

Analysis the effect of the built environment on children's creativity (Review the effect of the environmental characteristics on children's creativity in Tehran children centers) *

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Abstract

The today's world needs men and women who are creative, growing and improving in all areas of social, cultural, and economical field. According to the researchers, people have considerably higher creative abilities that can be flourished by encouraging, providing opportunities and training. So, the nature and characteristics of creative thinking have been the focus of many researchers.

Since one's personality is formed in the early ages, creativity at that age has been the notion of many studies; however, few studies have supported the effect of the built environment on the development of creativity in children. Researches also suggest that the built environment plays an important role in the physical and emotional health of the child and development of his creativity. Child growth, on the other hand, is a result of its interaction with the environment. If this interaction is lawful and organized, it causes better growth.

Meanwhile, there are questions for which this paper tries to find answers: how the built environment affects children's creativity and its prosperity? And what features of the built environment of Tehran's children centers have a positive effect on children's creativity? So the purpose of this study is to review the concepts of creativity and the effect of the built environment on the development of children's creativity by means of content analysis in the fields of environmental psychology and architectural design.

This research has been performed based on a descriptive – analytical method using articles, studies, reports, related documents (the library documents) and observation. So with the concepts of creativity from the perspective of theorists in this field and its relationship to the built environment, environmental factors that enhance creativity can be derived. Then the environmental features that affect the creativity of children in Tehran children centers were examined. In this study, first factors affecting the children's creativity and the environmental features which influenced these factors were analyzed. Then five children's centers that are active with the aim of fostering creativity were randomly chosen, and the building of these centers was analyzed using the results of this paper.

This study analyzes some environmental factors such as legibility, diversity, complexity, vitality, innovation, and mystery and their relation to children's creativity. The literature suggests, imagination, curiosity, and play have an important role in the child's creativity.

According to what has been mentioned in relation to the children and their growth, it can be concluded that, in environment designing for children, observing the principles of environmental psychology in children's physical and mental characteristics provides a proper context for developing children's creativity. In this paper, environment is the physical environment, which includes open spaces and natural environments.

Keywords

Creativity, Environmental psychology, Built environment, Children, Design.

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Introduction

Today's world requires creative men and women, to achieve growth and improvement in all areas of economic, social and cultural fields. According to the researchers, human considerably have creative ability which can be flourished by encouraging, providing opportunities and training (Horizad, 2005: 9-10). Studies also show that the childhood is the best time for the formation of personality. This time plays an important role in human life. In other words, the children's environment is the factors affecting this formation and growth. Behaviorists emphasize the effects of the environment on children. Behaviorists seriously oppose the effects of heredity and they knew environment as an important factor for the formation of behavior (Yousefi, 2010: 30). On the other hand, researches show that capabilities and creativity of children established in childhood and the best time for development of creativity occurs between the ages of 2 to 10 (Krippner, 1999: 597- 606). So, by strengthening and education and creating a suitable environment for them, from childhood, we can provide opportunities for developing children's creativity.

This research focuses on design principles in children's environments which play a role in fostering children's creativity. In this article, environmental factors that enhance creativity can be derived are explored regarding the concepts of creativity from the perspective of theorists in this field and its relationship to the built environment. In order to clarify the issue, five children's centers that are active with the aim of fostering creativity in Tehran were randomly chosen, and the building of these centers was analyzed using the results of this paper.

The issue

Research has shown several factors affecting the process of fostering children's creativity. And as the physical and non-physical, children's environments are the most important factors in this field. On the other hand, knowledge of environmental characteristics

affecting the development of children's creativity- in the field of environmental psychology- is the important issues in recognizing the characteristics of the suitable environment to increase the child's creativity and design of the built environment for him. In this regard, this research is trying to find the features of the built environment which is affecting the child's creativity and with this purpose reviews children's centers in Tehran.

Assumption

The basic assumption of this study is that the built environments are the important factors in affecting the child's creativity. And if they are designed appropriately based in the principles of environmental psychology in terms of the physical and psychological characteristics of children, they can provide a context for flourishing child's creativity. So, some features and capabilities of the built environment can predispose or prevent the growth of the child creativity which should be considered in the design of the centers for children to enhance their creativity.

Research Methodology

This research has been performed based on a descriptive – analytical method and using case studies, on the theoretical basis of new research findings in the field of environmental psychology and architecture. Then, the paper reviews the opinions of prestigious researchers, and the relationship between them. To gather the required information, the library documents and the field studies were used. In this regard, some centers of children's in Tehran were randomly selected as the case study, and were reviewing according to the results of this paper.

Creativity and environmental factors

Because of its abstract, the nature and definition of creativity is controversial among researchers and psychologists. The study of references indicates that the meaning of this word has changed over the time. It seems, when the political, social and

educational contexts are changed, evaluation and judging criteria evolved as well. Torrance (1962) as a pioneer of environmentalism, knew creative thinking as the emptiness and disorder, absent elements, shaping ideas and assumptions, estimates results, interpretation and testing of these hypotheses again (Tabatabaian, 2004: 100-101).

Rogers as humanists wrote that, "The concept of creativeness and the concept of the health, human, self-actualizing are seemed to be coming closer and closer and may turn out to be the same thing" (Runco, 2010: 150).

Scientists concluded with the followings: The first is that creativity can be acquired largely like other human talents and are not specific to the particular individuals. Second, the growth of creativity requires special conditions and stages of education (Mozafar, et al, 2007: 65). Torrance also in his book, *Creativity*, said: I was aware about the Edward de Bono's emphasis on the need of practice in creative thinking skills. And Alfred Binet also believes that mental skills can be improved through practice (Torrance, 1993: 15). Many researchers have examined the effects of the environment on people's creativity. Environment, in the knowledge of environmental psychology, includes all material and spiritual factors that surround the person, so family and friends, the community, and also the physical environment can be considered as the environment. Amabile such as those who examined the connection between the built environment and creativity has concluded that, the built environment is an affective factor in the development of the person's creativity. Amabile and her colleagues (1988), in interviews with 120 scientists in 20 different fields found that the environmental factors are superior to development of the creativity. Amabile said: "These findings show the importance of ecology and the environment is a more prominent factor than individual issues. This does not mean that external force is more important than your own. Surely personal factors have a great effect on creativity, but the important point is that

the share of the environment is more variable" (Hosseini, 2009: 31-32). In another study, Hennessey and Amabile (1989) say: "Our research has shown that social and environmental factors play a key role in fostering creativity". Amabile in the extensive interviews of 120 scientists uses this division. Some of the creative environment factors which are obtained as a result of interviews are: 1- Freedom 2- adequate resources, 3- time, 4- suitable atmosphere, 5- suitable research design, and 6- pressure (Some pressures can promote a creativity) (Hosseini, 2009: 64). So environment affects the person's creativity physically and non-physically, and the person's creativity is enhanced by its influence and other factors. The conclusions of the researches by Amabile, about the environmental factors affecting the growth of creativity, are shown in Fig. 1.

On the other hand, research shows, the creative process in any field requires three main elements: sufficient expertise in the field, talent and creative thinking, excitement and internal motivation (Ahmadi, 2003: 14). We should not forget that both heredity and environment play an important role in growth and personal success. Research shows that, when we checked the cause of the skills we need to consider both the effects of environment and heredity rather than only one of them (Phillipson, 2014: 184). However, the duty of intelligence and thinking about the daily environment can be divided into three categories: Adapt to the current environment, shaping the current environment to a new environment, choose a new environment. Creative thinking is more related to shaping the environment. Shaping an environment as a new form provides opportunities for creative thinking (Hosseini, 2009: 24). According to Rothstein, creativity can be achieved by creating an environment which is receptive to new ideas, encouraging people to touch, feel and explore the environment for new thinking, taking time to encourage creativity and teaching people in their particular field of knowledge requirements (Rothstein, 1990: 145-146). Thus, as the researchers emphasize, the necessity of

training and education in the development of creative thinking in person is undeniable. Many studies show that we can teach creative thinking by creating the suitable environmental condition. This research suggests that creativity requires what is known as context. Acknowledgment of this turns the space into a dynamic element that seems to be experiencing everything for the first time. This space has the capability to develop any understanding in order to involve person with the environment. Many researchers have investigated the role of environmental factors in increasing and decreasing of creativity.

For example, Woodman and Schoenfeldt have proposed an interactionist model of creative behavior at the individual level. In this model, they suggest that creativity is the complex product of a person's behavior in a given situation. The situation is characterized in terms of contextual and social influences that either facilitate or inhibit creative accomplishment (Woodman, et al, 1993: 294).

Excitement also is a sudden change that can be found after a sensory perception, imagination and reminds the behavior and are associated with physical anxiety. Fatigue, lack of health, intelligence, environment, family relations and the wishes are the factors that affecting children's emotions. Aliakbar Seyf defines motivation as the creator, maintainer and guiding of the behavior (Seyf, 2008: 245-252). Many psychologists do not distinguish between incentives and motivation and meaning them synonymous. Some know motivation as a general factor of behavior and incentives as an assigned factor of specific behavior. Developmental Psychology believes that motivation for learning comes from childhood. The interests of the children and their questions, lead to new experiment and knowledge. Whatever children move based on their interests and whatever gives them the opportunity to move according to their subjective questions, their learning process are deeper (Yousefi, 2010: 180-181). Therefore, environment design in order to build skills, creative thinking and interest and intrinsic

motivation enhances creativity in children. Table 1 shows the relationship between the main elements of the creative process and the environmental factors affecting creativity.

Characteristics that influence child's creativity

Environment affects on child, his personality and creativity in various forms. It is suggested that through interaction with the physical and social environment, children learn knowledge and understanding (Tai, 2006:11). As well, there are characteristics in childhood which, increases creativity in children by stimulating and its effectiveness for them:

- **Imagination:** One of these features is a child's imagination. It is said that child's imagination is the basis of his creativity. Children have amazing imagination that reaches its peak at the age of 4-7 years, and with this imagination, they can change facts according to what is inside them. This change can be good or terrible for the child. If it is pleasure it has a great role in the growth of children's creativity (Ahmadi, 2003: 36). In the pattern of Bohm two mental activities are considered which are related, Insight (vision) imaginative and belonging, and fiction (delusion) imaginative and belonging. During imaginative insight, a person seems to be able to get maps and images with the essence of the novel and innovative (Bohm, 2002: 17).

- **Curiosity:** curiosity, which is the dynamic key in learning (Izadpanah Jahromi, 2004: 47), is another feature that can increase creativity in person. This feature causes children to explore and understand the pace and stimulates their imagination. The cognitive approach suggested that discovering and understanding makes child's confidence and creative intuitive leaps (Yousefi, 2010: 127). Theorists also believe that environment-behavioral problems are as a result of inactivity or lack of stimulus. Studies about deprivation of sensory stimuli show that depriving the people from sensory stimulation causes severe anxiety and mental disorders (Zubek, 1969: 57). Some theorists also suggested that sometimes

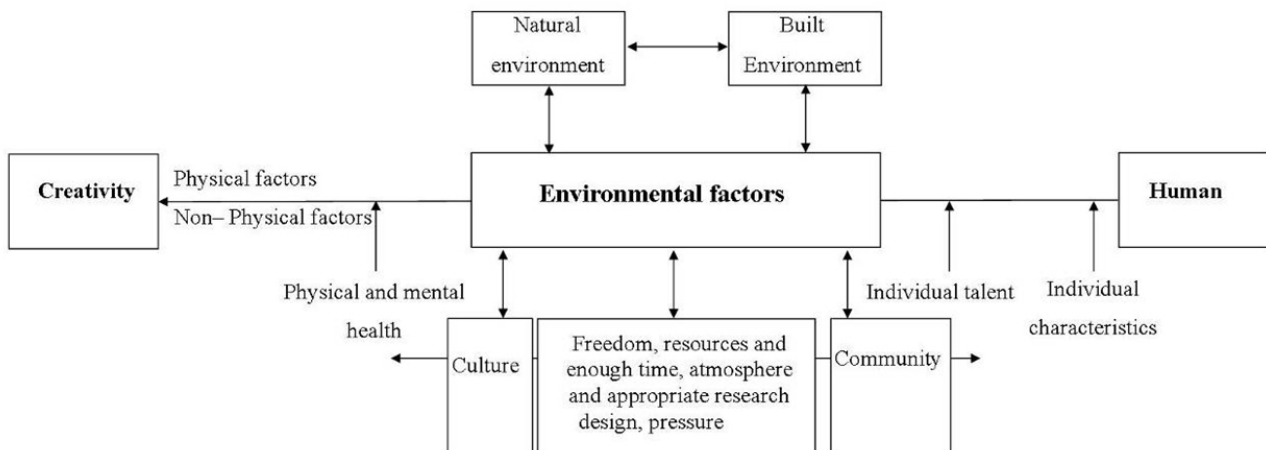


Fig. 1. The effect of various factors on person's creativity. Source: From Amabile researches on the environmental factors affecting creativity.

Table 1. The relationship between the main elements of the creative process and the environmental factors affecting creativity. Source: authors.

Source	Comments	Environmental factors affecting creativity		The main elements in the creative process
		Non-Physical (Society, culture, environment and etc.)	Physical (Built environment and natural environment)	
Rothstein (1990) Torrance (1962)	- With well-designed spaces and the physical environment for teaching and training people in the respective field, we can provide skills in every field in person.	-	*	Sufficient expertise
Amabile (1988) Woodman & schoenfeldt (1993)	- If physical environment designed properly, it can increase creative talent and ideas in person and lead it to be prosperity. - Social, cultural and other non-Physical environmental factors can form a creative thinking in person and flourishing his inner talent.	*	*	Talent and Creative thinking
Hennessey & Amabile (1989) Abraham Maslow (1954) Frederick Herzberg (1959)	- The physical environment, with unique characteristics and suitable design can create the motivation and excitement in the person. - Also suitable atmosphere, freedom, pressure, etc. as non-physical environment factors create required internal motivation in person.	*	*	Excitement and Internal Motivation

environment should be complex and stimulating and reproduce the excitement and give the person a sense of discovery of the environment (Bell, et al, 2001: 108). So, the “complexity” and “stimulating” of the built environment are such characteristics that influence a child’s creativity.

-Complexity: Most people understand complexity as being of the disorganized variety, whereas in fact, there are two distinct types of complexity: organized versus disorganized. For example, biological forms are highly complex, and at the same marvelously organized (Salingaros & Mehaffy, 2006: 119).

-Stimulation: Stimulation also occurs when an amount of information available in one place is more than capacity and human understanding. Research shows that human beings are positively able to deal with the average and middle of stimulation. As hyper stimulation may lead to malfunctions, lack of stimulation and insufficient motivation may be deprived organism of human action from the successful implementation of environmental challenges (Kaplan & Kaplan, 1982: 102- 122). The level of excitement that spaces create in human is associated with characteristics of interior spaces. These characteristics mainly stimulate the human senses, such as the sense of sight and hearing. From the perspective of environmental psychologist, various factors such as “complex or Incoherent patterns”, “complexity and Novelty”, “high density of spatial patterns”, “light of the space”, “the heat and humidity”, “room shape”, “lack of suitable orientation in an interior space”, “crowding”, “audiovisual properties of the elements in space”, «diversity and sudden changes in space» are effective in increasing the stimulation (Aiello, 1981: 385-504; Baum & Paulus, 1987: 534- 570; Evans & McCoy, 1998: 85- 94). The meaning of the diversity and sudden changes in space is being new animated along with other stimulants, or a variety of stimuli which is suddenly available. Creating open area in the interior closed spaces, the use of moving elements in walls and floors, the use of new forms, creating different levels in space, opening in the wall and creating visibility to

other spaces, creating contrast in coloring and lighting (Dark space along with bright spaces and vice versa) and using the materials with different textures are examples of diversity and change in space.

On the other hand, studies in the power of children’s imagination show that “natural stimulants elements” and “flexibility functions” increase curiosity and motivation of children for playing and participating in teamwork, and provides context for his imagination. Therefore, the use of the forms which are flexible and promote the child’s curiosity can increase child’s creativity (Noghrehkar, et al, 2009: 42-48).

-Flexibility functions: This means «possibility of using a space at different times for different functions”. The other meaning of the flexibility functions is when “in one place multi-function exists at the same time”. The purpose of this work is creating freedom of choice for children. In flexible spaces, space can be divided into a number of required functions with the moving elements in different times and according to education programs (Shafae & Madani, 2010: 219).

The built environment can also promote social interaction by providing recurring opportunities for individuals to have informal social contact with one another (Sullivan, Ch, 2011: 109). On the other hand, the design of space (in terms of shape, size and performance), in order to increase communication and having a positive influence on the quality of this interaction, also effects on growth of creativity (Shafae & Madani, 2010: 216).

Gump says: Two children in one place behavior more than one child in two places (McAndrew, 2008: 7). Thus creating “environments with more social interaction” is also effective on flourishing child’s creativity. This can be achieved by “appropriate scale of the space” (smaller spaces), “creating an appropriate function for space” (gathering spaces and conversation or workshop) or “suitable arrangement of furniture” (for example Central).

• **play:** Research shows that play is also effective in promoting children’s creativity (Shafae & Madani, 2010: 215). It is the primary mechanism

through which children become familiar with their environment (Aziz & Said, 2012: 205). Table 2 shows the relationship between the factors affecting the child's creativity and the characteristics of the built environment.

According to this table, if the built environment is designed flexible and stimulating or have complexity, and provide the interactions between children, it can stimulate the child to play and curiosity in the environment and provide context for the child's imagination and thereby fostering child's creativity.

James Gibson's theory of environmental capabilities (Affordance):

Capabilities of anything in Gibson's theory, either material or immaterial, are part of what makes it usable for a certain creature or member of the species. Physical configuration properties of an object or a place are a behavior that makes it usable for a specific activity. These properties provide esthetic meaning and perceptions. Some commands are met easier by an object or environment; some activities are constructed in a specific configuration of the environment, met some people's needs and do not others (Lang, 2004: 91). According to Gibson and Pick (2000), the environment provides information as ambient arrays of energy that is structured by surfaces, boundaries, events, objects and layout of the environment. The information perceives changes depending on the perceiver's movement (sitting, standing, walking, etc.) and their senses (sight, hearing, taste, touch and smell) (Hussein, 2012: 348).

According to Harry Heft, who discusses about the Gibson's theory of environmental capabilities, the central concept in the study of children's environment is the concept of affordance. Gibson presented this concept to demonstrate that our perceptual experiences include not only things and events in the environment, but more fundamentally in their functional meaning (Heft, 1988: 29). An affordance is "the perceived functional significance of an object, event, or place for an individual,"

or a "perceptual meaning". This means that an environment with its capabilities can be appropriate for one person according to some structural and functional characteristics, but not for another. This is the quality of affordance that makes it fascinating and controversial (Heft, 2005: 123-124). Gibson's Studies show that the built environment with characteristics of surfaces, materials, texture, color and even its function, can increase the capabilities of the environment in order to enhance the child's creativity (Fig. 2).

Also, the contact with nature has a major role in child development and his mental health. Psychologists have argued that children's ability to develop perceptual and expressive skills, imagination, moral judgments and other attributes is greatly enhanced by contact with nature. Research also has linked play in natural environments with improved creativity, language and cognitive development, and Independence (Dannenberg, et al, 2012: 237). Differences in the shape of natural elements (water, light, plant, etc.) and the possibility of using them in various ways which described it as "a variety of natural elements" can create a question for children's minds and provide context for their curiosity. Also Natural stimulants elements and flexibility of functions increases curiosity and motivation of children to play and participate in group and provides context for his imagination (Shafae & Madani, 2010: 216-219). On the other hand, the variability of the natural elements causes diversity of the mental picture and increase imagination (Krippner, 1999: 597-606).

Determinants factors of the environmental behavior

Any environment, either natural or built, effect on the person's behavior and his reactions and therefore it is known as behavioral environment. Barker and his colleagues pose the main point in environmental psychology, which focused on the influence of the environment on the behavior of a group of people. Barker says that behavioral environment exists itself and is not a subjective

Table 2. The relationship between the factors effecting the child's creativity and the characteristics of the built environment. Source: authors.

characteristics of the built environment that affect child's creativity					characteristics that affect the child's creativity
playing	more social interaction	Flexibility	Stimulation	Complexity	
*	-	*	-	*	imagination
*	*	*	*	*	curiosity
*	*	*	*	-	play

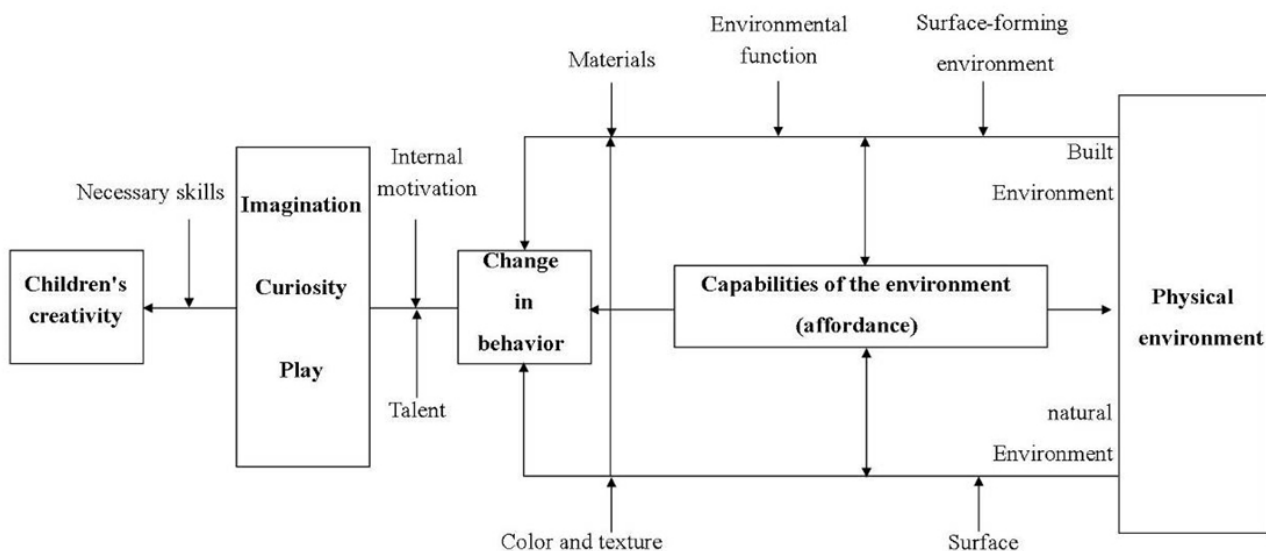


Fig. 2. The effect of the built environment and its capabilities on child's creativity. Source: authors derived from Gibson Affordance concept.

definition and has a physical structure, and of course, can change over time (Wicker, 1987: 613-635). Behavior patterns and physical environment are two main components of the behavioral environment; Changing in behavior patterns and changing in the physical environment change the behavioral environment (Bell et al, 2001: 124). From the Kaplan's view, four factors determine our reactions to the environment (Kaplan and Kaplan, 1989: 244):

- **Coherence:** Coherence refers to “obviously and understandable of forms, elements, parts

and building blocks and the relationship between them”. “Rhythm” and “continuity of the subject in design” are signs of cohesion (Kaplan and Kaplan, 1982: 82; Lynch, 1960: 118). In this area, Gestalt psychologists have also paid attention to how sensory intakes are organized, or how a whole is formed and are pulled together out of the parts. Gestalt psychologists believe that if various stimulants are designed such that they are perceived as a whole unit, tension will decrease. It implies that the design is coherent (Dondis, 1973: 14).

- **Legibility:** Legibility is one of the most important

concepts associated with coherence. Legibility which is raised by Kevin Lynch, means the degree that a person can easily understand the environment or remember it. Obviously legibility is necessary to move within or outside of the building (Bell, et al, 2001: 70-72). "Vividness and simplicity of the form", such that the form is as close as possible to geometric forms, reinforce the legibility of the form (Weisman, 1981: 189-204; Weisman, 1989: 113-114).

Also, "appropriate signs" are of the most crucial factors in improving the legibility (Passini, 1984: 153-164). When a plan is legible, it has been organized well and enough attention has been paid to the orientation of the components. Furthermore, it is possible to link components in an interconnected format (Lynch, 1960: 6).

• **Complexity:** Complexity is defined in terms of the number of different visual elements in a scene. The complexity of spaces refers to the amount and difficulty of information that must be processed by the person to move in the environment. Too much complexity has negative effects and weakens learning (Bell, et al, 2001: 44). Also, it causes confusion and stress on a person. Conceptually the complex environment causes exploration and activates the attention (McAndrew, 2008: 80).

• **Mystery:** Mystery means the amount of hidden information within the environment that one can discover (Bell, et al, 2001: 44). However, the most straightforward way to apply mystery to an architectural setting is "deflected data". This can be realized by letting the architectural trail (e. g. corridor) to bend away, which can lead to curiosity of what might lie beyond the bend that result in encouraging explorative behavior. Another mode of mystery is called "enticement". Essentially, this notion refers to the situation in which a person is in the dark, where it can see a partially visible and an enlightened area or setting (Joye, 2007: 312). Another mode of mystery in architectural setting is mystery in the "concept" of architecture design, which helps the spaces to be more attractive. Table 3 shows the relationship between the determinant factors of the

environmental behavior and effected characteristics on the child's creativity.

Among the determinant factors of the environmental behavior, Coherence and Legibility indirectly, and the complexity and mystery directly influence on creativity. Environment with coherence and legibility, affects on the physical and psychological safety of children and thereby provides context to play freely and interact with other children in the space. Complexity and mystery of the space provides the situation for curiosity and imagination of the child and also challenges his imagination. Stimulating and complex environment with flexibility and creating more social interactions- which are associated with the complexity and mystery as the determinants of the environmental behavior- are suitable for achieving this purpose, only if they are coherent and legible.

The previous studies showed that child's surroundings play an important role in fostering of his creativity. Also environmental characteristics that affect the child's creativity in the built environment and the determinant factors of the environmental behavior which increase children's creativity were analyzed. Summary of these studies is shown in Fig. 3 and Table 4.

Review Tehran children centers (Case studies)

In this part, characteristics of the built environment which increase children's creativity and determinant factors of the environmental behavior which effects children's creativity have been reviewed in Tehran children centers. For this purpose, five active children centers in Tehran were chosen randomly with the aim of creativity fostering. The building of these centers are analyzed using the results of this paper.

• **Khaneh kodake Ordibehesht:** This center was not designed for children primarily. So, changing its internal environment creates a suitable environment for children. The building of this center consists of 3 floors. The first floor is devoted to children from 2 to 4 years, the second floor for children from 4 to 6 years, and the third floor is dedicated to creativity

Table 3. The relationship between the determinants factors of the environmental behavior and effected characteristics on the child's creativity. Source: authors.

Comments	characteristics that affect the child's creativity			the determinants factors of the environmental behavior
	play	curiosity	imagination	
- Coherence in an environment with a sense of security, calls the child to play in the environment.	*			Coherence
- Legible environments invite the children to move and address them, so invite the child to curiosity and playing.	*	*		Legibility
- The complexity of the environment through its effects on children imagination and curiosity, stimulates child to play in the environment.	*	*	*	Complexity
- The mystery in the environment forces the child to imagine and curiosity, and in this way stimulates him to play.	*	*	*	Mystery

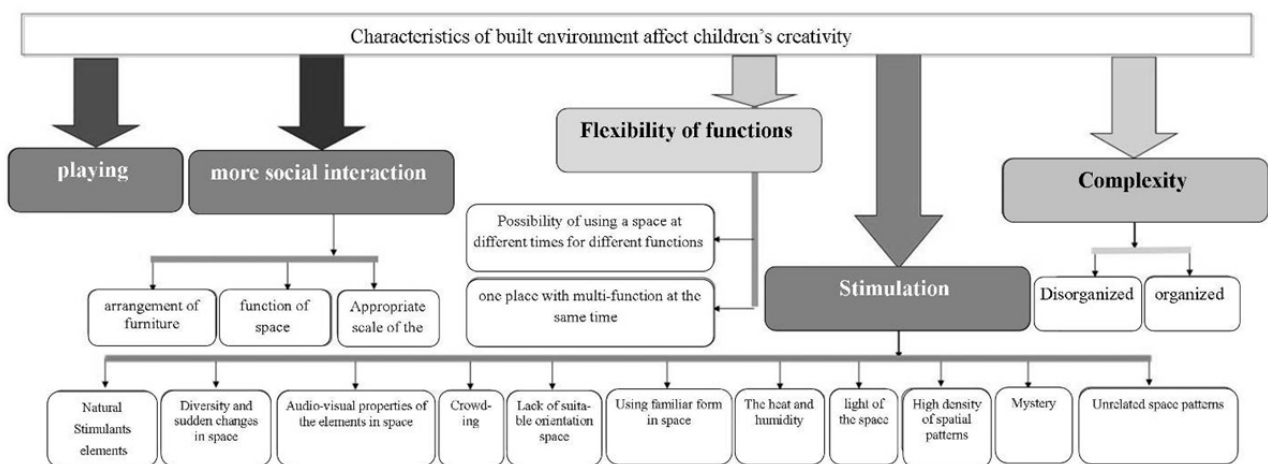


Fig. 3. Characteristics of built environment affect children's creativity. Source: authors.

Table 4. The determinant factors of the environmental behavior influencing the child's creativity. Source: authors.

the determinants factors of the environmental behavior which effects children's creativity						
		Legibility		Coherence		
Mystery	Complexity	appropriate signs	Vividness and simplicity of the form (geometric forms)	continuity of the subject in design	Rhythm	Obviously and understandable of forms, elements, parts and building blocks and the relationship between them

classes. Each floor has three classes and a closed playground. Each class is devoted to the function of painting, crafts, pottery and poetry. This shows the flexibility of functions in this center. Orientation is facilitated using partitioning and separation of spaces. Diversity and sudden changes in the spaces cannot be seen because of the uniformity of the lighting and coloring of spaces and the simplicity of the space's diagram. In this center all the classes and floors are quite similar.

Characteristics which effects children's creativity in this center are: different and cheerful colors, large windows for natural light, convenient scale and suitable space functions for more interactions with children (Fig. 4); (Table 5).

• **Kanoon paravareshe fekri kodakan va nojavanan Farahzadi (Center number 37):** the most attractive thing about this center is using the color in the floor and furniture. But other stimulating factors cannot be seen in this center. The central part of the building is dedicated to the library which forms the core of the center. In this part, natural light enters the space through windows and colored glasses, and increases space stimulation. The use of spaces for various functions provides flexibility. Also, this center has two classes which are separated from the library by wooden partitions, and they are used according to schedule. The connection of the classes is made through the corridor next to them. Divisions on the floor and the arrangement of the furniture shaped the orientation partially. Also the simple spatial plan in the center facilitates the orientation. Large central space and suitable dispersion of the color prevent the diversity and the sudden change of spaces (Fig. 5).

• **Zehne Roshan kindergarten:** The current building is not designed for children primarily, and has been changed kindergarten for children from 2 to 6 years. Closed playing space in the center, caused crowding and stimulating, and increase the capability of space for playing. Also the use of large windows and central patio for

natural light, bright colors in the furniture and curtains, using suitable furniture to the creation of an appropriate scale and their arrangement are such features affecting the child's creativity. Appropriate orientation cannot be seen in the kindergarten spaces because, locating of different classes around a central space, the existence of crowdedness in the middle of the building (closed playing space), lack of the signs for orientation. So, this center stimulates the child to explore the space. Furthermore, child can move into it and enhances imagination and curiosity and it caused increased creativity (Fig. 6).

• **Markaze khane karafarini va paravareshe khalaghiyate Kodak:** This center also is not designed for children primarily. So, with the changing of its internal environment it creates a suitable environment for them. This center, which is used by children from 3 to 6 years old, has closed playing space, semi-open space in the yard and three classes for painting, crafts and pottery. Circulation of the space in the center is not well designed, and so appropriate orientation cannot be seen in this center. For example, connection of entrance space and outdoor playing space, without appropriate orientation, encourages the child to explore space and stimulate his imagination and curiosity. On the other hand the space communications of this center give the child deflected data and increases the mystery of space. Because of the uniformity in the texture and color and uniformity of space lighting, diversity and sudden change of environment cannot be seen in this center (Fig. 7).

• **Khaneh kodake shahrbanu:** This center is located in shahrbanu place, Velayat Park. This center has closed relationship with the natural environment. Since the nature has the stimulus diversity, it can play an important role in the development of the child's creativity. So it should be noted that this center has a good location. Passing through the nature, and the existence of peace and quietness in shahrbanu, and then getting into a dynamic space with the various playing tools and different sounds (children, music, etc.)

cause diversity and sudden change in the space, increase stimulation and mystery. This center consists of a closed playground and a birth room which it is also used as a room for the intellectual development. The location of the playing ground in the center of the building causes positive points such as excitement and playing. Also warm colors, natural light and playing music in this part stimulate the children. In intellectual development room creative games and crafts and painting classes and work with the flowers are held. Since the whole of the center consists of two main spaces and entrance, and all

activities are done in the original space, this causes the appropriate orientation, flexibility of functions, and high density of spatial pattern in each space. Also, the height of the room is designed according to children scale. This scale and appropriate spatial function increases children's interaction.

Tables 10 and 11 show the results of the analysis of the environmental factors affecting the development of the child's creativity and environmental characteristics of the child centers in Tehran.

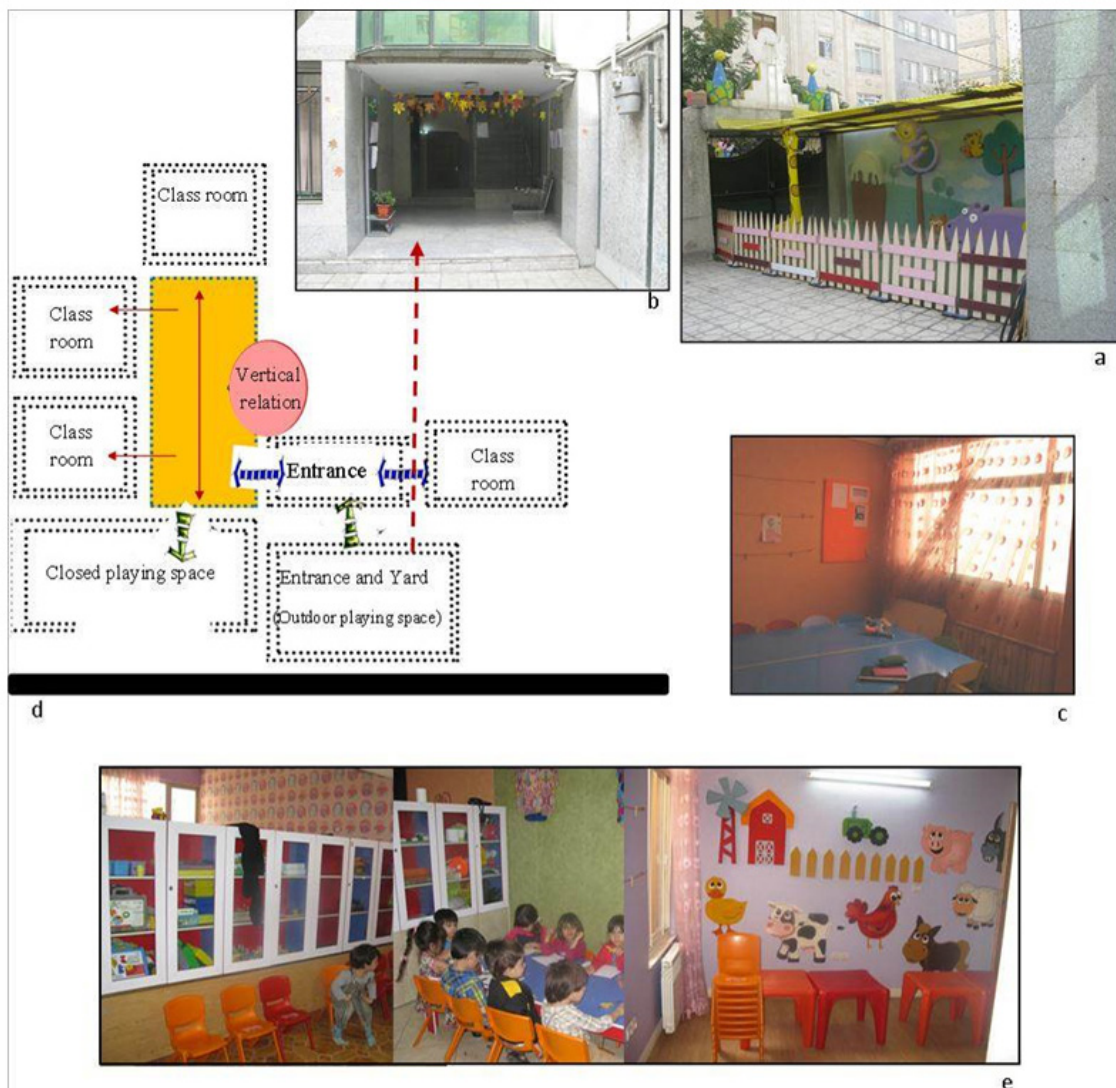


Fig. 4. Khane Kodake Ordibehest, a: Semi- open playing space b: Entrance c: Natural light in classrooms d: space diagram e: The use of color in space and the use of furniture in children scale. Source: authors.

Table 5. Observation of the environmental characteristics which influenced children creativity in khaneh kodake Ordibehesht. Source: authors.

Playing	more social interaction			Flexibility of functions		Stimulation											Complexity				
	arrangement of furniture	function of space	Appropriate scale of the space	one place with multi-function at the same time	Possibility of using a space at different times for different functions	Natural stimulants elements	Diversity and sudden changes in space	Audio-visual properties of the elements in space	Crowding	Lack of suitable orientation space	Room shape	The heat and humidity	light of the space	High density of spatial patterns	Mystery			Unrelated space patterns	disorganized	organized	
	*	*	*		*			*	*												

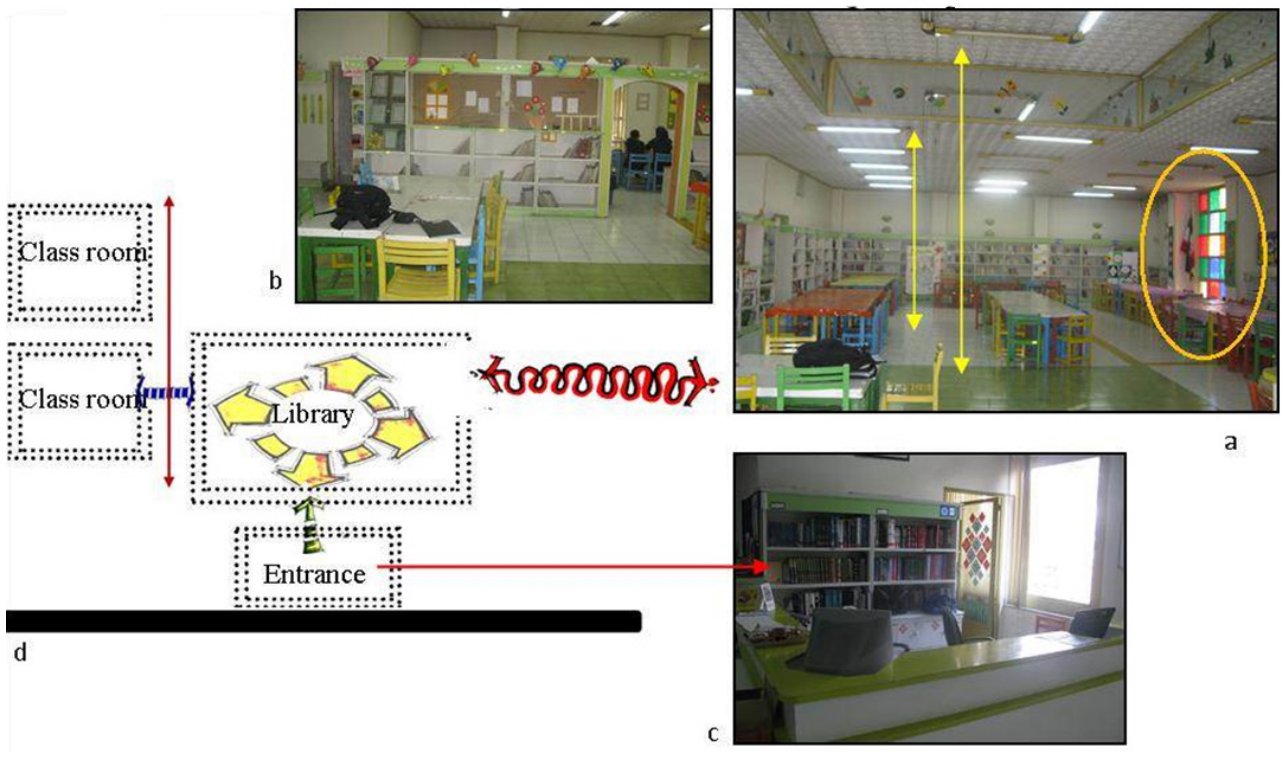


Fig. 5. Kanoon paravarshe fekri kodakan va nojavanan Farahzadi (Center number 37), a: The use of color on the floor and furniture of the library and the use of colored glass in windows, Lack of appropriate scale in space for children due to high altitude b: Entrance of classes that uses the partitions for isolating from the central part of the building (library) c: Natural light at the entrance and the Administration d: Space diagram. Source: authors.

Table 6. Observation of environmental characteristics which influenced children creativity in the center of number 37. Source: authors.

playing	more social interaction		Flexibility of functions		Stimulation										Complexity			
	arrangement of furniture	function of space	Appropriate scale of the space	one place with multi-function at the same time	Possibility of using a space at different times for different functions	Natural stimulants elements	Diversity and sudden changes in space	Audio-visual properties of the elements in space	Crowding	Lack of suitable orientation space	Room shape	The heat and humidity	light of the space	High density of spatial patterns	Mystery	Unrelated space patterns	disorganized	organized
				*					*		*	*				*		

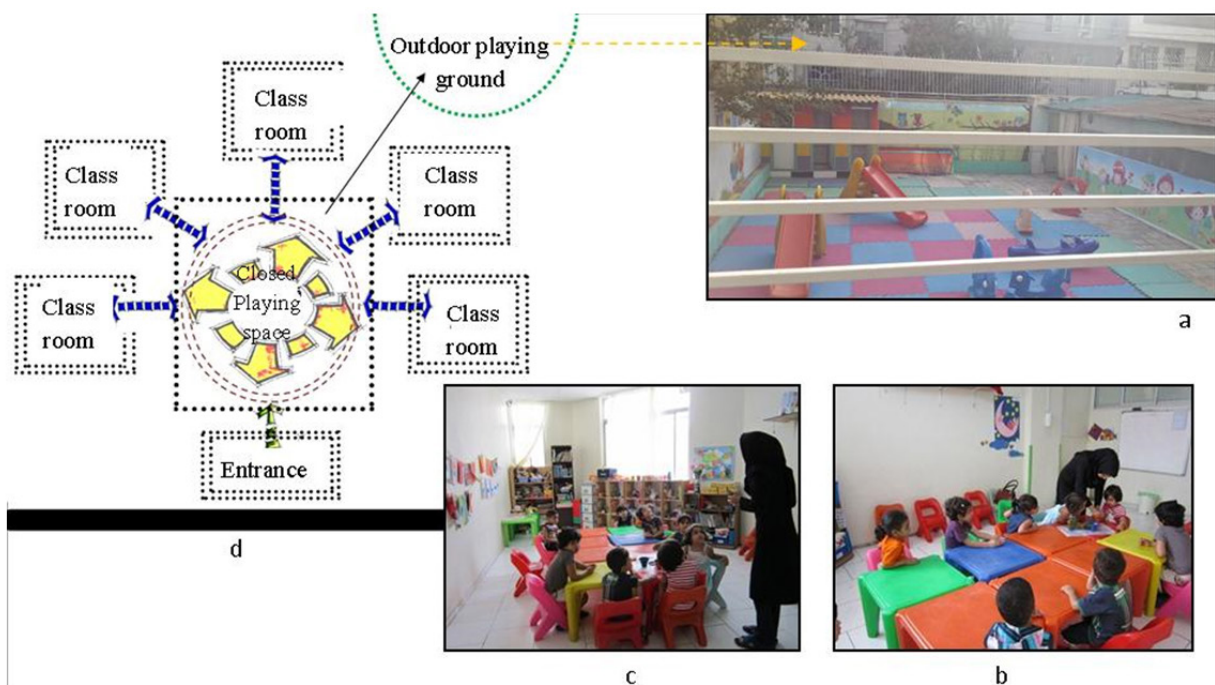


Fig. 6. Zehne roshan kindergarten, a: Open play space. Source: authors. b: The use of color in the furniture and its arrangement to create more interactions. Source: <http://creativitycenter.ir/News/Detail/5037/>. c: Natural light in classrooms. Source: <http://creativitycenter.ir/News/Detail/5037/>. d: Space diagram. Source: authors.

Table 7. Observation of environmental characteristics which influenced children creativity in Zehne Roshan kindergarden. Source: authors.

playing	more social interaction			Flexibility of functions		Stimulation											Complexity	
	arrangement of furniture	function of space	Appropriate scale of the space	one place with multi-function at the same time	Possibility of using a space at different times for different functions	Natural stimulants elements	Diversity and sudden changes in space	Audio-visual properties of the elements in space	Crowding	Lack of suitable orientation space	Room shape	The heat and humidity	light of the space	High density of spatial patterns	Mystery	Unrelated space patterns	disorganized	organized
*	*	*	*		*			*	*	*		*	*		*	*		

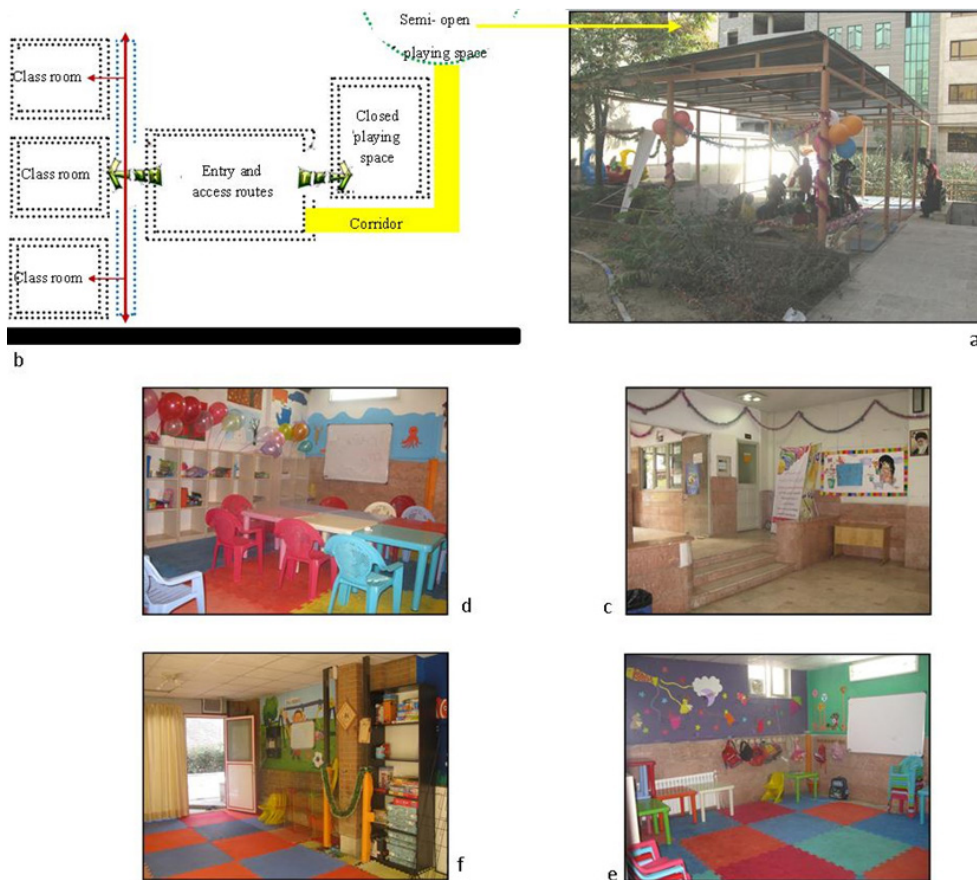


Fig. 7. Markaze khane karafarini va parvareshe khalaghiyate Kodak, a: Semi-open playing space b: Space diagram c: Entrance of the building d: Classrooms e: Closed playing space f: Relationship of the indoor and outdoor of the building. Source: authors.

Table 8. Observation of environmental characteristics which influenced children creativity in the home center of Karafarini va parvareshe khalaghiyate Kodak. Source: authors.

playing	more social interaction		Flexibility of functions	Stimulation										Complexity				
	arrangement of furniture	function of space		one place with multi-function at the same time	Possibility of using a space at different times for different functions	Natural stimulants elements	Diversity and sudden changes in space	Audio-visual properties of the elements in space	Crowding	Lack of suitable orientation space	Room shape	The heat and humidity	light of the space	High density of spatial patterns	Mystery	Unrelated space patterns	disorganized	organized
*	*	*	*			*	*	*			*							

Table 9. Observation of environmental characteristics which influenced children creativity in the khaneh kodake shahrbanu Source: authors.

playing	more social interaction		Flexibility of functions	Stimulation										Complexity				
	arrangement of furniture	function of space		one place with multi-function at the same time	Possibility of using a space at different times for different functions	Natural stimulants elements	Diversity and sudden changes in space	Audio-visual properties of the elements in space	Crowding	Lack of suitable orientation space	Room shape	The heat and humidity	light of the space	High density of spatial patterns	Mystery	Unrelated space patterns	disorganized	organized
*	*	*	*	*	*	*	*				*	*			*			

Table 10. The analysis of environmental factors in Tehran children centers based on characteristics affecting the child's creativity. Source: authors.

characteristics of the built environment that affect child's creativity								center
playing	Causing factor	more social interaction	Causing factor	Flexibility of functions	Causing factor	Stimulation	Complexity	
-	appropriate scale of space and furniture, functional appropriate space (workshops and classes), appropriate furniture arrangement around a table	+	using one space at different times for different functions	+	Natural light, the color of spaces and furniture, crowding, playing music	+	-	Khane Kodake Ordibehest
-	-	-	using one space at different times for different functions	+	Unrelated spatial patterns in the large central space with the multi-cumulative function, reading rooms, natural light, Using colored glass, crowded central space	-	-	Kanoon paravareshe fekri kodakan va nojavanan Farahzadi (Center number 37)
+	appropriate scale of space and furniture, functional appropriate space (workshops and classes), appropriate furniture arrangement around a table	+	using one space at different times for different functions	+	Stimulate children to play in the central space after arriving, stimulated by creating visibility from indoor to outdoor playing space, colored furniture, natural light, make a move in different directions, crowded in the main central space, crowding, playing music in space	+	+	Zehne roshan kindergarten
-	appropriate scale of space and furniture, functional appropriate space (workshops and classes), appropriate furniture arrangement around a table	+	using one space at different times for different functions	+	Giving deflected information through the corridors and uncertain access, Using warm colors, the lack of appropriate orientation, crowded the main space the entrance, playing music, indoor and outdoor playing space	+	-	Markaze khane karafarini va paravareshe khalaghiyate Kodak
+	appropriate scale of space and furniture, functional appropriate space (workshops and classes), appropriate furniture arrangement around a table	+	using one space at different times for different functions and using one place with multi-function at the same time	+	Unrelated spatial patterns in a space (use of room for celebrations and gatherings and workshops), stimulate children with the opening in the center, high density spatial patterns, color space, natural light, crowded central space, playing music, Entrance from outdoor playing space to outdoor space	+	-	khaneh kodake shahrbanu

Table 11. The analysis of environmental factors in Tehran children centers based on the determinants factors of the environmental behavior influencing the child's creativity. Source: authors.

the determinants factors of the environmental behavior which effects children's creativity							center
Mystery	Mystery	Legibility		Coherence			
		appropriate signs	Vividness and simplicity of the form (geometric forms)	continuity of the subject in design	Rhythm	Obviously and understandable of forms, elements, parts and building blocks and the relationship between them	
-	-	-	+	-	-	-	Khane Kodake Ordibehest
-	-	-	+	-	-	-	Kanoon paravareshe fekri kodakan va nojavanan Farahzadi (Center number 37)
+	-	-	+	-	-	-	Zehne roshan kindergarten
+	-	-	-	-	-	-	Markaze khane karafarini va paravareshe khalaghiyate Kodak
+	-	-	+	-	-	+	khaneh kodake shahrbanu

Conclusion

What about creativity and its related factors were studied in the past decade, consider the effect of environmental factors as the most important factor on creativity. On the other hand, studies about the characteristics affecting the child's creativity show that the physical environment has an important role in the development of the child's creativity, and these characteristics can facilitate the growth of creativity in children. Based on the above analysis, Figure 9 shows the effect of the built environment on the development of children's creativity.

As mentioned above, built environment can influence on children's creativity by not only the physical aspect, but also through its psychological organization. If this environment is designed properly and according to the physical and psychological characteristics of children, using features such as complexity, stimulation and flexibility, it would have a positive effect on children's creativity. Also, environments that cause fluidity of thought, freedom of exploration, more social interaction and invites children to play, are more effective on the development of children's creativity. It should also be noted that, if the built environments are in touch with the nature and have an ideal vision to the nature, they have more positive effect on child's creativity as well.

On the other hand, reviewing the environmental characteristics affecting the child's creativity in Tehran children's center, which aims creativity fostering, show that there has been little attention to the environmental characteristics in designing of the buildings of the centers. Since these centers are not designed according to the needs of children from the beginning, environmental factors affecting the behavior and physical factors have been neglected. However, these factors influence the child's creativity. In these centers appropriate space for children's creativity is created using changing interior space (Using small scale furniture, partitioning, coloring and create the playing space). In the built environment of these centers, environmental characteristics of social interactions are considered firstly, and then the flexibility of functions. Stimulating environmental factors and playing are less considered, and amount of complexity of space is not considered. Also, studies about the determinant factors of the environmental behavior which affects children's creativity in these centers show that, coherence is not seen in the design of these environments and legibility of these spaces are because of its simplicity and lack of complexity in them.

Since the design of environment to flourish children's creativity is a new topic, and in our country, this approach is not paid in the built environment for children, providing effective design solutions in this field and testing those using experimental tools is recommended. So the results can also be seen practically.

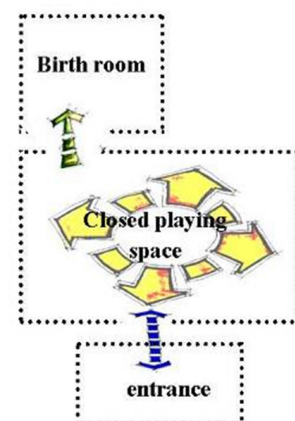


Fig. 8. Space diagram of the khaneh kodake shahrbanu.

Source: authors.

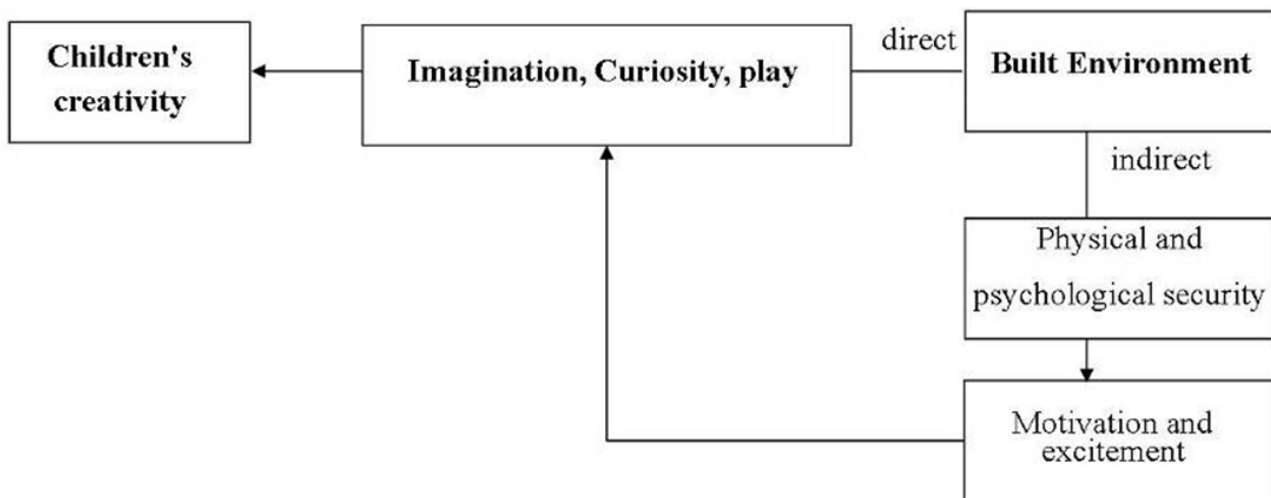


Fig.9. The effect of built environment on development of children's creativity. Source: authors.

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