the group, the number of people in the group, the subject of communication and group interactions, the location of the furniture, and the quantity and quality of its components (such as tables and chairs and benches). However, no significant research has ever been done to identify sitting patterns in educational and academic spaces. Studying the sitting patterns in public and semi-public spaces such as universities has not been performed in Iran. Therefore, the University of Tabriz was selected as the study area to know the sitting patterns in the open space. Moreover, the research method is described in the methodology section.

2. METHOD

Tabriz University, is a green university, with an approximate area of 275 hectares, is located in the eastern part of Tabriz city. Northern parts of the main campus are called as a "botanical garden." The southern part of the university campus is divided into two areas by the construction of Tabriz Ring Road; however, they are connected through an overpass. Currently, the total area allocated to the buildings and educational spaces of the University is about 323.895 m2. The campus of Tabriz University is considered to have the best

green area and quality among Iran's universities, and in the urban context of Tabriz, it has the largest green area among public and private organizations, which is about 100 hectares (Figure 1).

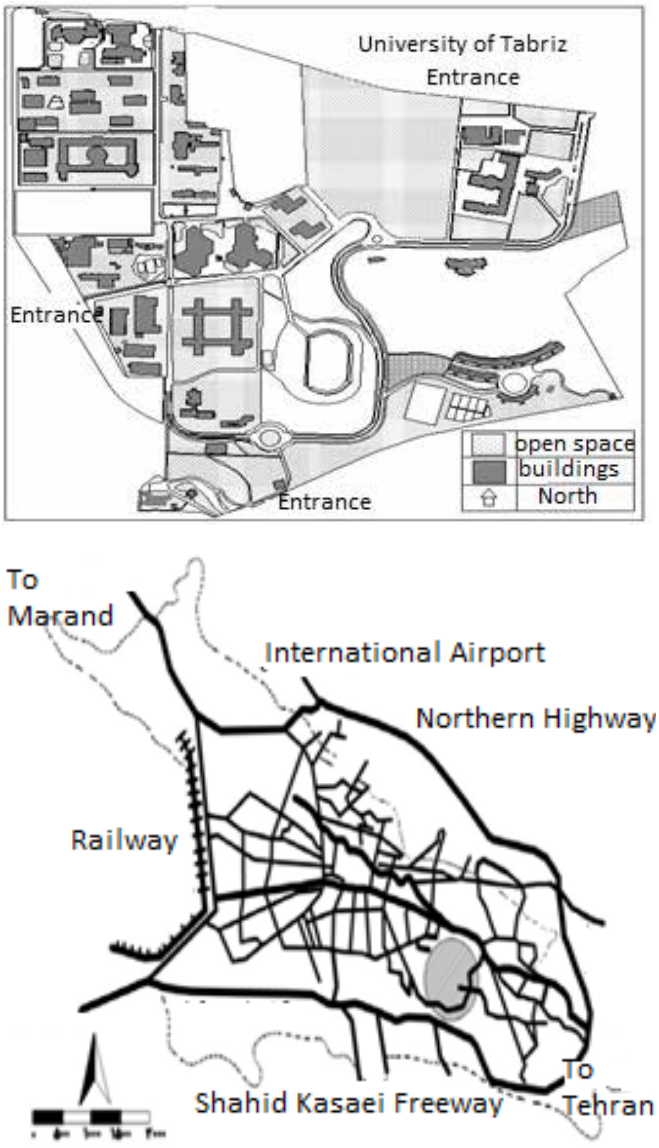

***Figure 1**: Location of University of Tabriz in the city (Left); University of Tabriz plan (Right)*

In the present practical-quantitative study, a questionnaire containing 35 questions was used. The questionnaire included three sections as follows: The first section contained demographic information of respondents such as gender, age, marital status, level of education, grade, place of residence, and language; the second section included three questions about the usage of the campus of the University of Tabriz; the third section evaluated the preferences of the campus users to use different proposed sitting patterns. Therefore, the various sitting pattern in the form of double and eight-seater patterns was designed by Photoshop and AutoCAD 2017 (Figure 2).

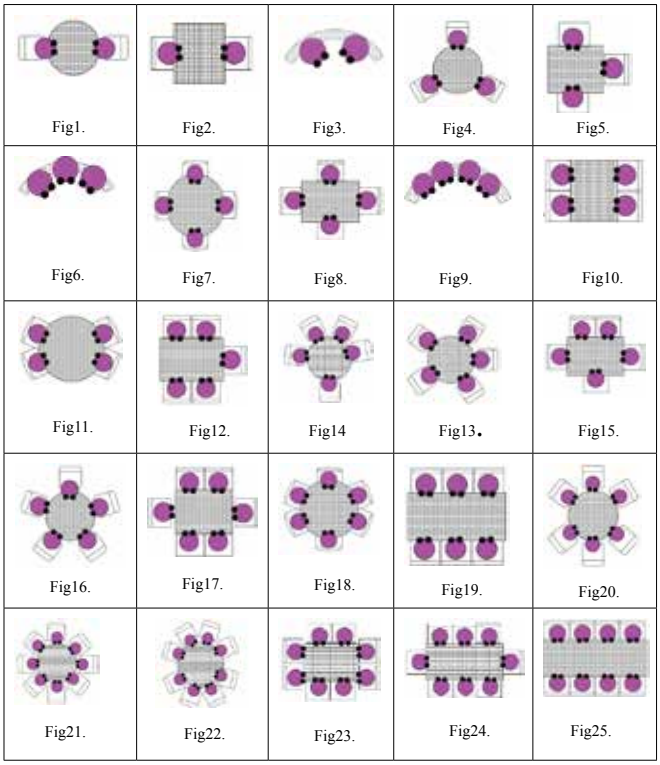

***Figure 2**: Types of group seating positions*

In order to prepare the images, 30 sitting patterns were designed by AutoCAD 2017, and then 20 common patterns (circular, linear, arc, square, and rectangular form) were selected to design the image questions of the questionnaire. The designed patterns were measured using a five-point Likert scale (1= completely disagree, 2= disagree, 3= do not have any idea, 4= agree, 5= completely agree).

The statistical population of the present study involved all students in the University of Tabriz. Mitra and Lankford Formula were used to calculate the sample size of the survey. Altogether, 280 students were selected to participate in the survey using Mitra and Lankford Formula (1999), where n = the number of questionable populations, e = deviation from the criterion (sampling error), and p = number of the statistical population without specific attribute and its value is 50%. According to this formula, the maximum standard deviation is ≤0.05. In addition, a random sampling method was used to pick up the participants. The present study's field study and data collection were performed for eight months (mid-April until mid-December 2017). In each month, 35 questionnaires were collected at different hours, and finally, 280 questionnaires were obtained. Among the collected questionnaires, due to the corruption of the data on 5 cases, 275 questionnaires were analyzed. In order to analyze the collected data, SPSS V20 software and descriptive statistical methods such as frequency, descriptive statistics, factor analysis, and clustering methods were used.

In the first step, the descriptive characteristics table of the samples was provided using descriptive statistics. Then, exploratory factor analysis in the form of principal component analysis (PCA) was used to analyze 25 questions about the student's preference for selecting

the sitting pattern in the study area. Therefore, their classification as the subsets of various factors was possible by correlating the students' preferences. Next, Kaiser-Meyer-Olkin's measure of sampling adequacy was used to ensure that the data were suitable for factor analysis. In this analysis, a specific value of more than one and a factor load of more than 0.4 were the basis of factor extraction. Varimax rotation method was also used to factor rotation. Then, Cronbach's alpha coefficient was calculated separately for each extracted factor to measure the validity and internal correlation. The factor scores of each sample in the identified factors (factor analysis stage) were used as composite variables for the segmentation of the respondents using cluster analysis. Accordingly, in order to determine the optimal and accurate number of clusters, hierarchical cluster analysis in the form of the Ward method was introduced in the method. Then, according to the accumulation coefficient and dendrogram hierarchical clustering diagram, 5 clusters were identified. Next, the K-means clustering method was used to segment the samples into five clusters. One-way analysis of variance was also used to recognize the significant difference between clusters. At the end of this step, the diagnostic analysis test was used to find out the accuracy of conducted segmentation. Finally, Chi-square was used to understand the relationship between students' demographic variables and respondents' willingness and position in the sample's clustering.

3. RESULTS

The present research findings were divided into two sections; the first section included the descriptive findings based on the frequency and mean average of respondents' characteristics, usage of the green campus, and the ranking of sitting patterns. The second section was related to the results of analytical and comparative analysis.

1.1 Characteristics of respondents

The below table describes respondents' characteristics such as age, gender, education, marital status, residence, and ethnicity.

***Table 1**: The demographic profile of the participants*

Variables		Count	Percent
Age	19≤	49	17/8
	20-29	218	79/3
	30-39	8	2/9
Gender	Male	171	62/2
	Female	104	37/8
Education	Bachelor	152	55/3
	Master	119	43/3
	PhD	4	1/3
Marital status	Single	228	82/9
	Married	47	17/1
Residence	Dormitory	75.3	207
	With Family	24.7	68
Ethnicity	Kurdish	36	13/1
	Turkish	157	57/1
	Persian	82	29/8

The priority of students in using the university campus

There were three questions about green campus usage, which are explained n table 2.

***Table 2:** Usage priority of the green campus*

Questions	Answer	Count	Percent
Use of university campus for recreation and entertainment	**Yes**	**247**	**89/8**
	No	25	9/1
Use of university campus social interaction and communication	**Yes**	**243**	**88/4**
	No	34	11/3
university campus to study Use of	**Yes**	**160**	**58/2**
	No	115	41/8

Based on the descriptive results, Figure 14 (mean = 4.1, SD = 0.90), Figure 18 (mean = 4.1, SD = 0.86), Figure 7 (mean = 4.00, SD = 1.01), and Figure 4 (mean = 3.9, SD = 1.01) received the highest priority from the participants. However, the lowest priority was given to Figures 12 (mean = 3.1, SD = 1.30), 6 (mean = 3.00, SD = 1.31), 9 (mean = 2.80, SD = 1.30), and 13 (mean = 2.71, SD = 1.37) (See Figure 3).

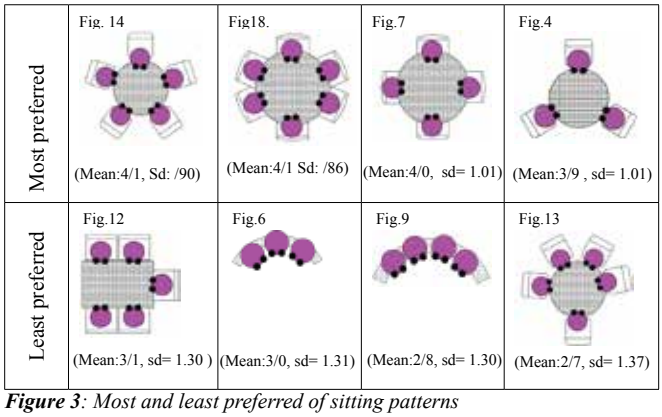

***Figure 3**: Most and least preferred of sitting patterns*

1.2 Seating patterns and principal components analysis

In the first step, to ensure that the sampling is enough and to identify the suitability of the data for performing factor analysis, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy was employed. This index was 0.762 with a P level of 0.001, which showed the suitability of the data for performing factor analysis (Table 3). The exploratory factor analysis was performed using 25 seating patterns with a specific value higher than one and a factor load greater than 0.4. The findings from this process include 60.66% of the total variance. Accordingly, a rotational factor matrix was created based on five factors with a specific value greater than 1. Then to measure the validity and internal correlation of the extracted factors, Cronbach's alpha coefficient was calculated for five factors, which results from 0.78 to 0.71 variables and shows the reliability of all factors.

***Table 3**: KMO and Bartlett's Test*

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0/762
Bartlett's Test of Sphericity	Approx. Chi-Square	2082/63
	Df	300
	Sig.	0/00

The reliability coefficient of 0.71 included five sitting patterns (Figure 4). Besides, as seen in figure 4, the circular pattern with a mean of 3.87 was the most preferred sitting position followed by symmetrical (M=3.58), rectangular (M=3.43), irregular (M=3.19), and partial circle (M=3.12), respectively. The components of each sitting position are shown in figure 4.

Rectangular (Mean= 3.43, α = 0.78)	Fig23. Mean:3/7 Sd:1/1	Fi19 Mean:3/7 d:1/1	Fig17. Mean:3/6 Sd:1/12	Fig10. Mean:3/6 Sd:1/05	Fig24. Mean:3/5 Sd:1/2	Fig25. Mean:3/5 Sd:1/1
Circular (Mean= 3.87, α = 0.76)	Fig16. Mean:4/1 Sd: /90	Fig18. Mean:4/1 Sd: /86	Fig20. Mean:3/9 Sd: /97	Fig21. Mean:3/7 Sd: 1/11	Fig22. Mean:3/5 Sd: 1/05	
Homolographic & Regular (mean= 3.58, α = 0.75)	Fig7. Mean:4/0 Sd:1/0	Fig4. Mean:3/9 Sd: 1/0	Fig8. Mean:3/8 Sd: /98	Fig2. Mean:3/4 Sd:1/2: 1/2	Fig1. Mean:3/4 Sd: 1/2	Fig5. Mean:3/3 Sd: 1/2
Partial circle (Mean= 3.11, α = 0.74)	Fig3. Mean:3/4 Sd: 1/3	Fig6. Mean:3/0 Sd: 1/3	Fig 9. Mean:2/8 Sd: 1/3			
Irregular (Mean = 3.19, α = 0.71)	Fig14. Mean:3/5 Sd: 1/0	Fig11. Mean:3/4 Sd: 1/0	Fig15. Mean:3/3 Sd: 1/1	Fig12. Mean:3/1 Sd: 1/3	Fig13. Mean:2/7 Sd: 1/1	

***Figure 4**: Sitting positions components based on factor analysis*

1.3 Seating pattern preferences and clustering analysis results

Classification of samples based on the similarity of view or preference can provide good designing sitting patterns. Therefore, the cluster analysis was used to segment individuals based on their common point of view. The segmentation of students as users of the Tabriz University campus e was conducted based on five identified factors (factor analysis) in the composite variables. First, based on the results of hierarchical factor analysis, five clusters were identified for optimal segmentation of samples. Then, the k-means clustering method was performed by classifying the samples into five clusters. Next, based on each cluster centre's final matrix, each cluster's highest centrality in different factors was used for their naming. The result of one-way ANOVA indicated a significant difference between all clusters in the tendency towards different preferences of students (Table 4).

***Table 4:** Seating positions factor means among clusters.*

Factor	Cluster 1 (n=71) (25/8%)	Cluster 2 (n=55) (20%)	Cluster 3 (n=35) (12/7%)	Cluster 4 (n=83) (30.2%)	Cluster 5 (n=31) (11.3%)	Total Mean	F_ Value	Sig.
Rectangular	**4/31**	3/32	2/75	3/85	2/90	3/43	68/60	0/00
Circular	3/86	**4/26**	**4/33**	3/77	**3/15**	3/87	24/56	0/00
Homolographic And Regular	**4/18**	3/57	3/81	3/86	2/48	3/58	40/83	0/00
Partial circle	2/04	**3/92**	2/29	3/76	**3/54**	3/11	93/58	0/00
Irregular	3/32	2/67	3/26	3/72	2/97	3/19	31/00	0/00

Discriminant analysis was used to assess the accuracy level of cluster membership. This analysis was performed based on discriminant functions. The Wilks' lambda value was closer to zero in each function, which indicated their suitability. This value varied between 0 and 1, and the closer to zero, the more suitable it is. The test result showed that all factors had a significant level of 0.001 in the discriminant analysis process (Table 5).

***Table 5:** Discriminant analysis to assess the accuracy level of cluster membership*

Function	Eigenvalue	% of variance	Canonical correlation	Wilks' lambda	Chi-square	df	Sig.
1	2/58	50/1	0/85	0/05	827/70	20	0/00
2	1/150	22/3	0/73	0/17	485/39	12	0/00
3	1/045	20/3	0/71	0/35	279/46	6	0/00
4	0/382	7/4	0/52	0/72	86/99	2	0/00

The discriminant analysis-based group membership prediction matrix showed that 98.2% of the total number of samples was correctly classified into five clusters, and therefore, the accuracy of this segmentation was appropriate (Table 6).

***Table 6**: Segmentation results of original grouped cases*

		Cluster Number of Case	Predicted Group Membership					Total
			1	2	3	4	5	
Original	Count	1	68	0	2	1	0	71
		2	0	55	0	0	0	55
		3	0	0	35	0	0	35
		4	2	0	0	81	0	83
		5	0	0	0	0	31	31
	%	1	95.8	.0	2.8	1.4	0.0	100.0
		2	0.0	100.0	0.0	0.0	0.0	100.0
		3	0.0	0.0	100.0	0.0	0.0	100.0
		4	2.4	0.0	0.0	97.6	0.0	100.0
		5	0.0	0.0	0.0	0.0	100.0	100.0
a. 98.2% of original grouped cases correctly classified.								

To provide a detailed analysis of the descriptive characteristics of each group, demographic variables of each cluster were extracted. Then, to find out the relationship between the most important demographic variables in Tabriz University students and their willingness to choose the sitting pattern in the campus, the Chi-square test was used. The results showed that among the students' demographic variables (gender, marital status, educational level, ethnicity, and residence), there is only a significant relationship between gender variables with their placement in clusters or groups of 5 (Table 7). It seems that gender plays an important role in designing seats on the academic campus.

Table 7: *Chi-square result for gender groups into clusters of seating positions preferences*

Gender	Cluster 1 (n=71) (25/8%)	Cluster 2 (n=55) (20%)	Cluster 3 (n=35) (12/7%)	Cluster 4 (n=83) (30.2%)	Cluster 5 (n=31) (11.3%)	Total	Chi-square	Sig.
Male	48 (24/1)	41 (24)	22 (12/9)	41 (24)	19 (11/1)	104 (100%)	10/30	0/03
Female	23 (22/1)	14 (13/5)	13 (12/5)	42 (40/4)	12 (11/5)	171 (100%)		

Cluster 1

This cluster involves 71 people out of whole samples (25.8%), comprising 24.1% of the total male students and 22.1% of the total female students (Table 7). The samples of cluster 1, with a total mean of 4.31 when placed in larger groups, tend to use rectangular patterns than the other four groups. Besides, when they place in the smaller group (less than four people), they have a higher tendency to regular symmetrical patterns with a mean of 4.18 (the seats are regularly arranged around a four-sided or circular table with the same distance). Also, cluster 1 has a lower tendency to use arc patterns than the other four groups (Table 4).

Cluster 2

As seen in table 2, this cluster involves 55 people out of whole samples (20%), comprising 24% of the total male students and 13.5% of the total female students (Table 7). Compared to the other four clusters, this cluster has a higher tendency to circular and arc (partial circle) sitting patterns with a mean of 4.26 and 3.92, respectively. As these groups of students are in groups of 5 or more, they prefer to sit together around circle tables, and when they imagine themselves in smaller groups of two, three, and four, they tend to sit on the arched benches. Compared to the other four groups, the second cluster has less tendency to use irregular patterns, i.e., the benches are not arranged at a regular distance around Table 4.

Cluster 3

This cluster involves 55 people out of whole samples (20%), comprising 24% of the total male students and 13.5% of the total female students (Table 7). This cluster with a mean of 4.33 focuses on using circular patterns compared to the other four groups. Cluster 3 has fewer tendencies to use rectangular sitting patterns in a group. Besides, the tendency of samples in this cluster to use an archer pattern with a mean of 2.29 is at the lower level (Table 4).

Cluster 4

This cluster involves 83 people out of whole samples (30.2%), comprising 24% of the total male students and 40.7% of the total female students (Table 7). This cluster is the largest group, and there is a higher percentage of a female in this cluster. The most prominent feature of this group is that with a minimum and maximum mean average of 3.72 and 3.86, there is a fairly similar tendency to five patterns. In fact, this group of students believes that, depending on the different conditions of social interaction in the campus, one can use each of the five patterns without a constant focus on a specific pattern (Table 4).

Cluster 5

This cluster involves 31 people out of whole samples (30.2%), comprising 11.1% of the total male students and 11.5% of the total female students (Table 7). This cluster does not have a higher tendency to use any of the five patterns than the other four groups. In three patterns, including a rectangular group, regular and symmetric, and an irregular pattern, its total mean is less than the median, i.e., less than the number 3 on the Likert five-choice scale. This group is moderately oriented to circular and arc patterns with a mean of 3.15 and 3.44, respectively. Therefore, it is similar to the second one at a lower level.

4. DISCUSSION

Seat patterns and their locations are important for landscape utilization in the university campus, particularly in semi-arid environments. Seating furniture in urban green spaces, including university campuses, is required to support various activities for students or users in the group in an easy, peaceful and sociable manner in an outdoor environment (Lee et al., 2013). Placing and designing tables and benches to suit the needs of students, as the main users of open spaces on campuses, has a significant role in spatial vitality and improving social interactions in leisure time. In the present study, the tendency of Tabriz University students to the different sitting patterns was studied in to eight-member patterns. Basic patterns were extracted from the literature review such as Luximon et al. (2015) where these patterns were the most frequently used for public spaces and social interactions. However, a few extra patterns were added by the researcher into the previous patterns. The findings of the study contained the applicable results for campus designers and administrators.

The finding of exploratory factor analysis showed five various sitting patterns. The first factor included a rectangular and four-sided pattern for 5-member groups. The second pattern involved a circular pattern so that the seats were arranged around a roundtable. This pattern contained 4-member groups. The third factor consisted of regular and symmetrical shapes for a small group of 2 to 4 members. In this pattern, the seats were arranged around a square or roundtable. In the fourth factor, 3, 2, and 4-member archer beaches were seen. The arch pattern is an intermediate between a linear and circular pattern. The fifth factor included irregular seat arrangement around a table.

In this pattern, 1 or 2 people sit in front of other members and play as a leader. Strodbeck and Hook (1961) demonstrated that people who occupy terminal positions, speak more than others and play an important role in decision-making.

In order to recognize the student preference to five patterns, the cluster analysis algorithms were employed, and participants were divided into five groups. The first group (25.8% of students) had a higher tendency to rectangular, regular, and symmetrical patterns. The second group (20% of students) preferred to sit in circular and arc-shaped patterns. The third group (12.7% of students) only preferred the circular pattern. The fourth group, as the largest group (30.2% of students), showed no specific tendency to mentioned patterns. As the smallest group (11.3%), the fifth group did not tend towards five patterns and only slightly preferred circular and arc patterns.

Generally, all students, as campus users, tend to have a circular pattern, and their tendency to sit in the irregular pattern is lower than the median mean. Therefore, it is worth considering this pattern in reviewing the campus of the Tabriz University. These findings are consistent with Luximon et al. (2015) and Steinzor (1950) referenced circle style tended to talk more to group members, supports more interaction between people, and allows for the interactions to become more natural as the distance becomes more natural closer. In other words, the circle style of campus seating furniture can help users interact better, use more eye contact, and create a shorter distance (Luximon et al., 2015).

Also, among the demographic variables, only gender affects student preference in choosing a sitting pattern. Individual perception of the surrounding may differ among people's characters such as age (Wang et al., 2019). A higher percentage of female students are interested in circular and arc patterns than male students, and in contrast, the higher percentage of male students placed in group four. The effect of personal distinct characteristics such as gender on quality of campus design were reconfirmed. Among the information background of users in campus, gender is the most prominent factor, which make big differences because their ages and education levels are almost very close to each other. Therefore, the gender factor should be considered in the design, selection, and placement of different sitting patterns in the campus by designers and urban green planners.

1.4 Managerial implications

The results include practical aspects for designers of green spaces, especially university campuses, and show the necessity of designing different types of benches and tables in these spaces. In other words, considering the various tastes of university campus users, it is possible to improve the attractiveness of the campus for social interaction among students, thereby enhancing the efficiency and vitality of the campus landscape.

1.5 Limitations and future researches

This study was limited to students' preferences for sitting patterns in university campus. It is suggested to consider the student's preferences for renewing campus furniture. On the other hand, accurate and reliable indexes-based optimal locating of sitting position and the way of combining a variety of sitting patterns with other elements of the campus are among the important issues that should be studied. Also. Future studies can study other effective factors on campus design such as users originate.

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