The Qualitative Meta-Analysis of Environmental Characteristics Affecting Children's Creativity in Schools and Academies

Sara Soleimani*[1], Mobina Kheiri[2]

Abstract

Creativity is currently among the hot topics in child development and education, which is also of utmost importance in psychological studies and environmental design. Previous research has thus far highlighted the effects of the surrounding environment on creativity development in this age group. Since an individual's personality is formed in childhood, researchers working on creativity have further focused on this stage of life. Therefore, this study was to reflect on the relationship between creativity and educational environments for children aged 2-10, and identify and explain the environmental components shaping creativity, utilizing the attitude of recognizing physical and mental dimensions in children and meeting their needs as users. Employing the exploratory research method and qualitative content analysis, the main variables contributing to the relationship between the environment and children's creativity were delineated, and there were attempts to recapitulate this relationship via logical reasoning. This study was a qualitative meta-analysis because an analytical approach, based on the theories presented in previous research, was adopted. The study results revealed that the architectural environment could foster children's creativity. In addition, a suitable platform would be provided for children to flourish and strengthen their creativity if the educational environments were designed with the aim to comply with the principles of child psychology.

1. Assistant Professor of Architecture, University of Kurdistan, Sanandaj, Iran
   *Corresponding Author: Email: S.soleimani@uok.ac.ir
2. Master's Student of Architecture, University of Kurdistan, Sanandaj, Iran

Introduction

As there is a need to think differently and develop many skills in the current economic, social, and cultural conditions, creative thinking is the lifeblood of today's human beings (Stricker & Sobel, 2020). Most researchers also argue that encouraging, providing momentous opportunities, and training all can support people attain creative thinking. Moreover, it has been suggested that creativity is formed in childhood (Van Liempd et al., 2018) and the best time to develop it arises between the ages of 2 and 10 (Kupers et al., 2019). Behaviorists, as the serious opponents of the theory of inheritance, lay emphasis on the effects of the environment on children, and even consider it as an important factor shaping their behavior (Jankowska et al., 2019). The review of the related literature demonstrates that most studies have thus far underlined the value of physical environment, particularly in everyday settings, on children's learning and education, but creative thinking and creativity are still among the areas in need of development (Falconer et al., 2018). As creativity development depends on educational and learning environments, physical spaces are fit for becoming a breeding ground for children's creativity (Stricker & Sobel, 2020).

This study was to put emphasis on the strategies of designing physical environments for children, which could be involved in fostering their creativity. Reviewing the existing research on creativity from a psychological perspective, this work also recognized the evolution of this concept and presented a comprehensive conceptual analysis of the related literature, after exploring the concepts, dimensions, and models regarding the relationship between creativity and artificial environments. The study results would accordingly have implications for organizations, including the Department of Education, the State Welfare Organization, the Organization for Development, Renovation, and Equipping of Schools, kindergartens, schools, academies, and all training centers that are somehow involved in childhood education and research.

Conceptual Framework
Creativity

Creativity represents some complex skills, allowing for making the best decisions and dealing with numerous problems facing different common situations of everyday life, via innovative ideas. This concept is thus an essential skill in the process of individuals' adaptation living in the rapidly changing society (González et al., 2019). Creativity can be further defined as the ability to think in a unique manner and bring up with new solutions to problems. In nature, creativity is to explore different approaches to achieve uncertain results (Fehr & Russ, 2016). According to the creativity framework developed by Rhodes, creativity takes place at the 4P's of person, product, process, and press (or place), which have been to date the basis for investigating the levels of creativity (González et al., 2019). Examining this framework also confirms that creativity does not occur in the minds of individuals alone, but as a process that occurs by continuous interactions between individuals and their surrounding environments (Kupers et al., 2019).

Recruiting advanced statistical techniques and some software programs, Guilford reported that the human intellect could be divided into four distinct factors, measured individually. In his view, some personality traits could directly contribute to the emergence of creativity, viz. the stream of thought (i.e., fantasy), intellectual or cognitive flexibility, original thoughts, and decision-making, which could give rise to divergent or unconventional thinking (Karimi, 2019). Moreover, most training techniques for creativity share this type of thinking, so people with divergent thinking seem different in their thoughts and actions and back off from existing customs and habits, but make the best use of creative and novel methods. Divergent thinking is even identical to creativity once it leads to effectively positive outcomes, also called creative products (Doron, 2016). In this sense, a creative product responds to new conditions and needs in a different way, namely, an innovative, unique, and rare answer is provided. In terms of

performance and practicality, this product gives appropriate answers to contextual questions (Abraham, 2016). Therefore, creative people firstly generate novel ideas (viz. divergent thinking), and then reduce them to the ones that suit the constraints of the problem (i.e., convergent thinking) (Benton, 2018).

As stated in Davis and Rimm, the main characteristics of creative individuals fall into different categories, including originality, independence, risk-taking, high energy, curiosity, humor, interest in complexity, artistry, open-mindedness, solitude, and a higher understanding. Moreover, awareness, emotionality, morality, questioning, and high intelligence are among the other features. According to Sak, imagination, emotional intensity, and curiosity can distinguish creative students from academically talented ones (Gucyeter & Erdogan, 2020).

After defining creativity and recognizing its levels, the factors and elements affecting this concept need to be discussed. One of the most comprehensive studies in this field has been that conducted by Amobile, using Table 1 to analyze the effective elements that shape creativity.

Table 1. The analysis of effective elements affecting creativity (Gharebeigloo, 2015)

Motivation	Creativity-related skills	Subject-related skills
- Attitude toward work - A person's understanding of one's motivation for doing the work often depends on: - The initial level of intrinsic motivation for that work - The presence/absence of specific external factors in the social environment - The ability to diminish environmental constraints	- Cognitive methods appropriate to the implicit and recreational information of the exploratory method for creating new ideas - A constructive work method depends on: - Training - Experience in generating new ideas - Personality traits	- Knowing the subject - Technical skills required to do the work - The talent of a subject depends on: - Cognitive abilities - Motor and perceptual skills - Formal and non-formal education

As illustrated in Table 1, the factors shaping creativity do not restrict to psychological ones, but environmental factors can definitely have a significant effect on creativity. Some research has also revealed that the best time to develop creativity and imagination is in childhood, at the age range of 2 to 10 (Kupers et al., 2019).

Most researchers have further explored the basic necessities of creativity development, viz. the necessity of understanding the environment and expanding cognition, the necessity of health, physical security, along with physical skills development, and the necessity of satisfying emotions, connecting with the environment, and building motivation. Such necessities call attention to the role of the surrounding environment and its possibilities for free and independent movement, physical skills development, and the creation of emotional and spiritual bonds (Gharebeigloo, 2015). On the other hand, behaviors are formed to meet human needs, so satisfying the basic needs of children can significantly affect how their personality is formed and developed. Therefore, it is concluded that behaviors, actions, and creativity development can be influenced by recognizing such needs, divided into the following four categories:

Table 2. The types of children's needs (Lawson, 2017)

1	Physiological needs	Motor activities, coordination of movements, balanced reactions, sensory perception, viz. smelling, touching, tasting, hearing, feeling warm/cold, softness/roughness, as well as dryness/moisture are among such needs. Exercise also stimulates intestinal activity and reduces digestive problems, bloating, and pain during puberty.
2	Psychological needs	Self-esteem, a sense of responsibility, imagination arousal, creativity, passion, environment discovery, concept recognition, and reduction in aggressive behaviors are included in such needs.
3	Social needs	The social needs are grouped cognition experience, a sense of belonging to defend one's position, altruism, learning to participate, conflict resolution, group dynamism, privacy, and friendly relationships.
4	Educational needs	When dealing with children, adults are guided and educated by their behaviors and beliefs. Educators and parents must thus adopt a specially designed educational philosophy. Structural clarity, adaptability, freedom from hidden lines, and care and support, all come from this educational philosophy.

Accordingly, designing special spaces for children to meet their physiological, psychological, social, and educational needs, and ultimately foster their creativity is of great importance as children receive the most impact from the environment, depicted in Table 2 (Shafaei, 2017).

Creativity and Education

Education experts and policymakers have thus far pointed up the role of education in enhancing creativity. In this sense, a good understanding of children's creativity is crucial for teachers, parents, and educators, aimed at providing the optimal conditions for child development (Kupers et al., 2019). Researchers have further shed light on educational issues and methods to examine their effects on children's creativity development. However, the impact of educational environments in this domain has been rarely investigated (Shafaei, 2017).

As concluded in Loxton, creative learners are not expected to thrive without a reservoir of knowledge and experience. Moreover, the skills of evaluating and distinguishing ideas are of importance in the process of developing creativity in children, and demand right contexts to emerge (Lawson, 2017).

Creativity has accordingly turned into an educational necessity over recent decades, and it is being examined from theoretical and experimental perspectives. Meeting the individual needs in students and guaranteeing their future success in a complex and uncertain world also reminds much more emphasis on creativity in education (Hernández-Torrano & Ibrayeva, 2020). Reviewing the literature on creativity and education accordingly determines the special role of the educational environment designed for children in creativity emergence and development.

Creativity and Environment

Once children receive and respond to new stimuli in their surrounding environments; for example, by moving toward them, reaching for them, and looking at them, and even manipulating them, they gather new information and develop new skills that subsequently enable them to understand new functions, utilize them creatively, and improve their own creativity (Louro, 2019; Van Liempd et al., 2018). Thus, a creative environment can stimulate creativity. Some have also considered the characteristics of learning environments as the most important factors shaping creativity (Hernández-Torrano & Ibrayeva, 2020). In addition, the learning environment should encourage students to discover, explore new ideas, take some risks, and establish interactions for creativity emergence and development. According to Brown et al., students should be in a free and appropriate learning environment for creative thinking (Gucyeter & Erdogan, 2020).

Numerous categories of creative learning spaces have been thus far proposed. Among the most recent generalizations, a creative learning space has been divided into five distinct sections, viz. (1) a personal space for working alone or learning individually, e.g., an individual study space, (2) a collaborative space for learning and group activities with classmates or teachers, (3) a presentation space for giving lectures as well as doing creative work, (4) a building space for experiencing, experimenting, manufacturing equipment, performing mobility activities, and making noise, and (5) an interaction space for having transition and recreation, which includes spaces not intended for creative work, but connecting other spaces, such as corridors, cafeterias, or entrances, as well as those for relaxation. A creative environment accordingly requires all five types of spaces, but in the right shapes and proportions for users (Thoring et al., 2018).

Research Method

The main analytical approach in this study was defined based on the relationship between creativity and the artificial environment. Moreover, the exploratory research method and qualitative content analysis were used to identify, analyze, and interpret the theories presented in previous research regarding the relationship between creativity and the artificial environment in order to provide a comprehensive model in this regard.

To this end, first, the related literature was reviewed and the valid library resources were extracted. The research field was also formed by a systematic review of the articles published on child development, creativity, and architectural spaces specific to children. The data were collected through a series of searches in the databases of Science Direct, Elsevier, and Civilica. The time span was accordingly limited to 2015 and 2020, and only reliable scientific articles were retrieved, but government reports, conference papers, and dissertations were excluded.

Practically, the analysis and summarization of these articles provided convincing information.

As the number of the articles collected for this purpose was theoretically saturated and proceeded toward repetition, only the topics that were exactly related to the impact of the environment on children's creativity were not selected, but those reflecting only on creativity or the environmental effects on behavior were also retrieved. The logical reasoning to refine and redefine the relationships between the mentioned variables was performed as the analysis method to provide a comprehensive model in this regard. Since this study with an analytical approach was based on the examination and interpretation of previous theories and research, it was considered as a qualitative meta-analysis.

A Meta-Analytic Approach to Psychological and Environmental Factors Affecting Creativity Development

The concept of the child in this study refers to the individuals aged 2-10, in educational environments, such as kindergartens, preschools, elementary schools, or even training centers and academies. According to the research on behavioral environment, there are many factors in childhood that can foster creativity in children if their effectiveness is stimulated and increased, viz. psychological and environmental factors, as described below.

Psychological Factors Shaping Creativity Development

Imagination

Children often exploit the imagination to interpret shapes and volumes in spaces and everything else in a special way. While playing, they also use one's imagination to create new and different usages for objects such as wood and stone (Bocozar, 2019).

A mental model or imagination is thus an internal symbol or representation of external reality that can significantly contribute to cognition, reasoning, and decision-making. Individuals also try to build mental models throughout life by their perception, imagination, knowledge, and personal life experiences. In this sense, children create and develop their mental models of the surrounding world, mainly through the loads of everyday observations and talks with

their parents, teachers, and peers. Visual imagination accordingly involves the creation, interpretation, and evolution of visual mental images (Jankowska et al., 2019).

Curiosity

Curiosity is characterized as the need and desire for knowledge, also called "thirst for knowledge" by Freud. According to Berlin, exploratory behavior demands curiosity as a motivational prerequisite. It is also known as a driving force in child development and even one of the most important motivations for academic achievement. Creative people are usually curious (Shafaei, 2017). Curiosity and exploration are further defined as goal-oriented activities among children to learn about things or situations, and simultaneously learn how to interact with other individuals or situations (Van Liempd et al., 2018).

Motivation

Both motivation and stimulation occur when the volume of information exceeds the capacity of human perception. The emotions created by spaces in human beings are thus related to the characteristics of interior environments, stimulating the human senses, such as sight and hearing (Tabatabaeian et al., 2017). In this respect, stimulation and then exploration are often defined as goal-oriented activities, which help to learn about objects or situations and how to interact with them (Van Liempd et al., 2018).

Experience

One acquires certain intuitions about good and bad ideas by gaining knowledge and experience in a particular field (Kupers et al., 2019). The cognitive foundations combined with experience and time can thus lead to a better study of problems, and provide new and appropriate solutions, which can activate and boost creativity. Using different strategies, experience also provides more elements for more creative production (González et al., 2019).

Color

Color helps individuals understand the environment and then develop creativity by producing mental and semantic structures as well as raising imagination. Typically, all people tend to associate colors with their own messages, concepts, and experiences (Henrique & Beatriz, 2019). Colors can also shape personality, especially in children, and induce some emotional experiences, such as joyfulness, laughter, despondency, grief, composure, touchiness, immobility, and excitement (Diwandi & Qomi, 2019).

Play

Plays have a vital role in children' cognitive and social development. Accordingly, an effective strategy to stimulate positive effects on creativity is to introduce the elements of play into the surrounding environment. In fact, playgrounds or anywhere else children can play is the best place for raising their creativity (Hojat & Shahhoseini, 2019). There are even different views and controversies in this domain (Theobald et al., 2015). Most studies have considered the main purpose of playing as fostering creativity, self-esteem, health, self-confidence, and communication skills in children (Einarsdóttir & Ólafsdóttir, 2017). Children's games can be thus categorized (Table 3) in terms of types of physical activities as well as the needs and uses of spaces (United Nations Children's Fund [UNICEF], 2018).

Table 3. The classification of children's games (UNICEF, 2018)

1	Active games	These games include jumping, running, cycling, climbing, and sliding. Such games do not require spaces with safety equipment against impact and fall, but it is necessary to ensure the safety of cards, structures, and environmental effects.
2	Innovative games	Playing with sand, gravels, plants, grass, water, clay, etc. are among such games. Accordingly, children can shape and alter some materials as they wish, and ultimately create what they want or imagine. In addition, the presence of some elements in the playground can raise this motivation.
3	Sensory games	There are touch, sight, hearing, and olfactory experiences. Children are also considered as the pioneers of sensory experimentation. Creating environments for gaining such experiences and simulating the factors and elements that help cultivate their experimentation, motivation, and creativity is thus essential.

According to Table 3, the main role of providing an appropriate environment for children to play a wide variety of games and then fostering their creativity is evident.

Environmental Factors Shaping Creativity Development

Defining Spaces for Collective Presence

Researchers have thus far shed light on the effect of group work on creativity development, and have concluded that creativity can be the fruit of cooperation (Shafaei, 2015). Encouraging conversations, plays, and learning activities among children and their peers can thus bolster the foundations of communication that are vital for their academic achievement, creativity, and cognitive development (Hassinger-Das et al., 2020).

Using the Natural Environment

The natural environment is assumed as an ideal place for the development of creative behaviors in children. Such environments stimulate children as well as their growth and unlimited learning, so nature should be considered as an essential member of their surrounding environment (Ahmadzadeh Beheshti et al., 2020). The presence of natural elements in the environment is thus effective in enhancing motivation and aiding children to express their emotions. It is also a good platform for children to get involved in group activities to foster their creativity (Harvey et al., 2020). The use of natural patterns and elements can thus help children have valuable experiences, try their curiosity, show their desire to play, find motivation to cooperate, and even raise their imagination (Shafaei, 2017).

Creating a Sense of Space

Children's creativity and learning also increase once they have a sense of belonging and stay in (Dyson, 2017). It is even important for children to be heard and understood (Crook, 2020). Using participatory methods, children can be involved in designing one's playgrounds, so they can have a more sustainable use of the environment and show a sense of belonging and space privatization while they are affected by the environment, which cultivates their creativity (Hojat & Shahhoseini, 2019).

Flexibility

Flexibility here denotes the ability to perform multiple functions in a given space at different times. According to Norman, each space has an intrinsic usage that determines the type of the activity for which it is intended, expressed through its configuration (e.g., the arrangement of rooms and furniture). This configuration can be further changed, which means that the type of space can be also altered. Changing the type and use of space accordingly requires time, energy, and some special activities. The amount of time and energy to change the space from one type to another also determines its degree of flexibility (Thoring, 2018). Therefore, the use of flexible spaces that stimulate children's curiosity can augment their creativity. Flexibility (in terms of shape, size, and function) and free movement in spaces are also the main features of creative physical environments (Jindal-Snape et al., 2013).

Arrangement

The arrangement of children's furniture such as tables and chairs can affect their creative activities. It has been also recommended to employ different and suitable arrangements for each age group in one space so that each child can use a table, a chair, and other equipment in proportion to their body and scale (Mayesky 2013). A child's exploratory play in an environment that is appropriate for their age can thus have lasting effects on cognitive functioning and creativity development in childhood and adolescence (Crook, 2020).

Safety and Security

Children need to feel safe in their surrounding environment and have no worries. However, safety and security should not be as physical or mental barriers, because children might feel stressed out in this case, wherein their education and creativity are disrupted (Koya, 2019). To stimulate their imagination, children also need to learn to stay calm, but active in a wide variety of places (Crook, 2020).

Complexity

Spatial complexity refers to the amount of data that must be processed by an individual in order to move and operate in the surrounding environment. Perceptually, complex environments stimulate curiosity and motivation, thereby fostering creativity in children. As declared by psychologists, various factors such as complex or non-intrinsic patterns, complexity and novelty, the high density of spatial patterns, space light, the audio-visual features of elements in the spaces, and diversity and sudden changes are effective in raising motivation in this respect (Tabatabaeian et al., 2017). Children can thus learn to deal with contextual problems, and then discover causal relationships between actions and outcomes by actively exploring the environmental complexities available to them, which can lead to the development of their logical reasoning and creativity (Van Liempd et al., 2018).

Legibility

The detectability and legibility of spatial features for children can undoubtedly contribute to their motor, mental, and ultimately creative development (Van Liempd et al., 2018). Legibility can thus help children understand the importance of communication and the way indoor spaces are connected to the outside ones and the pattern of their surroundings (Burlo & Agius Ferrante, 2019). Legibility is accordingly required to move inside or outside buildings. The clarity and simplicity of the form, in the sense that the form is as close as possible to the engineering contexts, can thus enhance the legibility of the designs. Proper signs are also among the factors that help the design to be legible. In this regard, Gestalt psychology has focused on the way sensory perceptions are organized (Tabatabaeian et al., 2017).

Factors Affecting Creativity Development

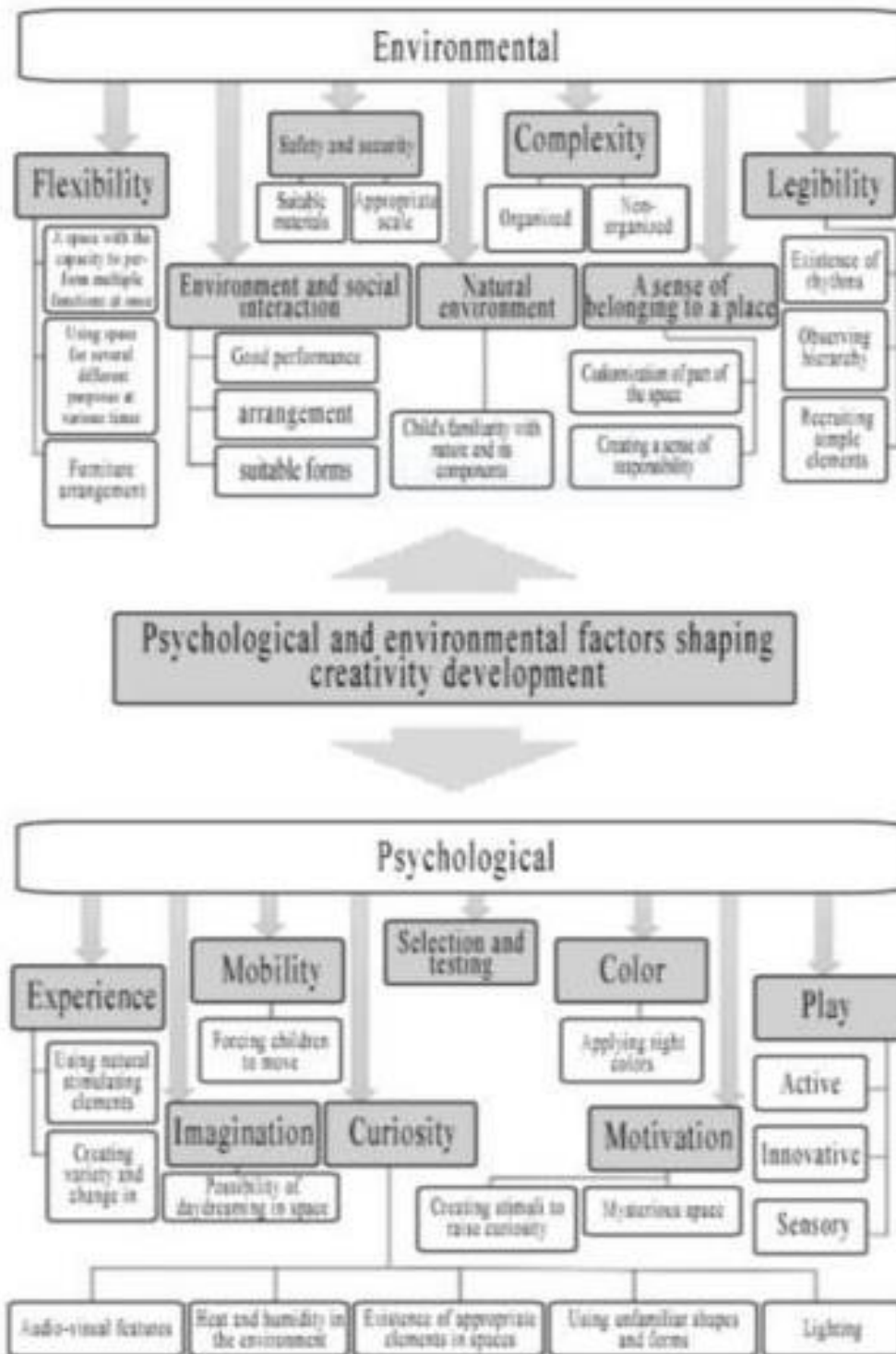Figure 1 recapitulates the psychological and environmental factors shaping creativity development.

Figure 1. Psychological and environmental factors shaping creativity development (Source:Authors)

Reviewing the related literature demonstrated that the psychological and environmental factors affecting creativity development could have reciprocal and multifaceted effects. Figure 2 shows the mutual relationships between the artificial environment and psychological factors that lead to creativity development in children.
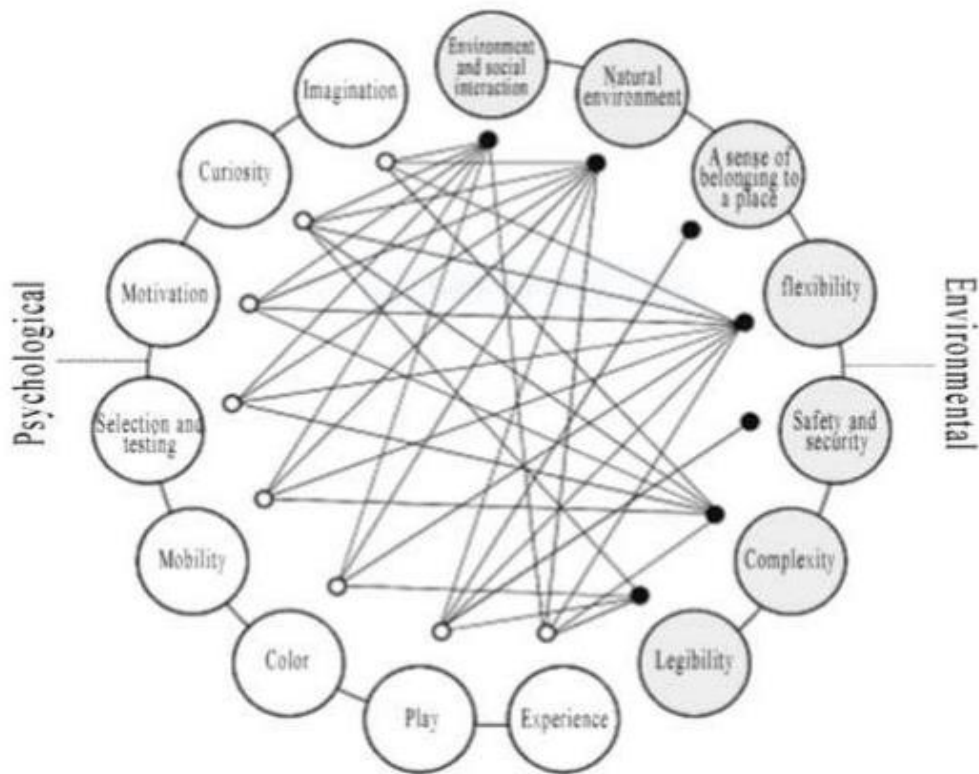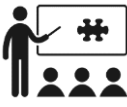
Figure 2. Multidimensional Relationship between Factors Affecting the Children Creativity (Source:Authors)

Discussion

The environment can have a continuously decisive effect on children because it helps establish communications, shape behaviors, and employ the senses (Crook, 2020; Kupers et al, 2019; Thoring et al., 2018). Therefore, meeting children's needs by creating appropriate environments is one of the meaningful ways to help them learn from their surrounding environments, strengthen their imagination, and ultimately develop their creativity (Louro, 2019; Shafaei, 2017). The environments specifically built for children should be thus designed in a way to allow for a wide variety of activities necessary for child development and social interactions. Such spaces should also provide great opportunities for learning from the environment and shaping the physical characteristics of the place by enhancing children's participation. Thus, the environments that are designed based on the psychological elements can provide children with different physical and mental skills, and even enable them to develop creativity and creative thinking by

understanding, learning, and applying different skills. The environment can be further assumed as an effective factor fostering children's creativity if they are in a place where all the favorable conditions are provided for this purpose and their potentials are not suppressed through the surrounding environment and external thoughts (Hojat & Shahhoseini, 2019; Thoring et al., 2018; Jankowska et al., 2019; Falconer et al., 2018). In order to cultivate creativity, much more attention should be accordingly paid to children's imagination, interactions, and motivation during the design of creative educational spaces. Upon the meta-analysis of the scientific articles retrieved as well as the refinement of the concepts of creativity, education, and the related materials, the components of space, which could have the greatest impact on creative education and increase creativity development among children in educational spaces, were extracted. 11 The following table illustrates these components and proposes architectural solutions for the educational spaces to develop children's creativity.

Table 4. The components of educational spaces to foster children's creativity (Source: Authors)

1		Providing spaces with appropriate scales and forms for group and interactive activities as well as collective presence	- Providing suitable spaces to establish the interactions between different age groups - Designing spaces such as lobbies and exhibitions as well as playgrounds, sports grounds, and collective storytelling rooms - Building small gardens and planting and maintaining plants in group and collectively - Designing spaces for group painting or singing - Constructing larger and wider spaces that enable children to experience learning, movement, play, and participation in group activities (Of note, the size of such spaces should not be too large to look scary and strange to children)
2		Arranging furniture properly to perform various activities	- Arranging furniture in the forms of only educational, educational and play, and only play - Changing furniture arrangements by children themselves
3		Using the natural outdoor environment and natural stimulants inside spaces	- Using the green color and familiarizing children with green spaces to promote their comfort, psychological safety, and motivation - Creating good opportunities to play with the elements of nature, such as plants, water, soil, and sand, and stimulating the five senses with some natural elements
4		Strengthening space flexibility and spatial installation to perform several activities simultaneously, with the possibility of exploiting spaces with different uses at various times and creating diversity and sudden changes in them	- Embedding movable furniture in spaces, such as the idea of light movable cubes in the form of furniture (Of note, the geometry of the spaces should be such that they can be arranged in various ways for the furniture) - Designing movable walls to separate each area, wherein the width of the corridors can be slightly larger than the standards as well as providing some spaces for displaying temporary art or installing shelves for books and children's tools in these corridors - Constructing spacious rooms with flexible furniture for play and various activities that do not restrict children in choosing the type of activity - Inserting parts that include unfinished paintings on walls or floors - Designing modular, movable furniture as well as changing furniture, colors, and materials in spaces
5		Paying attention to the audio-visual effects of space elements and observing aesthetic principles for visual attractiveness	- Playing suitable music for children in spaces and getting them involved in playing this music, such as the use of musical stairs and hollow elements on walls - Observing acoustic principles, lighting, scales, smooth floor surfaces, walls with different textures and warm colors, as the factors affecting the attractiveness of kindergartens
6		Considering space shapes and forms	Using shapes such as circles, ovals, and other soft shapes to design classrooms, learning spaces, and places for running and playing, and some other spatial elements such as stairs, ceilings, and walls

7		Giving value to color	• Providing spaces that are warm with cheerful colors, wherein the forms of varying colors and watercolor paintings indicate dream themes and lead to the stimulation of emotions and daydreaming in children
8		Respecting space lighting	• Employing natural lighting in play spaces and embedding artificial lights and combining them with natural light in study and educational spaces
9		Performing appropriate motor and mental games	• Considering outdoor environments as the second teachers to facilitate learning through natural games and exploration, wherein the type of furniture and spatial dimensions affect children's physical activities
10		Raising complexity and using distracting data in spaces	• Increasing the complexity of the environment, through its effects on children's imagination and curiosity and stimulating them to play there • Providing different play spaces and even its selection by children • Stimulating children's curiosity by winding paths in the environment and on the roads, as a kind of ambiguity • Designing puzzles • Developing unpredictable space patterns, such as creating different shapes by lighting and shadows and installing mirrors
11		Observing space legibility	• Observing hierarchy in the first place and using simple elements in spaces for further orientation
12		Paving the grounds for daydreaming in spaces and helping children to experience new phenomena	• Discovering secrets in the environment to force children to imagine and have curiosity, such as the construction of sand and mud structures that help harmonize mental imaginations and handcrafts (Of note, the difference between shadow and lighting can create different spaces for children, e.g. designing spaces where children can create different shapes with shadows or use shadow-creating walls
13		Motivating and stimulating spaces to raise children's curiosity	• Designing spaces such as tree houses • Constructing corners to stimulate children's curiosity
14		Creating a sense of belonging in children	• Designing the main entrance in a suitable shape • Installing students' pictures or personalizing spaces with their handcrafts • Providing special furniture or closets to put away everything there voluntarily
15		Generating a sense of security in spaces and a sense of calm in children by being present there	• Using appropriate materials and reducing possible obstacles and environmental hazards such as edges, ridges, walls, and high-risk devices in spaces • Not using heights beyond children's scales • Designing spaces for thinking and relaxation • Providing the possibility of interactions between parents and children in special rooms

Conclusion

Children are regarded as one of the most important elements of human society in all countries, so psychological and interdisciplinary studies, particularly architecture, can help in understanding their behaviors as well as development. In other words, children have been thus selected as the target population for many studies, such as psychology and architecture, because their skills and behavioral patterns can be explored and improved in this way. A creative and skills-based society can be accordingly developed, wherein individuals try to exploit their creative skills to deal with external problems.

Therefore, the creative skills taught for this purpose should not be limited to scientific archives in schools and academies, but contain external factors, such as the impact of learning and teaching environments and their role in fostering children's creativity. For this reason, it is of utmost importance to reflect on learning and educational environments from the perspective of architectural studies, because such environments can be the basis for meeting the requirements of child development. Paying attention to children's needs and addressing them by creating suitable environments is accordingly one of the strategies to learn meaningfully from the environment and strengthen their imagination.

Without considering architectural and psychological details, meaningful learning from the environment is not possible. To this end, physical spaces can turn into the settings to cultivate children's creativity. Such places should be designed in a way as to provide the context for all activities necessary for child development and their social interactions during education, and create opportunities for learning from the environment and shaping the physical characteristics of the place through strengthening children's participation. Thus, architects, psychologists, and teachers play the most important roles in flourishing and strengthening creative thinking in children. To put it more clearly, the architects and designers of educational spaces should try to design environments that can stimulate creativity in children while paying attention to the psychological points in this field. In addition to being calming, safe, cohesive, legible, flexible, and interactive and having appropriate complexity to stimulate children's imagination, these environments should raise children's imagination and curiosity, boost the possibility of experimentation, provide mobility, and even make them play a wide variety of games and develop their own creativity.

According to Table 4, such goals can be simply achieved by designing appropriate architecture, which means providing conditions and allocating spaces to children along with creating a sense of comfort in them by spaces, furniture, scales, and specific designs for communication between children and parents, which can consequently create a sense of place in this age group. By designing spaces with different furniture, walls, colors, and lighting, children can further imagine and experience new phenomena. Developing spaces such as tree houses, corners, and unpredictable spatial patterns can thus stimulate curiosity and motivate children in this regard. In addition, confirming the appropriate spatial scale can encourage children to play loads of games and try different activities, so paying attention to the form and shape of spaces is very effective in heartening children to perform an assortment of activities. On the other hand, the use of natural outdoor environments and the elements of nature inside some spaces can

amplify calmness, motivation, curiosity, and psychological safety in this age group. Providing flexible spaces and furniture that allow children to practice several different functions at various times also keeps them active while learning, playing, and participating. Moreover, designing spaces suitable for interactive activities, such as lobbies, group plays, creative activities, performance, and anthem rehearsals all lead to the emergence and development of children's creativity in a creative environment.

Psychologists and those involved in psychology can thus help architects identify the factors shaping creativity in individuals. Teachers and teaching assistants can further help achieve this goal, i.e., fostering creativity in children. That is why the results of this meta-analysis can be a great way to fulfill these goals. Although further studies are still needed in this field, it is hoped that these results suggest good paths to future researchers.

Ethical considerations

During the implementation of this research and the preparation of the article, all national laws and principles of professional ethics related to the subject of research, including the rights of statistical community, organizations and institutions, as well as authors and writers have been observed. Adherence to the principles of research ethics in the present study was observed and consent forms were consciously completed by all statistical community.

Sponsorship

Conflict of interest

According to the authors of the present article, there was no conflict of interest. This article has not been previously published in any journal, whether domestic or foreign, and has been sent to the School Administration Quarterly for review and publication only

References

Abraham, A. (2016). Gender and creativity: An overview of psychological and neuroscientific literature. Brain Imaging and Behavior, 10, 609-618.

Ahmadzadeh Beheshti, Sonia.Alizadeh Ajirlo, Saadolah. Babapour, Jalil. Hami, Ahmad. (2020). Investigating the effect of plants using in the educational and play environment on creativity improvement of child. Journal of Modern Psychological Researches.[In persian]

Benton, Laura. Varotsis, George, & Vasalou, Asimina. (2018). Leading by example: Exploring the influence of design examples on children's creative ideation. International Journal of Human-Computer Studies.

Bocazar, Beatrix. (2018). Discourses of creativity in Ontario kindergarten curriculum.

Burlo, Elena Tanti.; Agius Ferrante, Charmaine. (2019). Spaces and places for pre-school Children. Little voices big ideas, malta review of educational research, 13(1): 131-145.

Crook, Deborah J. (2020). Children changing spaces, changing schools. Children & Society. 2020; 00:1–16.

Diwandi, Javad, Great, & Qomi, Leila. (1397). Utilizing the capabilities of light and color in the educational space In order to increase children's creativity.

Doron, E. (2016). Short term intervention model for enhancing divergent thinking among school aged children. Creativity Research Journal, 28, 372 378.

Dyson, Anne Haas. (2017). A Sense of Belonging: Writing (Righting) inclusion and equity in a child's transition to school. Department of Education

Einarsdóttir, Jóhanna, Ólafsdóttir, & Sara, M. (2017). Drawing and playing are not the same: children's views on their activities in Icelandic preschools. Early Years Journal.

Falconer, E. G., Cropley, D. H., & Dollard, M. F. (2018). An exploration of creativity in primary school children. International Journal of Creativity and Problem Solving, 28:2, pp. 7-25.

Fehr, K. K., & Russ, S. W. (2016). Pretend play and creativity in preschool- age children. Associations and brief intervention. Psychology of Aesthetics, Creativity, & the Arts, 10, 296-308.

Gharebeigloo, Minoo. (2015). The role of environmental effects on developing creativity in children.

González, Restrepo. Karen, Johanna. Arias-Castro. Camilo, Cristian, & López, Verónica. (2019). A theorical review of creativity based on age. Soacha Cundinamarca. Colombia. Papeles del Psicólogo / Psychologist Papers. 40(2). 125-132

Gucyeter, S., & Erdogan, SC. (2020). Creative Children in a robust learning environment. perceptions of special education teacher candidates, Thinking Skills and Creativity.

Hassinger-Das, B., Zosh, JM., Hansen, & N., Talarowski. (2020). Play-and-learn spaces: Leveraging library spaces to promote caregiver and child interaction. Library & Information Science Research

Harvey, Caroline. Hallam, Jenny. Richardson, Miles. Wells, Rachel. (2020). The good things children notice in nature: An extended framework for reconnecting children with nature. Urban Forestry & Urban Greening

Henriques, Cordeiro، & Beatriz, Maria. (2019). How physical environment influence creativity. NOVA School of Business and Economics.

Hernández-Torrano, Daniel. & Ibrayeva, Laura. (2020). Creativity and education: A bibliometric mapping of the research literature (1975–2019). Thinking Skills and Creativity

Hojat, I., & Shahhoseini, S. (2018). Redefinition of children's play space Based on evaluation and analysis of their needs from play space with enhancing creativity approach. mmi; 1 (15):41-58

Jankowska, Dorota M., Gajda, Aleksandra. & Karwowski, Maciej. (2019). How children's creative visual imagination and creative thinking relate to their representation of space. International Journal of Science Education

Jindal-Snape, D., Davies, D., Collier, Ch., Howe, A., Digby, R., & Hay, P. (2015). The impact of creative learning environments on learners: a systematic literature review. Improving schools, 16(1): 21-31.

Karimi, Yusuf. (2019). Educational Psychology. Arasbaran Publications.

Koya, jesu. (2019). Activity center for children. National Institute of Technology Rourkela.

Kupers, E., Lehmann-Wermser, A., McPherson, G., & Van Geert, P. (2019). Children's creativity: A theoretical framework and systematic review. Review of Educational Research, 89(1), 93-124.

Lawson, Brian. (2017). How do designers think?.

Louro, M. (2019). Architecture stories in the construction of children's spatial conscience. In Intelligence, Creativity and Fantasy (pp. 166-171).

Mayesky, M. (2013). Creative activities for young children. Policy and Leadership (EPOL), University of Illinois, Champaign.

Stricker, Laura W., & Sobel, David, M. (2020). Children's developing reflections on and understanding of creativity. Cognitive Development55.

Shafaei, M., (2017). Design patterns of kids' spaces, focusing on enhancing their creativity, Int. J. Architect. Eng. Urban Plan, 27(1): 19-27, June 2017.

Tabatabaian, Maryam, Abbasalizadeh Rezakolai, Sanaz, & Fayaz, Rima. (2017). 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).

Tabatabaian, Maryam, Abbasalizadeh Rezakolai, Sanaz, & Fayaz, Rima. (2017). The effect of natural environment on childrens creativity.

Theobald, Maryanne, Danby, Susan, Einarsdóttir, Jóhanna, Bourne, Jane, Jones, Desley. Ross, Sharon. Knaggs, Helen. Carter-Jones. (2015). Children's perspectives of play and learning for educational practice. education sciences.

Thoring, Katja, Desmet, Pieter, Badke-Schaub, Petra. (2018). Creative environments for design education and practice: A typology of creative spaces. Elsevier Ltd.

United Nations Children's Fund (UNICEF). (2018). Strengthening learning through play in early childhood education programmes.

Van Liempd, H. (Ine) M.J.A. Ora Oudgenoeg-Paz. Fukkink, Ruben G., Leseman, Paul P.M. (2018). Young children's exploration of the indoor playroom space in center-based childcare. Early Childhood Research Quarterly.

Author 1 Name: Sara Soleimani
Email: S.soleimani@uok.ac.ir

Sara Soleimani is an Assistant Professor in Architecture Department of University of Kurdistan. She is a Member of Iran Elite National Foundation and received her Ph.D. in architecture from Iran University of Science and Technology. Her field of research is Education in architecture, Structural training in architecture and she was the supervisor of many BSc and MSc students in the field of architecture-based research for 12 years . Architecture department, Faculty of art and architecture, University of Kurdistan, Pasdaran St, Sanandaj, Kurdistan, Iran.

Author 2 Name: Mobina Kheiri
Email: m.kheiri1995@gmail.com

Mobina Kheiri has a masters degree in architecture from the university of Kurdistan. Her research interests are Education in architecture,architectural design for children and creative architecture