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Perception of diversity in urban culture: examining interior architecture students' views on campus accessibility

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S. Selhan Yalçın Usal
https://orcid.org/0000-0002-9488-2475
selhanusal@maltepe.edu.tr
Department of Interior Architecture, Maltepe University, Istanbul, Türkiye

A. Nilay Evcil
https://orcid.org/0000-0001-5165-255X
nilaye@beykent.edu.tr
Department of Architecture, Istanbul Beykent University, Istanbul, Türkiye

Abstract: Understanding diversity-related needs and developing the capacity to create inclusive designs are among the goals of Interior Architecture education. This study investigates how Interior Architecture students perceive accessibility in buildings, open areas and premises on and off campus in their daily lives and how interior design education affects their perceptions of accessibility. A 5-point Likert-type scale survey was administered to Interior Architecture students, both those who had taken and those who had not taken an accessibility and universal design course. Factor analysis and t-test were used to evaluate the survey results. It was observed that the students' perceptions of accessibility were largely guided by the spatial requirements of people with physical disabilities and visual impairments. Moreover, there was no difference in accessibility perception based on whether the students had or had not taken an accessibility course. From the results of the study, it can be recommended that design, interior architecture and architecture curricula should include universal design content with empathetic practices that focus on diversity in urban culture.

Keywords: accessibility, interior architecture education, universal design, empathy, university campus

1. Introduction

In the field of interior design, there are many issues that must be addressed, such as requirements for usage, site, climate, context, organization, materials, technical issues, and budget. Yet, the main issue always centres on the user. In interior architecture education, the primary focus of the study is to meet the needs of the user in the project development process [1]. Additionally, the physical, psychological, and organizational needs of the user must be determined and understood correctly. The duration of use of the space or product, its frequency, and the period in which it is used are also important. In this context, the student is expected to be able to use basic ergonomics and universal design data in order to develop an inclusive design. During the design process, designers have to be extraordinarily imaginative in dealing with the diversity of users to ensure designs meet everyone's needs. According to Webber [2], interior design students are more empathic than graduate students from other disciplines. The keen awareness that interior design students have about diversity is developed by the interior design curriculum. However, many researchers [3, 4, 5] have emphasized that the diversity related to users and their needs as taught through design program curricula should not only be restricted to ergonomics, accessibility, or universal design courses, but also be a subject matter for interior design project courses.

The creation of accessible environments falls within the scope of the fundamental human right of equality. Despite the regulations on accessibility and the inclusion of universal design in design education curricula, having a strong awareness of this issue affects implementation. Altay and Demirkan [5] showed in their study that cognitive and affective learning methods, such as role playing, increase interior design students' awareness. Gleń and Riekste [6] also emphasized the importance of role playing to understand people with disabilities. According to Usal and Evcil [4], empathic-based sketch studies are especially useful for interior design students in terms of helping them to realize user diversity. Understanding every aspect of user requirements leads to the creation of inclusive environments. Null [7] highlighted the importance, in terms of facilitating empathy in students, of defining a detailed user profile in design development studies.

In interior design education, raising awareness about the diversity of user needs in future designers would lead to the creation of environments that meet the needs of all users. Li et al. [8] find that designers' and non-designer's perceptions of urban public space are important for developing inclusive urban environmental design. Urban culture necessitates the integration of diverse perspectives and the creation of environments that cater to varied needs in design. It is crucial for interior architecture students, who are expected to become effective design leaders in the future, to embrace this culture. However, the spatial and micro-urban analysis of accessibility perceptions and how designs for diversity align with the needs of interior architecture students remains largely unexplored. In this context, a study was conducted on a campus situated in the city centre, focusing on students in their daily lives. The aim of this study is to investigate how interior architecture students perceive accessibility in the buildings, the open areas and the premises of their campus in daily routines and how interior design education affects their perception of accessibility. The findings and results of the study are crucial for developing an urban culture approach based on the inclusion of differences within interior architecture education.

2. The concept of accessibility for all in interior design education

Accessibility is a key concept governing the creation of liveable environments for everyone. In designing public spaces, accessibility standards that include adequate physical dimensions for circulation and movement, wayfinding, and floor solutions must be applied to secure life standards that are equal and satisfactory for all. Although accessibility regulations present many solutions related to space for all, designing inclusive environments requires a thorough understanding of all aspects of diversity. The idea of social diversity involves not only physical, sensory or age differences, it also covers gender, mental, economic and cultural differences. Universal design is defined as "... the design of products, environments, programs, and services to be usable by all people to the greatest extent possible." [9] At North Carolina University, Mace and his colleagues developed universal design principles to prevent discrimination via design. These principles are Equitable Use, Flexibility in Use, Simple and Intuitive Use, Perceptible Information, Tolerance for Error, Low Physical Effort and Size and Space for Approach and Use. Brief descriptions of these seven principles are given below [10]:

Principle 1. Equitable Use: The design is useful and marketable to people with diverse abilities.

Principle 2. Flexibility in Use: The design accommodates a wide range of individual preferences and abilities.

Principle 3. Simple and Intuitive Use: Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Principle 4. Perceptible Information: The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Principle 5. Tolerance for Error: The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Principle 6. Low Physical Effort: The design can be used efficiently and comfortably and with a minimum of fatigue.

Principle 7. Size and Space for Approach and Use: Appropriate size and space is provided for approach, reach, manipulation and use regardless of the user's body size, posture, or mobility.

When applied, these seven principles provide people with different capabilities and equal conditions, without separating them or calling attention to them. Design students and professionals who have a strong understanding of the concept of universal design will be better able to adapt design solutions to accessibility regulations. According to Demirkan [11], the use of universal design applications in structured environments helps to improve productivity, security and healthy life standards. Moreover, well-designed environments and products have a positive impact on individuals' behaviours. For instance, turnstiles in subway stations foster the formation of orderly lines, or transparent textured masks designed to protect against COVID-19 enable lip reading for deaf-mute people and the understanding of facial expressions for everyone. Tromp, Hekkert and Verbeek [12] emphasized that design strategies based on the needs of individuals and targeted to affect behaviours positively can lead to collective, socially responsible solutions. The adoption of accessibility standards and universal design principles by all designers, architects and students would lead to people-driven design solutions, helping to alter behaviours positively.

According to Imrie and Luck [13], the application of the concept of universal design by professional designers or students of design should be handled in a philosophical manner, as opposed to using a fixed guide, as this would help them to better understand diversity. In Türkiye, courses related to accommodating people with disabilities and other differences generally involve an accessibility guide and field work research and diversity-related empathic studies on accessibility and universal design [3, 4, 5]. Wijk [14] emphasized that courses related to developing an understanding of differences and diversity should be offered in the early stages of design and architecture education curricula. First-year compulsory design introduction courses address the topics of user differences and their distinct requirements, while upper-level elective courses generally address comprehensive and specific approaches to accessibility for all. According to Evcil [3], only 18.4% of architecture departments offered these abovementioned courses in Türkiye in 2012. However, that rate is expected to increase following the recommendation issued by the Turkish Higher Education Council's (YÖK) in 2011 stating that universal design courses should be part of the graduate education curricula of Architecture, City and Regional Planning, Interior Architecture, Industrial Product Design and Landscape Architecture departments.

The right to an education is an indispensable human right. Therefore, accessibility in terms of physical matters and education material for all is an obligation. Some studies [15, 16] have shown that the perception of accessibility of students is influenced by the quality of education and activities at educational facilities. In other words, improvements to physical accessibility have a positive effect on education perception.

2.1. Learning experiences of Generation Z

Learning methods, which have been a topic of debate for ages, continue to change and develop according to new circumstances. Although interior architectural education has a very long history, it is also regularly updated depending on the needs and norms of the day and technological innovations. Therefore, it is incumbent upon instructors to add methods of learning to common learning methods in today's changing conditions. The Generation Z youth, whose members are now reaching their twenties, have grown up in radically different social and physical environments than those of previous generations. For example, they have digital life experiences and can socialize in virtual environments. Advanced technologies have been with them from the very first days of their lives [17]. Most of them use online resources rather than books in libraries. Generation Z is a generation with an abundance of resources untethered by temporal-spatial restrictions. They tend to design their own learning experiences. For them, learning is not an outcome measured by exams, but an experimental process [17]. Therefore, higher education should adapt their methods to the needs of these newcomers.

Empathy in experiential learning for design education may appeal to Generation Z students. In interior architecture education, one-to-one desk studio critiques are important. History and theory, technology, material knowledge, relations with city and community, structural systems etc. contribute to students' skills. This can be referred to as a formal traditional type of transmissive instruction [18]. Yet, in interior architectural education, there is some evidence that experimental learning through empathy [4, 5, 19] is meaningful in the outcomes of learning experiences. In developing an empathic understanding, learners assume the role of the users who will experience the designed environment. "In the case of interior design, this is particularly important because most practitioners procure design jobs from established, repeat clients and referrals. Having the ability to understand a client's design needs is paramount for interior designers in terms of creating design spaces that physically and emotionally respond to the pragmatic design needs of each client." [19] Designing through empathy also makes it easier for students to make creative designs [4].

Accessible and inclusive educational spaces and buildings serve as laboratory environments for interior architecture students to observe users. Gleń and Riekste [6] also expressed the importance of learning through experience in the campus environment in their study. The authors particularly state that universal design education can be effectively realized not only with theoretical knowledge but also by students learning about different types of disabilities through role-playing on campus. Experience is crucial, particularly in the education of the new generation. Therefore, it is essential for interior architecture students to assess accessibility and inclusiveness in a campus environment that embodies fundamental rights, such as the right to education. This assessment should focus on circulation areas, entry spaces, and restroom facilities, which are basic requirements.

3. Examination of the perception of accessibility: the experiences of interior architecture students

In this study, an examination was conducted on how interior architecture students perceive accessibility and equality in the usage of public space and how their education affects perception of accessibility in these areas.

3.1. Method

A questionnaire was administered to interior design students studying at a foundation university in the city centre of Istanbul to determine their perception of accessibility, including the concepts and dimensions governing their perception. The study was conducted at a university located in the city centre, which is easily accessible by public transportation. It was deemed important that the university's commitment to inclusiveness and accessibility aligns with the urban cultural context of the campus. The second aim of the study was to identify any differences in the perception of accessibility between the students who took and who did not take universal design and accessibility courses. All participating students, both those who took and did not take courses on universal design and accessibility, were asked to complete a 5-point Likert-type scale questionnaire. Analysing students' spatial investigations by converting them into measurable numerical values offers a more reliable evaluation. The questionnaire consists of two parts. The first part includes questions on the students' demographic characteristics, their department, and whether they took an accessibility and universal design course. In the second part, the students were asked to evaluate 15 items related to accessibility on the university campus and its premises on a 5-point Likert-type scale with 1 "I absolutely agree", 5 "I strongly disagree." The questionnaire was administered to a total of 106 students, but after six of the questionnaires were deemed to be invalid, 100 questionnaires were used for data analysis. Of these, 70 (70%) were completed by students who took courses or seminars on accessibility or universal design. Respondents comprised 61 females and 39 males. Pilot testing of the questionnaire with 5 students was also conducted to identify any problems before the survey and this did not disclose any changes to be made. Interior architecture students' level 1 and 2 were allocated 15–20 min. of studio time to complete the questionnaire in two different days of the Spring Semester 2018–2019. To evaluate the results of the questionnaire, factor analysis and t-test were applied using the SPSS program. The study complied with the principles of research and publication ethics.

4. Results

4.1. Students' perception of accessibility on and off campus

In the literature, it is reported that a sample size of between 100 and 200 is considered to be sufficient when the factors are strong and prominent and the number of variables is not too large. As a general rule, the sample size should be at least 5 times the number of observed variables [20]. In contrast, some researchers argue that the sample size should be at least 50 [21]. In the present study, the data were collected from 100 questionnaires, and there were 15 variables included in the factor analysis. Although the sample size is at the lower end of the recommended limit, it is consistent with the specifications, insofar as the sample size is more than five times the number of variables. Results from the Kaiser-Meyer-Olkin Test (KMO = 0.722) indicated that the data were suitable for factor analysis, as the literature specifies that the KMO value should be 0.6 or above for a good factor analysis (FA) [20, 22]. Furthermore, the Bartlett's test, which was used to confirm the homogeneity of variance in perception of accessibility, was found to be

statistically significant in the study (chi-square = 388.187; SD = 91, $p < 0.001$). Considering the anti-image covariance, the correlation coefficient of 1 variable in the matrix was below 0.5 (barriers on the pavement = 0.497), therefore, after excluding the relevant variable from the factor analysis, a total of 14 variables were measured.

In performing the factor analysis, the varimax rotation method was used for the principal component analysis. Results from the analysis showed that the 4 factors obtained explained 59.52% of the cumulative variance (Table 1). The following 4 factors constitute the students' perception of accessibility on the campus (Table 2):

- Accessibility in university lift, stairs and counters
- University indoor guidance signboard (orientation) and accessibility at entrances / exits
- Accessibility of toilets on campus
- Accessibility on campus premises

The students' education program includes courses on intensive theory and practice and atelier studies, and they generally spend eight hours a day, four days a week on the campus. During their time on the campus, the students mainly use the classrooms, ateliers, dining hall, library and cafeteria, each located in different blocks and on different floors. Results of the factor analysis showed that the students' perceptions of accessibility can be explained by 4 factors, and that these four factors explain 59.52% of the variance. Examination of these 4 factors revealed that the factor of 'accessibility in elevators, stairs and counters' was the most important factor in the students' perception of accessibility, constituting 28.05% according to factor analysis and explaining 17.34% of the total variance, the results of which suggest that daily on-campus mobility stood out in their perception of accessibility. This suggests that interior architecture students associated accessibility with the most common design features in daily life. The second factor, in order of importance in perception of accessibility, was 'indoor guidance signboard (orientation) and accessibility at entrances / exits on campus' (15.81%). The last two factors, in order of importance in perception of accessibility, were 'accessibility of toilets on campus' and 'accessibility on campus premises', at 13.87% and 12.49%, respectively. In the study conducted by Kane [23] with physically disabled students, students reported that they experienced problems with accessibility to buildings, toilets, dormitories, and classrooms. In another study, it was reported that according to people with disability, the building perimeter was the biggest barrier [24]. Considering these problems experienced by physically disabled people, it is not surprising that the students' perception of accessibility was focused on these areas.

Table 1. Principal component analysis / Total variance explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1. Accessibility in university lift, stairs & counters	3.927	28.053	28.053	2.428	17.344	17.344
2. University indoor guidance signboard & accessibility at entrances/exits	1.660	11.860	39.913	2.214	15.815	33.159
3. Accessibility of toilets on campus	1.608	11.487	51.400	1.942	13.874	47.033
4. Accessibility on campus premises	1.137	8.124	59.524	1.749	12.491	59.524

In a separate study conducted by the present researchers, it was observed that students primarily associated different user profiles with physically disabled individuals [4]. According to Hall and Imrie [25], most architects consider physically disabled people when thinking about accessibility, rather than people with cognitive, auditory, and visual impairments. In this study, the results clearly showed that in the students' perception of accessibility, they prioritized the spatial needs of physically and visually impaired people.

Table 2. Rotated component matrix

Rotated Component Matrix[a]				
Statements	**Component**			
	1	**2**	**3**	**4**
1. Indoor direction signs in the university are sufficient	0.626	0.436	0.147	−0.062
2. The university has handrails on stairs and ramps, and they are at the appropriate height	0.661	0.408	0.118	0.001
3. Height of the information desk at the university is suitable for everyone	0.742	0.184	−0.021	0.014
4. There are guiding lines (tactile surfaces) in the university	0.408	0.557	0.320	−0.193
5. Braille alphabet is used on the buttons of the elevators in the university.	0.194	0.535	0.370	−0.107
6. There are toilets available to people with disabilities in the university.	−0.004	0.039	0.878	0.013
7. The toilet equipment in the university are designed according to standards for the use of people with disabilities	0.038	0.083	0.861	−0.008
8. The width and height of the steps on the stairs of the university are convenient for walking up and down	0.033	0.582	−0.180	−0.132
9. Emergency exit signs are clearly designated and suitably positioned at the university.	0.373	0.542	0.256	0.123
10. My friends with different physical abilities can use the university entrance turnstiles.	0.237	0.524	0.171	−0.352
11. I can access any location in the university with the elevators.	0.761	−0.106	−0.045	−0.030
12. Pavement widths are narrowed by parked vehicles, electrical transformers, garbage bins etc.	−0.252	0.485	−0.145	0.622
13. I do not feel safe when crossing pedestrian crossings due to cyclists and motorcyclists	0.032	−0.211	−0.008	0.772
14. The slopes of the pavement ramps are too high, making it difficult to ascend the pavement.	0.051	−0.143	0.065	0.746

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
[a] Rotation converged in 12 iterations.

4.2. Difference in Students' Perception of Pedestrian Accessibility on Campus

The t-test was performed to determine if there was a statistically significant difference in their perception of pedestrian accessibility on campus between the two groups, namely those who took accessibility course or seminar and who did not. The result defines statements' means from 1 to 11 relating to students' overall perception of pedestrian

accessibility on campus. Three statements (12−13−14) were not included in the t-test as they relate to off-campus accessibility. Result from the t-test showed that there was no significant difference between those who had received prior education about accessibility and universal design and those who had not (T = −0.200, df = 98, P = 0.842), as seen from the P value of > 0.05 (Table 3). Both groups indicated their evaluation of on-campus accessibility as "I am indecisive" (group means: 2.6467 and 2.6743). Hence, taking courses, seminars on accessibility and universal design did not change students' perception of on-campus accessibility.

Table 3. Comparison of students' evaluation on pedestrian accessibility on campus according to whether they had taken and not taken courses / Seminars on UD and accessibility: T-Test table

Group	N	Mean	Standard deviation	T	df	P
Those who did not take a UD and accessibility course	30	2.6467	0.50716	−0.200	98	0.842
Those who took a UD and accessibility course	70	2.6743	0.68049			

5. Discussion and Conclusion

Today, accessibility is a concept that needs to be addressed in a comprehensive manner. The gathering of individuals in both public and private spaces is crucial for the development of urban culture, as it promotes social interaction among diverse groups. This study examined the campus as a micro-scale city, focusing on how young interior architecture candidates perceive its accessibility based on their experiences and perspectives within this environment. The results of this study revealed students' insights about on and off campus accessibility which were primarily guided by the spatial requirements of people with physical and visual impairments. Their perception of accessibility can be grouped in four main factors: Accessibility in university lift, stairs and counters; indoor guidance signboard and entrance accessibility, accessibility of toilets and accessibility on the campus premises. The previous studies also noted that students mostly tended to design the accessibility by considering the needs of physically and visually impaired people [4, 25]. They also prioritized accessibility on-campus rather than off-campus, such as accessibility of public buildings nearby, transportation vehicles to the campus or parks around the campus. Furthermore, the study identified that taking courses or seminars on accessibility and universal design did not change students' perception of accessibility. According to Afacan [26] "the students are not able to correlate the information gained in separate lectures." At this point, Larkin et al. [27] point out that universal design thought is a process in design education which cannot be achieved in a single step. The linkage between the contents of studio works and accessibility for all issues can be enhanced by innovative teaching methods. As many researchers [4, 5, 6, 7, 19] have expressed the view that the need for empathy in interior architecture education may increase awareness about accessibility. At this point, it is important to develop new methods for the youth of the Generation Z who tend to prefer experiential process [17]. Working with people with disabilities in design studios as jury members or collaborative projects with people with disabilities may also increase student awareness on accessibility. The limited perception of diversity among students who are expected to possess strong empathy skills indicates that this issue requires a broader approach. It is essential for local governments and relevant ministries -such as education, family, and the environment- to support initiatives that raise awareness about diversity. Furthermore, it is necessary to develop resources that incorporate new technologies to help the younger generation better understand these concepts.

In this study, it was observed that the training activities based on accessibility guides were not effective enough. Design education without empathic practices is insufficient. According to Strickfaden and Devlieger [28], spending time with people is important to develop empathy. Educational activities that do not include application and experience studies on different users will fail to create sufficient awareness of differences among students.

Education on accessibility should be conducted according to the universal design concept and should not be limited to guides and regulations. The initial works of the designing process require deep research on user needs and

user experience. Furthermore, it is important to perform interdisciplinary studies in the process of design education to address differences in sociocultural structure, ensure that individuals with different abilities come together in this process and strengthen communication. University campuses are social environments that feature spaces for both learning and social and recreational purposes and as such, they play a unifying role, rather than isolate individuals, and facilitate productivity through clubs and collaborative work areas. It is important that universal design and accessibility studies teach students how to utilize these environments efficiently.

The generalizability of the study is limited since the sample did not represent all interior architecture students. The results of this study show that interior architecture students' perception of accessibility can be grouped in four main items which constitute on-campus provisions. These provisions mostly address the spatial needs of physically and visually impaired people. Students who took prior lessons or seminars on accessibility or design for all and who did not, have similar perception of on-campus accessibility. There is a need to increase knowledge on accessibility in design curricula with new techniques addressing to the Generation Z. Finally, it is recommended future studies on this subject focus on creating more common areas in campus ensuring unifying curricula for inclusive design, and developing different learning methods, such as simulation systems, to prevent interruption of empathy and implementation trainings during epidemic and disaster periods, such as the COVID-19 pandemic.

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