The Role of Built Environments in Student Interactions at School

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ABSTRACT

Schools are the gathering place and places for the social activity of students and like the beating heart, are the centers for all forces, events, and the gathering place of values. They play an important social role in the collective life of students. As a place of communication, the school must have a wide range of qualities to allow people to interact and ultimately promote learning. The purpose of this article is to interpret and analyze the strategies and principles adopted to establish social interaction in school to promote learning by reviewing studies on the sociopetality of space. This is an applied research study in terms of purpose that uses descriptive-analytical methodology. The required data were collected using desk research and a questionnaire. The statistical population consists of a panel of experts, and the samples are randomly selected. The effective social interaction components were then analyzed and prioritized based on the questionnaire indicators using the Analytic Hierarchy Process (AHP). The collected questionnaires were analyzed using the Expert Choice software. The results showed that the mental criteria had the highest importance coefficient and the physical criterion had the lowest importance coefficient. On the other hand, the prioritization of sub-indicicators showed that the sub-indicators of "length of stay" belonged to the behavioral criterion, and the sub-indicators of "accessibility of public space", such as class, belonging to the physical criterion, had the highest importance. The reason is that an improvement in these criteria will lead to greater student satisfaction and increased social interaction.

Keywords: Closed Educational Space, Social Interaction, Hierarchical Analysis, Survey Method.

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1. INTRODUCTION

Given the changes in school design due to cultural changes in society, Harrison believes that community dynamics will affect work models. Recent changes suggest that most tasks are participatory and collective rather than individual. Also, learning takes place in the form of problem-solving in virtual learning communities to establish social interaction. Given these design changes, learning environments should generally reflect changes in communities (Baker, McKoy, Moore, & Vincent, 2008). By examining learning environments, Bransford explained four distinct models for learning environments: community-based environments, evaluation-oriented environments, individual-centered environments, and knowledge-based environments. The development of new learning sciences indicates that community-based learning environments are vital to learning. In this model, the concept of "society" is used in the form of sociopetal schools and classrooms so that the environment belongs to communities larger than home. Under such an approach, learning seems to take place through social values, research, trial and error, and to allow the student to learn from his or her mistakes. Classes and schools reflect a different set of values and expectations. In this area, the goal of learning is to promote a sense of community among individuals and the sociopetality of space (Bransford, Brown, & Cocking, 1999). LLC studies of schools are a prominent example of national research that addresses the social conditions of schools. According to the results, out of seven countries out of 13 Latin American countries, strong and non-imperious relationships between different users are among the main features of a positive learning environment. In such supportive environments, students feel good about going to school. Because they are treated kindly, they are eager to go to the classroom (UNESCO, 2012). Clegg, Blington, and Sriemes (1994) enumerated the characteristics of the classroom environment, validated by teachers, to influence learning. These included the following: The environment should be aesthetically pleasing, be able to stimulate children's interest, be of a high standard for displaying and presenting student work, be practically maintained, as well as the size and position of the classroom, relationships and social interaction between students and between teacher and students, regular classroom environment, classroom organization and performance, and teacher expectations of learning outputs.

Schools provide an environment for children in which they can expand their social networks. According to social identity theory, collective intelligence is accelerated and developed through relationships between students, leading to enhanced member loyalty and drive them to build a community (Kohlberg, 1971). Twentieth-century architecture discovered the importance of the social function of architecture and the power of the built environment in strengthening collective relationships. In contemporary times, increasing individualism has given double importance to the physical environment as a vehicle for neighboring human beings to establish a close relationship between them and to compensate for part of the current social interactions lost in the architectural and urban structures and contexts of the past. For this reason, many recent studies have focused on the relationship between physical space characteristics and collective interactions. They state that physical space in any environment acts as a spatial system whose characteristics affect users' collective interactions (Pasalar, 2003). One of the most important reasons for conducting this research study was the current importance of the architectural relationship for understanding human activities. This study seeks to identify the collective activities of humans regarding school architecture. Finally, the coverage capabilities of Iranian schools on the sociopetality of appropriate social behaviors are examined by examining the five effective criteria. The main problem of this study is to evaluate the components affecting social interaction, and finally, to prioritize the components from the perspective of experts. The results can be used to solve existing problems and limitations and provide a set of solutions for future plans.

2. LITERATURE REVIEW

The school building design is influenced by theoretical architectural perspectives. Therefore, researchers believe that the curriculum and educational philosophy play an important role in designing and planning school buildings. However, school building design is generally influenced by theoretical and empirical findings of environmental and educational psychology, such as student needs, and the role played by the school social environment in building children's knowledge, learning, and behavior (Weinstein, 1979). The architecture of schools and educational spaces generally affects education and training through the physical organization of children's spaces and interactions with the school environment. Public spaces, such as classrooms can also help build and strengthen relationships (McGregor, 2004). Student interactions are important among students to improve social skills and learning efficiency. Regarding the relationship between environment and interactions, McGregor enumerates the following effects for low-quality spatial environments:
- Reducing students' learning and interactions
- Loss of creativity
- Loss of time and individual effort

Architectural space has a great impact on the child's social development. Therefore, architectural space can be defined as a social space in which children play with peers and adults, and friendly relations are established between them that are associated with social progress and development (Ladd, 1999). Therefore, one of the

most important issues in the design and planning of educational spaces is students' behavior, such as social interactions and their relationship with models and spatial qualities. An example of practical measures to design a school to meet social needs is the New Mexico School of Trachea Children. It is designed and programmed for three- to six-year-olds with diverse learning styles, developmental ability levels, and different cultural and moral backgrounds. To design, plan, and build a school, teachers need to think and plan about the moving walls of the complex (Taylor, 2009). Many studies have been done on the effect of social interaction on public spaces, resulting in people's desire to be in space. These public spaces include schools on various scales. Extraction of factors affecting the sociopetality of interior spaces of subway stations in Tehran showed that furniture and seats had the greatest effect on increased social interaction between people. However, the seats were arranged linearly in all the studied stations where face-to-face encounters and accidental collisions were impossible (Hamzeh Nejad, 2011). Madanipour argues that communication for conversation takes place in personal spaces in personal spaces at closer distances. Here, personal information is transmitted to the person peer attracted to him or her through sensory signs of intimacy. In this case, people may feel that they have more control over their personal space, which in turn leads to a stronger social connection between people.

As an important part of the foundation of society, the separation of public and private spheres relies on the creation and protection of this border. According to this view, social relations take a physical-spatial form by defining space, such as benches and fountains, and the architecture around them, enclosing them within the boundaries separating the public and private spheres (Madanipour, 2003). In general, there are different perspectives on creating a successful public space (such as a school) that can accommodate different individuals and groups. In this regard, we can mention the views of Jane Jacobs, Jan Gol, Alan Jacobs, Cooper Marcus, and Donald Epillard. In summary, the above views enumerate several factors affecting attendancy and social interaction, including mixed-use, vitality, visual (scenic) beauty, and maintenance of space, in particular, and physical comfort, the ability to sit and stop, proper access, and security, proportion and readability (legibility), diversity, and public space, as the most important ones. In line with the above studies performed using quantitative and qualitative methods, this study examines and evaluates the social interaction component by adopting a different approach.

3. ENVIRONMENT AND SOCIAL RELATIONS

Since this is an interdisciplinary research study, the literature review was conducted in two areas: the study of the body-behavior relationship and the

effect of the body on social behaviors. In this study, the body in question is the school, and the behavior in question is interpersonal interactions and social relationships. According to Maslow's hierarchy of needs, the category of "social interaction" ranks third after human security needs in importance. Among all these models, the same or even more importance is attached to the physical environment as to the social environment. This is because the physical environment contains a number of fixed elements that can reduce interaction opportunities through planning and design. Each model has its own unique components. The most important of these models, commonly used in research, will be discussed below. Patterson (1968)'s study of social space in educational settings and social interactions was one of the first studies of factors affecting social interaction in the educational setting. The results showed that physical and sensory proximity significantly affect social relationships and the rate of conversation between individuals (Patterson, 1968). In general, early research on the relationship between the environment and social relationships mainly addresses physical distance and so on.

Studies in Ireland have shown that neighborhood residents are more familiar with each other's pedestrian areas and local parks and trust each other (Leyden, 2003). Also, studies by Moss et al. (2009) in the Netherlands concluded that residents who live next to green spaces feel less alone, know their surroundings better, and interact more with them. Another study by Ziland et al. (2008) in Sweden on parks and forests in Zurich found that adolescents were more likely to meet with their peers in easily accessible parks and green spaces. As a quality component, green space has always played an important role in increasing citizen presence and social interaction, both independently as a public space and alongside public spaces (Kaczynski & Henderson, 2007). Green space provides a good platform for leisure, relaxation, and social interaction, increasing citizens' physical and mental health and other spaces.

Individuals shape social relationships generally based on their particular interests, expectations, norms, and plans. Therefore, how a person is present in a place with others is considered as a factor influencing a person's decision to stay in that place. As a result, individuals may even seek out places where there are individuals with similar characteristics in class, ethnicity, religion, economic group, lifestyle, education, income, parenting habits, and race. While homogeneity encourages people to meet each other, increase interaction with physical-social places, and consequently promote attachment to those places, heterogeneous social places allow people to experience rich and free social interactions (Marcus & Sarkissian, 1986). One study examined students' use of space and their preference for using space outside of class. Several items were used to evaluate educational space qualities, including accessibility, readability and intelligibility of space, spatial boundaries, circulation,

physical characteristics, and furniture. This study focused on spatial diversity and the size of indoor and outdoor spaces. The results confirmed that both of these factors have a significant effect on students' spatial preferences. The size of the space is important because students will avoid a space where they feel crowded. Diversity is also important because different people, genders, and ages require different microspaces with different capabilities. They also found that other environmental factors also affected students' preferences, such as spatial arrangement, natural and artificial lighting, acoustics, and visibility. The effect of classroom organization model on students' learning behavior was studied. In their study, Marx et al. (1999) examined the relationship between the extent of student interactions and the type of classroom organization. They found that the rate of social interaction was greater in semicircular organizations. Reid et al. (1999) conducted a series of studies on the relationship between group activity and classroom architecture. The results showed that the lower height of the classroom ceiling increases group activity in the classroom, which influences improved social interactions. In contrast, higher ceilings prevent student group activity in the classroom, leading to lower social interaction levels. The results showed that the "space" scale is a factor affecting social interaction between students. Research shows that small schools are good places to help improve intergroup and personal relationships. Students' success rates and willingness to participate in social and educational activities are higher in small schools than in larger schools (Barker & Gump, 1964; Lipsitz, 1977; Duke & Trautvetter, 2001). Research on large schools shows that large schools are deprived of the benefits of small schools because of their large size. In small schools, group cohesiveness is greater, and people with different social and demographic backgrounds are provided with constant interaction opportunities. In large schools with separate models or spatial units, interpersonal communication and school control interactions and opportunities are enhanced by reducing alienation and violence among students (Wasley et al., 2001; Duke & Trautvetter, 2001). In a study entitled "Classroom Architecture: Challenges", the interaction was found to be facilitated by two important factors, namely the technology used in the classroom space and the flexibility in the classroom space. This seems to help independent and group learning. In a similar study, Redling (1994) compared the effects of three types of classroom organization on students' interactive behavior. He found that students engage in more interactive behaviors in a cluster and U-shaped organizations than in traditional organizations. Dermody and Smith achieved interesting results in a study of Irish primary schools. Based on interviews with teachers and students, this empirical study examines the effect of class size, school, density, and other factors, such as light, sound, heat, etc., on the learning process. The results showed that both

teachers and students tend to be small or medium-sized in school. This is because of the small size of the school increases the opportunities for social interaction between children and provides teachers and children with more opportunities for conversation and personal space. A study was done on the term School Climate. Elements and components of the School Climate encompass various aspects of the physical-social environment. According to this study, the term School Climate consists of four types of environments, defined as follows: physical environment (guides to learning), social environment (promoting communication and interaction), effective environment (promoting a sense of belonging and self-confidence), and self-confidence). Academic (promoting learning and self-fulfillment). The following conclusions were drawn from this study of the school social environment to improve communication and interaction:

- There are various teachers and educational groups; parents and teachers are involved in the educational process.

- Staff are interested in student suggestions, and students are provided with opportunities to make decisions and participate in school-based learning and learning processes.

According to Harvey and Drogge (2002) studies on the spatial properties of educational buildings based on teachers and students' views, several spatial properties help establish a sense of community between individuals. These include visual communication between spaces, group classrooms, the scale of spaces such as the size of halls for gatherings and emotional activities, and flexible, multifunctional spaces for a variety of applications. In his doctoral dissertation entitled "School Facility Design Features: Adapting Principles of School Design and Teacher Perception in California Schools," Mason (2008) focused mainly on achieving the six principles and Mason (2008) focused mainly on achieving the six principles and concepts of designing and planning school spaces to achieve three goals: academic success, growth responsiveness (including social growth, emotional growth, and cognitive growth), and social justice for space users. For this purpose, he used desk research, structured interviews, case observations, and an open-ended questionnaire to collect and analyze information. From these schools, ten schools were selected as a sample. This study was conducted by interviewing twenty teachers in ten schools about their perception of the six design factors and their relationship with the three objectives of the curriculum. Then, educational facilities and their design features were evaluated. In this dissertation, several indicators were proposed to design for each variable. Subsequently, eight out of ten schools were selected to hold weekly student consultation sessions. Initially, the relevant questions were designed for each of the variables through pathology and analysis of case studies and researcher experience of educational programs. After conducting

many analyses in this regard, the researcher believes that the improvement of social development in the school environment is due to the variety of multifunctional spaces for various group activities for learning. In this way, students can study and research in a private environment, and a number of spaces can be provided in an environment for personal privacy. In such spaces, the student can do the necessary supervision, and social interactions will be improved. There are a variety of small and large meeting spaces in the school environment (such as small learning groups, relaxation spaces, small recreational activities, and project spaces). Educational and learning neighborhoods are a variety of social spaces in which various educational groups are located. Learning facilities and spaces should be flexible to perform a variety of learning activities. Not only flexibility should be included in the curriculum, but learning spaces should be flexible to perform activities to achieve a variety of goals. This way, users will be able to adapt to future changes. In such environments, children can function, move freely in space, and interact without disturbing their classmates (Deane Mason, 2008). Duran-Narucki conducted a study on the relationship between school building conditions, student attendance, and academic and educational success among New York schools. This study examined the role of the "attendance at school" component, as an intermediate variable, in the relationship between school facilities and student grades changes. The required data were obtained from the current condition of 95 New York Elementary School buildings. The results showed a relatively reduced presence of students in the school due to outdated facilities, thereby reducing grades, academic success, and interactions. This study sought to answer the question: "Does the state of school facilities affect student interactions, and ultimately student learning and success?" The results showed that daily interactions between school users are affected by school building conditions. Low-quality building is not a good place for social interaction, work, or learning. This plays a significant role in the number of days a student attends school and the quality of the educational process (Duran-Narucki, 2008). In his research on the effect of sitting type on children's social relationships in the classroom, Dee points out that students are better off sitting like a horseshoe in the class, that is, in the form of language classes, because such sitting and arrangement facilitate communication with each student and the whole class (Department for Education and Employment, 1999). The above study is consistent with Hartopp (1996) hypothesis and some other researchers that how classroom placement plays an effective role in friendship, social interaction, and intimate relationship between students. Weinstein and Mignano's studies were among the first studies on factors affecting social interaction in the classroom. The results showed that the following factors improve social interaction between students in the classroom:

children's mental security, use of play space in the classroom, increase self-esteem (so that each child can attend the class), the possibility of group activities, growth of thinking and symbolic expression, enhancing motor development (activity), the possibility of exploration in the environment, and increasing children's commitment (Weinstein & David, 1987; Weinstein & Mignano, 1997). In a paper entitled "School Design, Crisis, Educational Efficiency, and Design Applications," Moore and Luckney concluded that attractive and comfortable physical environments could provide several benefits for achieving educational and learning goals, including encouraging learning and socially positive relationships (Weinstein, 1979). High density increases anger in schools, reduces social interaction, and destroys participation in the environment. Also, the level of participation in small classes is higher than in large classes. Teachers interact more with students in classes with fewer students, leading to the formation of learning teams and groups. In this way, students will be able to learn from each other through face-to-face interactions and negotiation. According to some researchers, physical criteria (such as the formation and organization of space, form, geometry, order, coordination, harmony, variety of dimensions and proportions and other aesthetic dimensions, position and placement of approaches) and activity criteria (e.g., problems and barriers to users' movements, evaluation of space functions, methods of using space by users, conditions and social characteristics of activities) are among the most important criteria of sociopetality (Mohammadi & Ayatollah, 2015). In his doctoral dissertation, Michael collected information using a combination of quantitative and qualitative methods through observation and questionnaires and examined the capabilities of the collective space for social interaction. This study, conducted by adopting an exploratory approach, investigated the effect of perceptions and preferences of adults and youth in designing a collective space for intergenerational interactions. For this purpose, five research questions and the effect of 51 variables included in the subcomponents of personality-individual characteristics, spatial images, environmental capabilities, spatial characteristics from the perspective of users and spatial models were investigated. A total of 135 people participated in this study. The required data were collected from three different domains: preferred activities, optimal spatial features, and optimal spatial models, for intergenerational communication between the two age groups. This dissertation was done in five steps. In the first step, out of 192 images taken, 24 final images were selected by a questionnaire suitable for social interactions and five environmental capabilities (security, sense of belonging, space that allows multiple activities, interpersonal conflict, a space that allows for multiple activities, interpersonal engagement, a space that allows people of different age groups to attend, and

increased interaction) by the literature and user surveys by selecting priority images and open-ended questionnaires. (Users were asked to specify what images are important for intergenerational interactions, citing reasons). They were classified into five general groups.

Users were also asked to state their reasons for choosing images and their spatial features. They were classified into five different subgroups. Studies show that users generally prefer similar public spaces. In the second step, users were asked to specify which of the five spatial values and capabilities they preferred for intergenerational interactions, citing reasons. In the third step, users were asked to specify which models and spatial features were preferred for intergenerational interactions, citing reasons. Various questions were asked in the form of three questionnaires (in addition to questions about the individual-personality components of users, including youth, adults, and professionals), as follows:

1) Experts were asked to describe a pleasant public place where they gather and talk to their friends, giving reasons (describe your perception of being with your friends in the same place).

2) Select five images from the displayed images suitable for meeting friends, stating the reasons.

3) Select proportion images with the five factors mentioned in the research suitable for interpersonal interactions with reasons.

4) Choose images from these 24 images represent the appropriate space for interpersonal interactions with reasons.

5) Users were asked to categorize the five important factors mentioned to increase intergenerational interactions.

6) Name and location of the places you have used so far for the meeting, giving reasons. How far are they from home?

7) Users' perceptions of spatial features were questioned that these spaces could meet users' needs in five appropriate areas of social interaction.

The content analysis results indicated that 18 activity models and nine spatial qualities were suitable for interpersonal interactions. In this study, control variables were gender, level of education, and type of space ownership. During the research, various comparisons were made between the responses of users from different domains in SPSS. In different parts of this dissertation, especially the five spatial capabilities necessary for social interaction, a comparison was made between the two age groups. The results showed a negative correlation between the five variables. This means that by increasing one variable, the opposite variable decreases. The results also showed that interpersonal interaction is enhanced if a collective space, such as a park, street, etc., has diverse, attractive, and inviting uses, diverse perspectives and views. Space has a sense of belonging, is safe and lively, which allows the presence of different groups and

facilitates their access to various collective activities and facilities. According to the results of this thesis, an environment should have constructed elements (with buildings adjacent to each other and close to people) and natural to allow people to talk and interact in a calm, diverse, and lively environment, away from outside disturbances, through rest, walking, sitting, and group activities, such as sports and shopping. The results also showed that interaction is facilitated when the environment is sufficiently safe and confidential, where people can operate away from any outside hustle and bustle and perceive this space as a personal space similar to a home.

In his dissertation on the impact of school architecture on student interactions at school, using a qualitative approach, Churchill addressed in detail the relationship between the primary learning environment and children's interactions. Following the study of the adaptation of learning approaches to learning spaces, we studied the Crow Island Elementary School, built in 1940, on a case-by-case basis, the physical embodiment of Dewey's vision or the leading movements of the twentieth century. Four conclusions were drawn from this study. First, safe and comfortable environments help to improve children's learning and interactions in the environment. This variable allows the child to be cared for to perform his/her activities. Second, the flexibility of architectural spaces facilitates the improvement of children's learning and interactions in space. Spaces should be able to adapt to changes in activities and practices and be agile enough to facilitate a variety of learning activities, such as group activities. In this regard, some classroom spaces should be able to be integrated into other spaces and classrooms. Third, space must be diverse enough to facilitate a variety of learning activities, such as manual training, technology availability, and communication with the outdoors. Fourth, spatial quality, including temperature and humidity control, is essential for promoting social interactions in the school (Churchill, 2014).

The accessibility of a collective space is an effective barrier to increase the desirability and establishment of social interactions (Peters et al., 2010) because accessibility increases the likelihood of social interactions in space (Fisher, 2009). In such a place, appropriate furniture attracts people to participate in social gatherings (Gehl, 1978). The arrangement of furniture in space also affects the establishment of effective relationships (McCulloh & Sailer, 2012). Back-to-back benches, for example, as an example of unsociable organization, may prevent social interaction. An interactive place should provide ample space to encourage and attract people, leading to increased social communication (Gehl, 1978).

The size of the space is important to define the type of interactions that may occur in space. While the area of space must be large enough to accommodate a certain population, too large a space can have devastating effects. For example, studies of two public spaces, Team

Park and Gaffert Park, have shown a more intimate atmosphere in Team Park, unlike Gaffert Park, due to its smaller size. This was because random interactions did not occur in Gaffert Park because of its large size (Peters et al., 2010). The shape of the space becomes important when the area of the space reaches a certain level. Long, narrow corridors provide a different kind of interaction compared to a large, rectangular space. The road along with the center are the two main elements of any spatial organization, one representing movement and time and the other representing peace and communication with others. A space that induces pause and sitting is more appealing to groups because of its proportions.

An effective factor in turning a space into an interactive place is to be in the path of people's daily activities. Proximity affects the degree of social interactions of users of a place. Studies of scientists and engineers in a research organization have shown that people interact more with each other when working in adjacent offices (Kraut et al., 2002). In their study of interactions at a research center, Toker and Gray found that people whose workstations could be seen from the group space section were more likely to have unintentional meetings with colleagues than those who worked in greater isolation. It was also found that more social researchers certainly prefer their workspace to be more accessible (Gray & Toker, 2008). "Attraction"

allows a certain place to host a certain population and increases the possibility of social interaction in it. It can be mediated through spatial diversity (Bentley, 1985), beauty (Bisadi, Mozafar, & Hosseini, 2013), sound, and appropriate lighting (Boubekri & Wang, 2009). The results of a study conducted by researchers at the Center for Architectural and Urban Research showed that researchers' motivation to participate in a collective space increases due to spatial diversity and flexibility. Also, the beauty of the space increases the peace and comfort of users, in the first place, and increases their motivation to be present more and longer in those spaces, and equally increases the possibility of interaction between them, in the second place (Bisadi, Mozafar, & Hosseini, 2013). "Lighting", as a structuring element in a space, can help us understand what spatial understanding, path selection, navigation, and social interaction involve (Boubekri & Wang, 2009). Criteria affecting sociopetality can be divided into five groups: physical, contextual, psychological-personality, behavioral-activity, and semantic. These criteria were highly regarded by researchers in the field. Due to the research scope, i.e., the architecture of the environment and place, more criteria were examined in the physical and environmental fields. Comparative study of social interaction indicators in the comprehensive approach, the basis of measuring social interaction in this study, showed that this approach could meet all situations.

Table 1. Comparative Study of Factors Affecting Sociopetality

Areas Affecting Sociopetality	Variables Studied	Variables Affecting Each Area	Altman	Simmel
Physical	Functional Centrality of Public Space, The Layout of Space, Accessibility of Public Space and Classroom, Permeability of Space, Existence of Common Space, Scale, Readability and Flexibility of Space	Public Space Accessibility, Permeability, Common Space, Scale, Readability, Flexibility, Space Geometry, Working Distance, Functional Centrality and Space Layout	Flexibility, Permeability and Scalability	Readability, Flexibility and Geometry of the Space
Behavioral	Collective Activity, Density And Length of Stay in the Place	Collective Activity, Density, Length of Stay in the Place	Density	-
Semantic	Symbols and Signs	Symbols, Signs, Etc.	-	Signs
Contextual	Cultural Background	Culture, Economy, Etc.	Culture, Age and Gender	-

The range of components extracted from the previous step was validated based on the comments of experts and specialists (Delphi technique). In this section, as a field study, architects and designers, especially environmental psychologists and behavioral scientists, were asked to explain their views on the components affecting sociopetality as well as the review conducted in the previous section. Accordingly, the following steps were taken in this section. In the first step, ten architecture and urban planning experts in environmental psychology were asked to explain the components affecting sociopetality. Then, the collected answers were coded. In the second step, all the effective components were returned from them in the

form of a questionnaire. They were asked to express their views on those components. Finally, the proposed five components related to sociopetality components were confirmed.

4. METHODOLOGY

This method utilizes the Analytic Hierarchy Process (AHP) technique to achieve the desired goals. This study investigated the specific application of this method in determining the criteria for designing an educational space to promote social interactions for learning. For this purpose, an analytical hierarchy process questionnaire was developed based on

desk research and in-depth literature review. The questions were answered in the form of weighing and determining the components and indicators of designing educational spaces to achieve the research objectives by experts. To evaluate educational space architecture and environmental psychology experts' views on the factors extracted from the literature review, a researcher-made questionnaire was first developed using the Delphi technique and its experimental study by fifty professors before the final distribution. After determining the questionnaire's validity, 40 questionnaires were distributed by

sending or in-person referral among professors to assess the impact and priority of physical, contextual, psychological-personality, behavioral-activity, and semantic components, obtained in the research topic by specialists. Among them, 25 questionnaires were collected and evaluated using Expert Choice.

5. FINDINGS

Table 2 shows the analysis of the geometric mean findings of the pairwise comparisons of experts in the main criteria.

Table 2. Pairwise Comparison Matrix of the Main Criteria

	Physical Component	Behavioral Component	Semantic Component (Symbolic Elements in Space)	Contextual Component (Cultural Background)
Physical Component	1	0.315	0.725	0.636
Behavioral Component	3.175	1	1.665	1.888
Semantic Component (Symbolic Elements in Space)	1.379	0.601	1	1.783
Contextual Component (Cultural Background)	1.572	0.53	0.561	1

The largest eigenvalue of this pairwise comparison matrix is 5.1. According to Table 1, the consistency indicator and consistency ratio are 0.025 and 0.022, respectively. Consistency ratio is less than 0.1, indicating the consistency of expert responses. Also,

the importance weights of the main criteria, in this case, are obtained from normalizing the eigenvector corresponding to the largest eigenvalue, as shown in Table 3.

Table 3. Importance Weight of the Main Criteria

Main Criteria	Importance Weight	Rank
Physical Component	0.0857	4
Behavioral Component	0.2475	1
Semantic Component	0.1675	2
Contextual Component	0.1362	3

Table 4 shows the geometric mean matrix of the pairwise comparisons of experts in the physical criterion. The largest pairwise comparison eigenvalue of the above matrix is 8.43. Therefore, the consistency indicator and consistency ratio, in this case, are 0.06

and 0.04, respectively. Consistency ratio is less than 0.1, indicating the consistency of expert responses. Importance weight of physical criteria is obtained according to Table 4.

Table 4. Importance Weight of Physical Sub-Criteria

Sub-Criteria	Importance Weight
Flexibility	0.0855
Functional Centrality of Public Space	0.118
Accessibility of Public Space and Classroom	0.1748
Space Layout	0.1023
Space Permeability	0.0945
Existence of Common and Public Space	0.1619
Scale	0.122
Readability	0.1412

Table 5. Pairwise Comparison Matrix of Physical Sub-Criteria

	Flexibility	Functional Centrality of Public Space	Space Layout	Accessibility of Public Space and Classroom	Space Permeability	Existence of Common and Public Space	Scale	Readability
Flexibility	1	0.441	0.359	0.803	1.11	0.561	1.208	0.678
Functional Centrality of Public Space	2.268	1	0.464	2.268	0.684	0.379	0.75	1.084
Accessibility of Public Space and Classroom	2.786	2.155	1	2.091	1.511	1.149	1	1.014
Space Layout	1.245	0.441	0.478	1	0.807	0.822	1.246	1.114
Space Permeability	0.901	1.462	0.662	1.239	1	0.553	0.488	0.441
Existence of Common and Public Space	1.783	2.639	0.87	1.217	1.808	1	1.246	1
Scale	0.828	1.333	1	0.803	2.049	0.803	1	0.699

The last pairwise comparison matrix is related to behavioral sub-criteria. Table 6 shows the geometric mean of pairwise comparisons of experts in behavioral subscales.

Table 6. Pairwise Comparison Matrix of Behavioral Sub-Criteria

	Collective Activity	Population Density	Length of Stay in the Place
Collective Activity	1	2.46	0.511
Population Density	0.407	1	0.441
Length of Stay in the Place	1.957	2.268	1

The largest pairwise comparison eigenvalue of the above matrix is 3.06. Therefore, the consistency indicator and consistency ratio, in this case, are 0.03 and 0.05, respectively. Consistency ratio is less than 0.1, indicating the consistency of expert responses. Importance weight of behavioral criteria is obtained according to Table 7:

Table 7. Importance Weight of Behavioral Sub-Criteria

Sub-Criteria	Importance Weight
Collective Activity	0.3284
Population Density	0.1716
Length of Stay in the Place	0.5

Finally, by accumulating weights, importance weight and ranking of criteria are obtained according to the results of Table 8:

Table 8. Final Importance Weight and Rank of Different Sub-Criteria

Main Criteria	Sub-Criteria	Importance Weight	Rank
Physical Component	Flexibility	0.0855	13
	Functional Centrality of Public Space	0.118	10
	Accessibility of Public Space and Classroom	0.1748	3
	Space Layout	0.1023	11
	Space Permeability	0.0945	12
	Existence of Common and Public Space	0.1619	6
	Scale	0.122	9
	Readability	0.1412	7
Behavioral Component	Collective Activity	0.3284	2
	Population Density	0.1716	4
	Length of Stay in the Place	0.5	1
Semantic Component	Symbolic Elements in Space	0.1675	5
Contextual Component	Cultural Background	0.1362	8

6. CONCLUSION

This study aimed to identify the factors affecting the strengthening of students' social interactions in school. According to the achievements of this study, the factors affecting the aforementioned promotion were introduced. To this end, a number of studies have been conducted on theories about social interactions and the feasibility of the formation of events, in addition to related domestic and foreign research. The results showed that "promotion of social interaction" has physical, behavioral, semantic, and contextual characteristics. The highest and lowest significance coefficients were related to behavioral criteria (significance weight: 0.2475) and physical criteria (significance weight: 0.0857), respectively.

On the other hand, the prioritization of sub-indicators showed that "length of stay", belonging to behavioral criteria, and "accessibility of public space", such as class, belonging to physical criteria, were the most important. The "length of stay" sub-indicator had the highest importance weight (0.5) with consistency ratios of 0.046 and 0.022. This was consistent with the fact that it should provide a platform for students to stay in place for longer periods and interact. This was consistent with Walham's research confirming this. Also, the use of special physical capabilities in the design of interior spaces to facilitate the accessibility of public spaces, such as classrooms, allows people to easily access such spaces and interaction (importance weight: 0.1748; consistency ratio: 0.046 and 0.022). This was consistent with Altman's studies confirming this. This study aimed to examine the criteria of interior spaces in terms of quantity and quality. By identifying these characteristics, designers can pave the way for facilitating the sociopetality of the environment and creating flexible environments in schools, which enable the sociopetality of proportion to a wide variety of students.

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