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Affordances of school's In-Between spaces for children's multiple intelligences

Seyedeh Somayeh Mirmoradi *[1]

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Abstract

Several concepts in environmental psychology explore the reciprocal relationship between the environment and human behavior. One key concept is Affordance, introduced by Gibson. This concept suggests that architectural projects can shift their focus from merely considering function and form to creating environments that effectively meet the diverse needs of users. In-between spaces in school architecture are often overlooked in the design process, yet they can offer numerous affordances. This research aims to highlight the various design affordances of these spaces in schools and categorize them based on their ability to address different aspects of children's intelligence, as outlined by Multiple Intelligences (MI) theory. Using the framework of affordance theory, this qualitative study aimed to identify the various environmental characteristics of in-between spaces in schools that support children's multiple intelligences. The results of this research indicate that in-between spaces, due to their high design flexibility, are rich environments for accommodating the diverse intelligences of students. These spaces can support various types of children's multiple intelligences if designers and school leaders are aware of diverse affordances of these spaces.

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[1] Assistant professor of architecture, Babol Noshirvani university of technology, Babol, Iran
*Corresponding Author: Email: s.mirmoradi@nit.ac.ir

introduction

Education at all levels is being transformed, impacting teaching methods, materials, and the physical learning environment. Over recent years, efforts have been made to align school architecture with contemporary educational practices to create stimulating and responsive teaching and learning environments. (Kowaltowski et al., 2024) A well-designed learning environment can positively impact the teaching and learning experiences of teachers and students, as demonstrated by multiple studies that have analyzed the impacts of school buildings on the learning process (Fisher, 2016; Kariippanon et al., 2018; Barrett et al., 2019; Tanner, 2000; Young et al., 2020).the design of school building needs to reflect pedagogical goals and recommended activities, while concurrently anticipating changing educational dynamics and the need to accommodate future needs flexibility (Kowaltowski et al., 2024). In recent years, shifting teaching methods and pedagogical practices have signaled new spatial paradigms that necessitate the need for spatial flexibility and increased diversity of settings in schools' spaces (Fisher, 2007; Kariippanon et al., 2018).

formal schooling was established in the nineteenth and early twentieth centuries, based on a subject-focused curriculum delivered didactically in traditional classrooms. Since then, school buildings have largely been designed to reflect and enable teacher-centered instruction. However, many newer learning spaces, as may be identified as ILEs (Innovative Learning Environments), are being designed to enable a wider range of pedagogies (Young and Cleveland, 2022). Innovative learning environments (ILEs) (OECD 2013) may be considered "the product of innovative space designs and innovative teaching and learning practices" (Young et al., 2020). The design of ILEs is fundamentally based on the premise that broader pedagogical opportunities can be offered through the integration of more varied features within the environment. However, fulfilling the design intentions/aspirations of new learning spaces is clearly dependent on the ability of teachers (as leaders of learning activities) to perceive, utilize and shape the affordances of the environments they occupy—and to support students to act similarly (Young and Cleveland, 2022).

From the view of ecological psychology, the environment and human behavior are very related and it is impossible to study each one separately (Gibson,1966). Several concepts have been proposed in the field of environmental psychology, which deal with the mutual influence of the environment and human behavior, and also indicate the effect of behavioral patterns on appropriate environmental design. One of the concepts that is very effective in this field is the concept of "affordance", which originates from ecological psychology.

affordance deals with the mutual relationship between the environment and the organism. affordance pays attention to both the environment and the observer (Gibson, 1979). Heft (1989) believes that the concept of affordance includes both the objective aspects of architecture (architectural function) and the subjective qualities of architecture (functional meaning). affordances are relational characteristics and emphasize the appropriate matching of characteristics of the environment and the person, rather than considering each one alone (Heft,1989).

An important point about affordance is that it does not belong only to the environment or to the organism. Rather, it is the result of the confrontation of these two. Such a view rejects the objective perception of function in architecture. The perception that users should follow specific and defined functions in buildings. Based on this concept, the goal of architectural projects can be improved from just paying attention to function and form to creating environments that meet the needs and purposes of users. The concept of affordance can help define the relationship between designers, users and built environments and changes the purpose of design from a purely functional or formal view to creating an environment that meets the needs of users. By designing and evaluating the affordances of a built environment and analyzing the behavior of its users, it is possible to achieve a more accurate understanding of the different levels of the capabilities of architectural spaces and its use for the designers of these environments.

Flexibility in the learning environment has been discussed and analyzed thoroughly in the last decade and continues to be advocated. Through the concept of affordance, flexible spaces permit and stimulate collaborative, personal, and social learning and teaching, as well as increased mobility of students to work where and how they choose, depending on learning tasks (Reinius et al., 2021). Educational tendencies and pedagogical changes primarily aim for collaborative, participatory, and independent teaching

and learning, in line with the twenty-first century skills that students should acquire and for promote these aims, flexible physical school spaces are recommended (Young et al., 2020; Kariippanon et al., 2018). Evidence stresses the importance of varied learning opportunities for example External Areas, Flexibility and Reflexivity, and Spaces in Between.Recent researches acquired that specific attention in school design studies is mainly given to the learning or classroom space. additional research especially concerning socialization spaces in schools' community is needed. (Kowaltowski et al., 2024) Recent researches indicate that the spaces in between learning environments should be integrated with these, providing further flexibility and opportunities for learning in the school building (Young et al., 2020; Kowaltowski et al., 2024). The spatial type of schools' spaces that this paper focused on is 'in-between spaces', as a small space that allows different experience and use than the dominant landscape of larger space. They occur between larger formal, and formally designed spaces. Unlike the formal spaces of school, designed with predetermined activities in mind, in-between spaces are not often the focus of the design team and are not currently considered by designers in advance for the purpose of activities that take place in them (Aminpour, et al., 2020).

For an optimal learning environment, teachers must be prepared for the new situation and the dynamics in which they will partake, broadening their understanding of how the environment can influence learning activities. (Kowaltowski et al., 2024) For school leaders, teachers and students, newly built learning environments may be considered successful when pedagogical practices align with a school's educational aspirations and vision. For this to occur in the context of ILE's, teachers as individuals and as members of collective groups, need to better perceive and utilize the affordances of the environments available to them (Young and Cleveland, 2022). Introducing an affordance perspective to the field of school design may create a valuable and meaningful bridge between architectural designers and the inhabitants of learning spaces (i.e., teachers and students), towards creating better spatial-pedagogical settings for teaching and learning (Young et al., 2020).

Research framework and method:

This paper reveals the environmental affordances of in-between spaces and their importance to multiple intelligences of children in Schools. this spatial type spaces of schools plays an important role in supporting and providing for children's intelligences at school and previous studies have dealt with them less. The paper begins with a discussion of framework it uses about *'Affordances Theory'* and *'Multiple Intelligences'*. This theoretical discussion aims to identify the framework of the affordance theory and different types of children's multiple intelligences and the characteristics of each. This paper aims to establish the concept of *"In-Between Spaces"* as vital areas for children, that are currently underappreciated in school design. It attempts to explore the various affordances of two important in-between spaces within schools, focusing on their design potential based on children's multiple intelligences. This paper highlights the unique opportunities provided by these spaces offer regarding their significant potential for fostering the development of all types of children's intelligences.

Using the framework of affordance theory, this qualitative study aimed to identify the various environmental characteristics of in-between spaces in schools that support children's multiple intelligences. Based on this analysis, we first outlined several advantages and positive affordances of in-between spaces that may not be present in indoor or outdoor environments. For each of these affordances, relevant design considerations applicable to the two in-between spaces discussed in this article were identified to address those affordances. Subsequently, based on these design considerations, a summary was developed to illustrate how designs informed by each affordance can effectively support specific aspects of children's multiple intelligences. In conclusion, it is demonstrated that each of the in-between spaces discussed in this article can be effectively designed to align with specific categories of multiple intelligences, provided they are developed thoughtfully and responsively to various affordances.

Review of literature:

Due to the wide scope of the topic of designing educational spaces, only recent studies related to the application of affordances theory in architectural design and specially design of educational spaces have been addressed in this section.

The use of affordability has a long history in architecture. For the first time, in the field of architecture, the categories of affordance for buildings were introduced by architect Jon Lang (1987) According to Lang the affordance has been called

'availability' by architect Louis Kahn and 'capability' by landscape architect Lancelot Brown because designers realized that affordance could influence human behavior. (Lang,1987)

The central idea of affordance-based design is that design is the specification of a system structure that possesses certain desired affordances in order to support certain desired behaviors, but does not possess certain undesired affordances in order to avoid certain undesired behaviors. By changing the structure of a system, designers can change the system's affordances. (Maier, et al., 2007) Among the studies that have dealt with the concept of affordance in architecture, can mentioned these ones:

Tweed (2001) has studied two concepts of affordance and the effectivity of using affordances in Computer-Aided Architectural Design (CAAD). While creating a relationship between the affordances and design of the buildings, emphasized the general characteristics of the affordances and their potential in helping to respond to all aspects of architecture. In his opinion, the use of affordances in architecture leads designers to designs that are responsive to a wider range of users (Tweed,2001).

Stating that the human relationship with the built environment is influenced by the affordances of building elements and spaces, Koutamanis (2006) has investigated this relationship on two general levels of building elements and spaces. He considers building elements to have four interrelated (physical/mechanical, perceptual, semantic and cultural). Koutamanis has stated two levels to relate affordances with functional patterns of architectural spaces: spatial and interactive level. The spatial level refers to the internal structure of these patterns and includes their general relationships with the environment and its basic elements. The meaning of the interactive level is to adapt these patterns to the spaces that accommodate them. (Koutamanis,2006).

The function-task interaction (FTI) method had been applied in identifying environmental affordances in a conference room, where affordances have been addressed beyond the function-oriented affordances (Kim et al., 2007). They have examined the concept of affordance in a limited way in a specific use. This research was done as a case study by analyzing the affordances of a conference room. Components and building elements of a conference room and possible reactions against them are presented. Finally, a list of desired affordances in this space and how to respond to them has been discussed (Kim, et al., 2007).

Galvao and Sato proposed the Function–Task Interaction (FTI) Method. This method includes a general product development process and also an affordance method, especially the FTI matrix (Galvao and Sato,2005,2006). In the FTI method, product functions and user tasks were derived from function decomposition and task analysis, and linked to each other in the FTI matrix (Kim et al.,2011).

Aim of Agirachman et al, (2022) study is to develop an affordance-based design review method in architectural design by utilizing immersive VR technology. Their study confirms that the affordance-based design review method using virtual reality helps students improve their design work. The method reveals the presence of positive and negative affordances in student's work. They used the framework of affordance-based design, established by Maier and Fadel (2009).

There are much more limited studies on the use of affordance theory in the design of educational spaces. As an example, can referred to these two recent studies in this field:

Young et al., (2020) investigated the affordance for learning perceptions of educators and architects with respect to the action possibilities for deep learning in both ILEs and more traditional classrooms. The study identified a taxonomy of affordances found to enhance opportunities for varied pedagogical approaches (Young et al.,2020). Young and Cleveland, (2022) highlighted the relevance and value of affordance theory in relation to school-based learning environments and argue the value of an affordance-based approach to learning environment design and use is beneficial for some reasons, From a designers' perspective, For school leaders.

This article attempts to introduce the various potentials that are important in in-between spaces of schools and are neglected in many cases by using the concept of spatial affordances. It has also been tried to express the relationship between available affordances in these spaces with children's multi-intelligences.

Affordance theory:

Several concepts have been proposed in the field of environmental psychology, which deal with the mutual influence of the environment and human

behavior, and also indicate the effect of behavioral patterns on appropriate environmental design. One of the concepts that is very effective in this field is the concept of "affordance", which originates from ecological psychology. The concept of affordance, which was first proposed by Gibson, refers to the action possibility that enables organisms to do it. Gibson believes that the environment has meaningful characteristics and provides capabilities to organisms. (Gibson, 1979) In other words, affordances are the semantic and functional features of the physical and social environment, which are based on the relationship between the environment and the person.

In his book entitled *the Ecological Approach to Visual Perception*, Gibson discussed how organisms perceive their environment. In this book, he provides a description of how affordances are perceived in the environment. He explains that animals change the levels of the physical environment with this goal in order to adapt the affordances of the environment to their needs. (Gibson,1979,1989)

A decade later, another psychologist, Donald Norman, expanded Gibson's theory and applied it to design. Norman outlined several strategies for what a particular object should and produce. In his book *Poet* or *The psychology of everyday things*, he deals with the psychology of objects that are used in everyday life (Norman,1988). Another edition of this book was published in 2002 under the title of *The design of everyday things* (Norman, 2002).

By distancing from the meaning of Gibson's affordance, Norman considers it related to both real and perceptual properties of objects. From the point of view of *Poet*'s book, the perception of each person is a component of affordances (Norman,1988). It can be said that Gibson relates affordances to the practical capabilities of beings, while Norman emphasizes the mental and perceptual capabilities of the user. In *Poet*'s book, affordances depend on culture and past experiences, that is, learning through interaction and social experience.

Instead of Gibson's affordance, Norman (Norman,2002) introduced perceived affordance, which is about characteristics in the appearance of a product that provide clues for proper reactions or that limit what can be done. According to Norman, Gibson's affordance was real affordance, which is about the physical characteristics of an object or interface allowing its operation. Norman distinguished two factors of product: functionality and appearance, because these two are the most relevant for understanding the relationship between design and human emotions. (Norman,2005), (Norman and Ortony,2003) Norman believes that affordance is the result of users' mental perception of objects and themselves, which is based on their previous information and experiences (Norman,1988).

An affordance is what one system provides to another system. Affordances always express a relationship between two separate systems. In Gibson's original formulation, one is the environment, and the other is an animal situated in it. For design, and especially for architecture, we can view the environment as the built environment and consider the typical animals in them to be in fact human users. Hence the usual affordances of interest exist between artifacts and users. These affordances can be called "Artifact-User Affordances" (AUA) (Maier and Fadel, 2009). AUA indicate what uses the artifact provides to the user (Maier, et al., 2007). As in all affordances, AUA can be either positive or negative, depending upon whether the potential behavior is beneficial or harmful to the user. Positive affordances must be designed into the artifact, while negative affordances must be designed against. Therefore, an important task for designers is to ascertain from users what positive affordances should be designed and what negative affordances must be designed against. (Maier and Fadel, 2003). In this article, we have emphasized on "Artifact-User Affordances" (AUA).

Gibson defined affordances as the action possibilities resulting from the relationship between user and environment. He argued that user perception is critical to identifying the action possibilities offered by an environment, and that spatial affordances may lie latent until actualized by individuals (Young et al., 2020). Understandings about affordances and how they relate to school design and educational practice is needed in support of effective teaching and learning. Adopting an affordance-based approach to design is likely to help generate shared understandings between architects and users, aiding in the creation of spaces that are not only well-designed but also well-used in practice. (Young and Cleveland, 2022)

The Multiple Intelligences (MI) theory:

Gardner a professor of education in 1961, started writing a book about human abilities, titled *"Kinds of Mind"*. In 1966, this book became *"Frames of*

Minds". This book explained, for the first time, the theory of multiple intelligences. Gardner tried to expand the awareness of human capacity beyond IQ tests and define the individual intelligence. He tried to recognize the organization of human abilities in the brain. As a result, Gardner showed that the human brain has different parts, each dominant in various cognitive functions (Gardner, 2003). He noticed that everyone had a profile of strengths and weaknesses that can comfortably coexist in one human's profile (Gardner, 1998). By 1981, Gardner had authored a book on his work in defining intelligence (Gardner, 2003). Gardner argues that the belief that humans possess just one intelligence capacity, which always involves only linguistic and logical mathematical skills, is false (Gardner,2001). Therefore, in 1983, the theory of Multiple intelligence was born with publication of book entitled *"Frames of Mind".* Intelligence is perceived as a set of components − currently eight and possibly more. Gardner suggested defining intelligence as the capacity for solving problems and creating products in natural settings (Stanford, 2003).

Gardner identified seven intelligences (Baum et al.,2005): linguistic, logical, musical, spatial, bodily, interpersonal, and intrapersonal. In 1995, Gardner added naturalist intelligence as the eighth intelligence. A ninth one, existential, is considered as possible intelligence by Gardner and some educators .(Gardner, 1998). Therefore, in addition to Gardner's theorized eight, there are other proposed intelligences. The most popular is existential intelligence, which Gardner defines as *"capturing and pondering the fundamental questions of existence"* (Gardner, 1998, p. 22). Next, we introduce Gardner's multiple intelligences:

1) Linguistic intelligence

People who are linguistically intelligent are good in storytelling, using descriptive language, reporting, poetic use of language, and word play (Baum et al., 2005). Students who are high in linguistic intelligence think in words and love reading, writing, and telling stories. Materials, such as books and writing tools, may encourage them to express their knowledge (Armstrong, 2009).

2) Logical-Mathematical intelligence

In contrast to linguistic intelligence, logical mathematical intelligence is not related to the auditory-oral sphere; instead, it is related to the world of objects, ordering and reordering them (Gardner, 2004). Logical-mathematical intelligent people usually use and appreciate abstract relations. Their intelligence is emphasized in products like graphs, time lines, logic puzzles, and computer programs (Baum et al., 2005).

3) Spatial Intelligence

Spatial intelligence involves sensitivity to colors, lines, shapes, forms, spaces and the relationships between these elements (Armstrong, 2009). Some spatial tests or puzzles are related to logical-mathematical intelligence, as well, as both deal with subjects other than auditory (Gardner, 2004).

4) Musical intelligence

Musical intelligence involves sensitivity to the rhythms, melodies or tone color of a musical piece (Armstrong, 2009). Anyone can exhibit musical skills by living a life full of music and learning to read and/or play music. Nevertheless, each person has different levels of musical core talent (Gardner, 2004).

5) Bodily-Kinesthetic Intelligence

Bodily-kinesthetic intelligence is the ability to use and control the body or part of the body to create something or to solve a problem. It does not necessarily involve releasing energy through physical activities; it could be through hand crafting for example (Baum et al., 2005). It involves using the body, or a part of it, in order to express feelings and ideas, or to create products, such as involving hand and fingers in sculpturing. It relies on physical skills that include speed, flexibility, balance and strength (Armstrong, 2009).

6) Interpersonal Intelligence

Interpersonal intelligence is the ability to understand and deal with other people. It involves sensitivity to the feelings, beliefs, and moods of other people. It does not necessarily include a preference for working in groups (Baum et al., 2005). It deals with others' moods, temperaments, and motivations (Gardner, 2004). People who are interpersonally intelligent have the ability to affect others' decisions, feelings and beliefs (Baum et al., 2005)

7) Intrapersonal Intelligence

Intrapersonal intelligence is the capacity to understand oneself, including one's feelings, moods, intentions, and needs. It involves the ability to express

oneself through other intelligences, such as painting, singing, or poetry. Self-smart persons do not necessarily prefer to work individually or in isolation (Baum et al., 2005). It involves the ability to act adaptively according to self-knowledge, alongside the capacity for self-understanding and self-esteem (Armstrong, 2009).

8) Naturalist Intelligence

Naturalist intelligence is the ability to distinguish living creatures (plants and animals), in addition to the ability to be sensitive to other natural features and patterns. It involves knowledge of the natural world. It is not, however, limited to the outside world (Baum et al., 2005). Nature smart also includes the capacity to distinguish objects in urban environments, such as cars and CD covers (Armstrong, 2009).

In-Between spaces in schools:

"The primeval act of architecture is the separation of an inside from an outside. The architect is, by the meaning of the Greek word, the primeval cutter, he cuts and thereby creates Space." (Arnheim et al., 1966, pp. 7,8) In relation to the space between inside and outside, a space that is neither internal nor external, and basically has the role of connecting these two areas, various interpretations have been presented. Many researchers, including Anderson (1991), Gehl (1996), Hajer and Reijndrop (2001), Hillier and Hanson (1984), Stevens (2007), Skjaeveland and Garling (1997) have done research on this issue. They have used expressions like "in-between", "interface", "betwixt", "threshold", "liminal space", "buffer zone" in relation to this issue. The term "in-between" is the most common interpretation of the space between inside and outside.

In-between spaces with transitional characteristics are based on the principles of separation and transfer, separation and continuity, limits and boundaries, interference and orientation. Demand for inside/outside relationship and its impact on forming in-between spaces as one of complicated elements of architecture must not be neglected; this element as a subsystem of architecture must respond to the needs that Lo (1986) believes that architecture must serve: Physiological Demands for – light, air, sun, the filtering out of climatic extremes, and generally protection from the hazards of the outside: to ensure both the short- and long-term survival of the individual. Psychological Demands for – privacy, contact with others and contact with the environment, a sense of security, identity, and orientation: to add meaning to the life of an individual. (Brookes, 2012)

The differentiation between this 'outside' and 'inside' is defined by human's behavior and perception. A physical boundary is often implemented but is not essential. This space becomes the 'in-between' it could be known as a connection, a line of tension, a boundary, a transitory space. A relationship can be defined as: "Whole" = "Part" + "Connection" + "Part" (Brookes,2012: 12) In-between can also be known as a connection, transition, border, differentiation, threshold or line of tension. (Brookes,2012: 17) the in-between, which allows one to establish a relationship between the two. It is through the implementation of a boundary, a connection, that ultimately has the ability to turn a space into a place. (Lo, 1986, p. 3) A "line of tension" essentially is an imaginary line which runs from one space to another. It is this line which links the inside to the outside. The two parts produced by Here-and-There being the inside and the outside, are the end of the lines. While visual movement provides the "corridor", generating the line itself. A "visual channel" has the ability to carry us across this line of tension, this differentiation between inside and outside. (Brookes,2012: 25)

Affordances of school's In-Between spaces to multiple intelligences:

Based on affordance theory, the purpose of architectural projects can be improved from paying attention to function and form to creating environments that meet the needs of different users. In-Between spaces in school are often forgotten spaces in design despite that they have many affordances. Therefore, in this research, an effort has been made to emphasize the different design affordances of these spaces in schools and categorize them in terms of the possibility of responding to different aspects of children's intelligence in based of *MI theory of intelligences*.

In general, school's in-between spaces have different affordances due to their special features, some of which may not be existed in formal indoor or outdoor spaces. The specific affordances of an in-between spaces in school architecture may vary depending on the design, layout, and intended use of the space. These are some advantages and positive affordances of in-between spaces that may not be available in indoor and outdoor spaces:

- Social interaction: The in-between space may afford opportunities for students to interact with each other, fostering social connections, collaboration, and teamwork.

- Transition and movement: The space may afford smooth transitions between different areas of the school, acting as a pathway or corridor.

- Relaxation and break: The in-between space might afford a place for students to take a break from their academic activities. It could offer comfortable seating, natural lighting, or even greenery to create a calming atmosphere.

- Informal learning: in between spaces may afford opportunities for informal learning activities. It could provide display areas for student work, whiteboards or chalkboards for impromptu discussions or brainstorming, or even technology-enhanced features for collaborative learning experiences.

- Privacy and solitude: The in-between space might afford a quiet and private area for individual students to study or reflect. It could include secluded corners, individual study pods, or private nooks that allow students to focus without distractions.

- Multi-functionality: The in-between space may afford multiple functions or uses. It could be designed to be versatile, allowing for different activities or events to take place, such as exhibitions, presentations, or small performances.

Design considerations to achieve each intelligence of multiple intelligence theory

Among the various in-between spaces that can exist in schools, two of the most important spaces have been discussed in this article. These two spaces are:

- Space between classroom and movement space (Learning corridor)

- Space between classroom and courtyard (Outdoor learning terrace)

First, the spatial affordances that can be achieved in these two school's in-between spaces were listed. According to Gibson's affordance theory, affordances are the possibilities for action that an environment offers to an individual. In the context of architectural spaces, these are some advantages and positive affordances of in-between spaces that may not be available in indoor and outdoor spaces: (A-Z):

- Accessibility
- Adaptability
- Audio Capability
- Coordination Capability
- Build Capability
- Creativity Capability
- Display Capability
- Discoverability
- Expressive Capability
- Focus Capability
- Flexibility
- Group Work Capability
- Interaction Capability
- Nature Integration Capability
- Physical Activity Capability
- Play Capability
- Quietness Capability
- Reflection Capability
- Reading Capability
- Safety Capability
- Spatial Diversity Capability
- Self-Reflection Capability
- Seating Capability
- Socialization Capability
- Thinking Capability
- Tactile Capability
- Visual Capability
- Writing Capability

In this part, in table 1-3, has been studied the important design considerations to achieve each of affordances mentioned in the design of two in-between spaces. In these tables, in one column, there is a list of affordances that can be taken into consideration in two school's in-between spaces, and in another column, design considerations that can be implemented in these spaces to achieve mentioned affordances are writed.

Table 1: Design considerations to achieve each affordance in Space between classroom and movement space (Learning corridor) and in Space between classroom and courtyard (Outdoor learning terrace) (A-F)

Affordances	Design Considerations
Accessibility	The space with accessible to people with physical disabilities, ensuring ramps, elevators, and appropriate signage are in place.
	Design with clear and intuitive layout that allows for easy navigation and movement.
Adaptability	Movable furniture, modular partitions, or flexible layouts that can be easily reconfigured to suit different activities and needs.
Audio Capability	Install speakers or sound systems to play soothing or inspiring music in the corridor
	Use materials and design techniques that minimize noise and echo in the corridor
Coordination Capability	Enough space and seating arrangements for students to comfortably gather, collaborate, and coordinate their activities include benches, tables, or other seating options that encourage group work.
	Design should be flexible and adaptable to accommodate different activities and group sizes, include movable furniture or dividers that can be rearranged.
	Design should consider the need for visual and acoustic privacy in certain areas, especially when group work requires concentration through the strategic placement of partitions, screens, or acoustic panels.
	Design should consider the integration of technology with power outlets, Wi-Fi connectivity, interactive displays that facilitate communication and information sharing.
Build Capability	Provide sufficient space in the corridor or outdoor learning terrace to accommodate the anticipated number of users.
	Use modular furniture and space's element that promote flexibility and adaptability to easy modifications.
	Storage spaces for materials, tools, and finished projects.
	Design the space to be adaptable to different activities and age groups. Incorporate movable furniture, modular storage systems, and flexible workstations that can be easily reconfigured.
	Consider the specific age group of children who will be using the space and design accordingly.
Creativity Capability	Children can create artwork using various mediums like paint, clay, paper, and fabric.
	Using bright and vibrant colors, playful patterns, and interesting textures can stimulate children's imagination and creativity.
	Use movable furniture, modular structures, or flexible layouts.
	Interactive installations, tactile surfaces, or sensory experiences like sound or light installations can engage children's senses and encourage exploration and imaginative play.
	Design zones for different activities, such as reading nooks, art stations, or play areas.
	Secure and supportive environment for children to freely express their creativity.
	Providing spaces to showcase children's artwork, projects, or creations.
Display Capability	Provide bulletin boards or display areas where students can showcase their writing, poems, or other linguistic creations.
	Incorporate signs or labels with vocabulary words or quotes to promote language development.
	Provide interactive displays that encourage problem-solving and logical thinking, such as puzzles, number games, or even math-related artwork.
	Utilize the walls or floor space to display visual art, photographs, or maps.
	Create a space where students can showcase their musical talents, such as a small performance area or a display of musical instruments.
	Display mathematical concepts or equations in a visually appealing manner.
	Incorporate signage, interactive displays, and bulletin boards.
Discoverability	Use different textures and materials to create a visually stimulating environment.
	Create a layout that offers multiple pathways and levels for children to explore. This could include ramps or stairs that lead to different areas or activities.
	Integrate interactive elements such as sensory walls, interactive screens, or interactive art installations.
	Connect the corridor or outdoor learning terrace with the surrounding environment with windows, outdoor seating areas, or nature trails.
	Design the adequate space with sufficient dimensions to allow students to express themselves freely.
	Create a flexible layout that allows for various activities and interactions. Include open spaces, alcoves, or nooks where students can gather, socialize, or showcase their work.
	Incorporate visually stimulating elements such as colorful murals, artwork, or displays that reflect the school's identity.

Expressive Capability	Use materials and design techniques that minimize noise and echo in the corridor to create a more comfortable environment for students to express themselves verbally or through music without disturbing others.
	Design display Areas along the corridor where students can showcase their projects, artwork, or achievements.
	Incorporate interactive elements such as digital screens, interactive boards, or tactile installations.
Focus Capability	Design the space in a way that clearly defines different areas or zones to create a sense of boundaries and separation, allowing students to focus on their tasks.
	Minimize noise disturbances that can distract students with use sound-absorbing materials, such as acoustic panels or ceiling tiles, to reduce reverberation and control noise levels.
	Incorporating spatial design elements like alcoves or niches can help create quieter areas for focused activities.
	Provide comfortable seating options with ergonomic designs that promote good posture.
	Arrange furniture in a way that allows for individual or small group work, with clear sightlines and minimal distractions.
	Use biophilic elements such as natural elements and greenery to improve cognitive function and reduce stress, enhancing focus and attention.
Flexibility	Different types of seating options such as benches, bean bags, cushions.
	Varied seating arrangement
	Design terrace or corridor with a flexible layout that allows for different activities and group sizes
	Incorporate movable furniture or modular elements that can be rearranged to accommodate various activities and group sizes.

Table 2: Design considerations to achieve each affordance in Space between classroom and movement space (Learning corridor) and in Space between classroom and courtyard (Outdoor learning terrace) (G-F)

Affordances	Design considerations
Group Work Capability	Design seating areas or collaborative spaces where students can gather and interact with each other.
	Design spaces that promote collaboration and social interaction. Include seating areas, group workstations, and open areas for students to gather and engage in discussions or group projects.
Interaction Capability	Involve the school community, including teachers, parents, and students, in the design process to ensure that the space meets their needs and preferences.
	Create different zones or areas that can be easily adapted to different learning or play activities.
	Incorporate seating areas, benches, or gathering spaces where children can sit, talk, collaborate, or simply observe.
	Integrate interactive elements such as interactive art installations, sensory panels, or interactive games into the design.
	Design the space in a way that allows for visual connections between different areas, classrooms, or outdoor spaces.
	Natural light creates a more inviting and pleasant environment for children to interact with each other.
Nature Integration Capability	Use natural materials.
	Incorporate elements of nature into the corridor design, such as potted plants, natural lighting, living walls or images of the outdoors.
	Create a calming and nature-inspired environment.
	Incorporate views of outdoor spaces or create opportunities for students to connect with nature through windows
	Incorporating ample natural light into the design of the in-between spaces can enhance the visual and spatial intelligence. Use large windows, skylights, or light wells.
	Integrating nature and green spaces within the in-between areas. This can include indoor plants, living walls, or outdoor gardens.
	Windows afford the action of looking out or allowing natural light to enter a space.
Physical Activity Capability	Incorporate hands-on activities or interactive elements in the corridor design include areas for students to engage in physical activities, such as mini-games or stations that involve movement.
	Design corridors with ample space for movement, allowing students to engage in physical activities.
	Children can engage in various physical activities like running, jumping, climbing, swinging, and sliding.

Play Capability	The design should incorporate measures to prevent accidents, such as non-slip flooring, rounded edges, and adequate lighting.
	Use movable furniture or modular elements that can be rearranged to accommodate different activities and play scenarios.
	Consider the age group of children using the space and design elements that are appropriate for their developmental stage.
Quietness Capability	Provide quiet areas or cozy corners where students can retreat for reflection or individual work.
	Create a calming and nature-inspired environment.
	Incorporate comfortable seating, reading nooks, or meditation areas to foster a sense of calm and introspection.
	Incorporate sound-absorbing materials to reduce noise
Reflection Capability	Designing quiet spaces or gardens where students can reflect or meditate.
	design spaces that are scaled appropriately for their size.
	child-friendly materials that are durable, safe, and easy to maintain. Consider using materials that provide sensory experiences, such as textured surfaces or interactive elements.
	Create spaces that can be easily adapted for different activities and learning styles. Incorporate movable furniture, modular elements, or flexible layouts that allow for various uses
	involving children in the design process through participatory design techniques to ensure that their needs and preferences are considered, and spaces truly reflect their needs.
Reading Capability	sufficient natural or artificial lighting in the space to facilitate reading without causing strain on the eyes.
	Provide comfortable seating options such as benches, chairs, or built-in seating areas that are ergonomically designed to support proper posture while reading.
	Incorporate sound-absorbing materials or design elements to minimize noise and distractions, allowing for a quiet and focused reading environment.
	Adequate accessible shelving and storage for books, magazines, and other reading materials, allowing students to easily find and return items.
	incorporate natural elements such as greenery, plants, or views of the outdoors to enhance concentration and reading experience.
	Incorporate power outlets, charging stations, or Wi-Fi connectivity to support the use of digital reading devices and e-books if applicable.
	Design the space with flexibility in mind, allowing for different seating arrangements, movable furniture, or adjustable lighting to accommodate various reading preferences and activities.

Table 3: Design considerations to achieve each affordancein Space between classroom and movement space (Learning corridor)and in Space between classroom and courtyard (Outdoor learning terrace) (S-Z)

Affordances	Design considerations
Safety Capability	Ensure the design incorporates safety features like non-slip flooring, sturdy railings, and appropriate lighting to maintain a safe learning environment.
	Prioritize safety by incorporating child-friendly materials, such as rounded edges, non-toxic finishes, and durable construction.
	Install safety features like handrails, non-slip flooring, and secure storage for tools and materials.
	Design the space to allow for easy supervision, with clear sightlines for teachers or caregivers to monitor children's activities and ensure their safety.
Spatial Diversity Capability	The spatial organization of the in-between spaces should be flexible and adaptable to accommodate different activities. This can include open areas for group discussions and collaboration, as well as smaller nooks or alcoves for quiet reflection or individual work.
Self-Reflection Capability	Incorporate inspirational quotes or affirmations to promote self-reflection and personal growth.
Seating Capability	Provide different types of seating options such as benches, bean bags, floor mats, and cushions to accommodate different learning preferences and intelligences.
Socialization Capability	Design layout and configuration of the space in a way that fosters social interaction and encourages students to gather and engage with each other.
	Provide seating and gathering spaces with comfortable and inviting seating arrangements that encourage students to sit and interact with each other.
	Incorporate technology infrastructure, such as Wi-Fi access points, charging stations, and interactive displays, to support digital connectivity and encourage collaboration among students.
	Design the spaces to be flexible and adaptable to cater to different activities and group sizes.
Thinking Capability	Flexible furniture and movable partitions can be incorporated to create various learning zones such as personal area.
	Maximizing access to natural light and providing views of the outdoor environment.
	Design elements such as biophilic design principles, green walls, or outdoor seating areas can help students connect with nature and stimulate their thinking.
	Incorporating visually stimulating elements, such as colorful murals, artwork, or interactive displays.
	Integrating technology seamlessly into the design can enhance students' ability to explore and think critically.
Tactile Capability	Choose materials that are tactile and inviting to touch.
	Design surface finishes smooth and easy to clean, as well as resistant to wear and tear.
	Proper lighting design can enhance the tactile experience by highlighting textures and creating shadows that invite touch.
	Design features that are easily reachable and proportionate to the student’s scale encourage touch and interaction.
	Use of multisensory elements that engage multiple senses, such as interactive displays, sound installations, or aromatic plants.
	Ensure that all touchable elements are safe for users. Avoid sharp edges, secure loose or fragile elements, and use non-toxic materials.
Visual Capability	Create a visually stimulating environment with colors, shapes, and patterns to engage the spatial intelligence of students.
	Visual stimulation such as murals, artworks, interactive displays
	Use colors, textures, and patterns to create an engaging and visually appealing environment.
	Color and material choices can influence emotional and sensory intelligence.
Writing Capability	Allow for personalization and customization of the learning space by incorporating writable surfaces, pin boards, and movable furniture.
	Designing areas that promote writing and creativity, such as writing workshops or writable surfaces.

In the following section, based on the design concideraions presented in Tables 1 to 3, Table 4 summarizes how each of the affordances discussed in the article, when supported by the design considerations identified in these two in-between spaces, can address different types of children's multiple intelligences in schools.

Table 4: The relationship between affordances and multiple intelligences in school's in-between spaces

MI intelligence \ Spatial Affordances	Accessibility	Adaptability	Audio Capability	Coordination Capability	Build Capability	Creativity Capability	Display capability	Discoverability	Expressive Capability	Focus Capability	Flexibility	Group Work Capability	Interaction Capability	Nature Integration Capability	Physical Activity Capability	Play Capability	Quietness Capability	Reflection Capability	Reading Capability	Safety Capability	Spatial Diversity Capability	Self-Reflection Capability	Seating Capability	Socialization Capability	Thinking Capability	Tactile Capability	Visual Capability	Writing Capability
Linguistic intelligence	*	*	*	*			*		*		*	*	*			*	*		*	*	*		*	*			*	*
logical intelligence	*	*			*		*	*	*		*					*	*		*	*	*		*		*		*	*
spatial intelligence	*	*				*	*				*					*				*	*						*	*
bodily intelligence	*	*		*							*	*			*	*				*	*					*		
musical intelligence	*	*	*				*				*			*						*	*							
interpersonal intelligence	*	*		*	*	*	*		*		*	*	*	*		*			*	*	*		*	*				
intrapersonal intelligence	*	*			*	*	*	*	*	*	*			*		*	*	*	*	*	*	*	*		*	*	*	*
naturalist intelligence	*	*						*			*			*						*	*				*	*	*	

Conclusion:

In recent years, evolving teaching methods and pedagogical practices have introduced new design considerations for schools. Efforts have been made to align school architecture with these contemporary educational approaches. One significant initiative in this alignment is the focus on Innovative Learning Environments (ILEs), which aim to integrate new educational theories with the design of modern educational spaces. One of the theories in environmental psychology that can be particularly effective in designing Innovative Learning Environments (ILEs) is Gibson's affordance theory. This article aims to utilize this theory to clarify the various spatial affordances of in-between spaces in schools. Most recent research on the design of educational spaces has concentrated on classrooms and outdoor areas, with little attention given to other school spaces. One space with significant affordances discussed in this article is the in-between spaces. For example, the corridors or hallways which can account for up to 35% of a school's total space, often lack an educational function. However, by recognizing their considerable design potential, we can transform these isolated spaces into active contributors to the educational environment. This article investigates the affordances of in-between spaces in schools in relation to children's multiple intelligences.

According to the theory of multiple intelligences, there are several intelligences and can be considered when designing this space. Each intelligence has its own affordances that can be incorporated into the design. When designing school corridors or outdoor learning terrace to achieve each intelligence of multiple intelligence theory, it is important to consider the design considerations. By incorporating these features, school corridors and outdoor learning terraces can be intentionally designed to support and enhance each dimension of the Multiple Intelligences Theory. Moreover, the in-between spaces of schools can be strategically organized to effectively address the diverse intelligences identified in the theory, thereby fostering a rich, dynamic, and inclusive learning environment.

In this article, an attempt has been made to address different affordances that two of important school's in-between spaces have for designing in based of multiple intelligences of children. Based on this, first, some advantages and positive affordances of in-between spaces that may not be available in indoor and outdoor spaces were listed. Then, for each of those

affordances, relevant design considerations applicable in two in between spaces considered in this article were written in order to respond to those affordances in Tables 1 - 3. As seen in tables 1 to 3, there are many different design possibilities in the design of in between spaces in schools. After that, in table 4 according to the design considerations mentioned in table 1-3, it is summarized that the design based on each of the mentioned affordances can be useful in responding to which of the children's multiple intelligences. And at the end, based on the information in Tables 1 to 4, it is showed that each of the in between spaces in this article, if designed properly and richly based on responsiveness to different affordances, can be designed in accordance with which category of multiple intelligences, as it can be seen in Table 5 that due to the great flexibility of these spaces, we can design them rich in order to diverse intelligences of children.

Table 5: The affordances of two important in-between school spaces to cater to children's multiple intelligences

The MI theory intelligences	Between Classroom and movement space (Learning corridor)	Between Classroom and courtyard (Outdoor learning terrace)
Linguistic intelligence	✓	✓
Logical-Mathematical intelligence	✓	✓
Spatial Intelligence	✓	✓
Musical intelligence	✓	✓
Bodily-Kinesthetic Intelligence	✓	-
Interpersonal Intelligence	✓	✓
Intrapersonal Intelligence	✓	✓
Naturalist Intelligence	✓	✓

Certainly, other design considerations may also be employed to achieve these affordances.These tables can be used by designers as a basic guide for designing these spaces. In this research, an attempt has been made to draw the attention of the designers of educational spaces to the many affordances that can be fulfilled in the in between spaces of schools by means of the affordance theory, as well as to the various solutions that exist to achieve these affordances in the in between spaces of schools that they are often neglected.

Understanding and applying the theory of multiple intelligences in educational spaces means comprehensive identification of a wide range of intelligences in students. If we apply the theory of multiple intelligences correctly in school, we have given students the opportunity to get involved in subjects that may be difficult for them in normal situations. But this involvement helps them to discover their abilities and, in this way, they become aware of their abilities in a new field and develop them. This theory helps students to strengthen an area of their intelligence in which they are weak.

Certain spaces in schools have greater potential for design according to multiple intelligences. Among these, in-between spaces stand out; despite their significant design potential, they often remain neglected and treated as residual areas within schools. These spaces can accommodate various types of multiple intelligences, allowing students to engage in different experiences related to their individual strengths. More importantly, they provide opportunities for students to explore and develop their diverse intelligences within these environments. Due to their high design flexibility, in-between spaces offer rich opportunities for accommodating the diverse intelligences of students. By understanding the various affordances of these spaces in creating contexts that respond to students' unique intelligences, we can develop environments that foster the growth and development of their multiple intelligences. Awareness of affordances—the action possibilities arising from the relationship between users and their

environment—can serve as a valuable bridge between architects and school leaders. This understanding can facilitate the creation of improved space-pedagogy settings that foster the development of all aspects of children's multiple intelligences in schools.

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Name: Seyedeh Somayeh Mirmoradi*

Email: s.mirmoradi@nit.ac.ir

Assistant professor of architecture, Babol Noshirvani university of technology, Babol, Iran