

Effective Factors in Promoting Creativity among 3-6 Years Old Children in Educational Open Spaces of Tehran based on the Prismatic Creativity Model*

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ABSTRACT

Children spend about 25% of their time in open spaces of educational environments. This space can respond to different spiritual and physical, art, and educational needs (learning and creativity growth), so this is an important factor in the design of educational spaces. Unfortunately, there is considerable inattention to landscaping of educational open spaces, particularly for preschool age. This issue requires paying more attention to the professional design of this important space for promoting children's creativity. Therefore, this study aims to provide the field for promoting the quality of open spaces in educational centers regarding the role of these spaces in developing creativity among 3-6-year-old children. The variables affecting creativity were identified and classified by reviewing the literature on the topic. The open-ended test (with the qualitative method) was done to examine the design attitude of architects and experts in educational sciences and psychology, experts in the field of children's creativity to optimize educational open space for promoting the creativity of children based on a descriptive technique and content analysis method. According to the results of the open-ended test and literature review, a close-ended questionnaire was distributed among kindergarten and preschool educators in Tehran City. Six factors were then introduced after implementing Exploratory Factor Analysis (EFA) of questionnaires' results through SPSS16 software: participation and experience, psychological well-being, stimulating natural elements of the environment, function versatility, vitality of environment, and environmental motivation. A prismatic model was then formulated using path analysis through AMOS26 to analyze the relationship between the mentioned factors. In the validation step, a painting test and semi-structured interview were done among 60 children due to the importance of their opinions about the space they use. The findings were confirmed in this phase. It is worth noting that discussion of the factors mentioned above based on the questions designed for them can lead to creating a list of design principles of open areas for children, which can be examined in further studies too. Also, different classifications may be obtained since the control variable of gender is used in this study.

Keywords: Creativity, Open Area, Educational Open Spaces, Courtyard, 3-6 Years Old Children.

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1. INTRODUCTION

As a place where children spend a long time of day, educational space can result in place attachment and belonging both qualitatively and quantitatively (Siavashpour, ShadlooJahromi, and Nodehi 2016). Educational centers have been always the most important urban spaces and their role and position have been developed through scientific advances and expansion. Among these centers, educational centers for children are more important (Khakzand and Babaei 2016, 36). Educational centers must be designed in a way that learning becomes pleasant and simple because the creation of interest in and tendency towards educational environments and their interactions with open spaces and green spaces of the courtyard is among the significant factors for academic achievement (Tabaeian 2021, 129). A courtyard with an accurate design would develop the learning opportunity providing a space for more suitable learning and creativity (Koleva, Duman Yüksel, and Benaabidate 2017). Therefore, the problem of this study is to provide the field for qualitative promotion of open spaces in educational centers to promote the role of these spaces for creativity development among 3-6-year-old children in Tehran City. This city has been chosen due to the considerable racial and class diversity in this metropolis, and the age range of 3-6 is the golden time of education and perceptual growth. Moreover, perception is the first step of the creativity process.

The advent of creativity during childhood especially in the 3-6 range is more possible than at other times (Amabeli 1995), and the imagination shaped in the early years of childhood would form the base for creativity during the puberty period. Therefore, the effective factors in increasing creativity power must be examined to actualize them (Aram Fard 2003). Children spend 25% of their time in the courtyard of the educational environment, and since the courtyard can respond to the different spiritual and physical, art,

educational, and other needs (learning and creativity growth) of preschool students (3-6), this scape is highly important in the design of educational space (Tabatabaei Yeganeh et al. 2022, 114). Unfortunately, inattention to landscaping the educational open area requires paying more attention to the professional design of this important space to promote children's creativity.

In terms of research approach, this is an applied study and in terms of method, this is a quantitative-qualitative method based on descriptive statistics. This study first examined the factors affecting creativity and after classifying the factors affecting creativity, the factors of the design of educational spaces' landscape that affect the children's creativity growth were extracted from the literature review. In the research method phase, the research steps were explained in the next phase. The next step included data analysis and the creativity model was introduced after analyzing the factors. The results and novelty aspects of the study were discussed in detail in the conclusion section.

2. THEORETICAL FOUNDATIONS (FACTORS AFFECTING CREATIVITY)

It is vital to pay attention to creativity and solutions for developing and promoting it (Priyanto and Dharin 2021). Assessment of the creativity component indicates that creativity is not a fixed personality trait without any change or evolution in a person but may be improved, weakened, or even ruined under the effect of various factors and barriers. Some conditions pave the way for the creation, development, or growth of creativity, while other situations may destroy creativity (Hosseini 2008, 43). The barriers and factors can be divided into three general (individual, physical, and functional) factors affecting the children's creativity. Table 1 expresses the most important factors.

Table 1. Classifying the (Functional, Physical, and Individual Systems) Factors Affecting the Child's Creativity

Systems	Characters related to Creativity	Summary of References
Human (Individual)	Vitality	(Azemati, 2020; Maraashi, 2020; Sirfian, 2019; Poor Momen, 2019; Shah Mohammadi, 2014)
	Motivation	(Amabeli, 1995; Chin, 2010; Hosseini, 2009; Shafae, 2009; Cheng Wong, 2001; Bitti, 2012)
	Initiative	(Karimi Azari, 2014; Sternberg, 2001)
	Imagination	(Geoffrey, 2007; Aram Fard, 2001; Krippner, 1999; Hosseinpour, 2012; Shafae, 2009; Azemati, 2008; Amabeli, 1998)
	Curiosity	(Olenj, 2015; Malek, 2012; Akrami, 2004; Azemati, 2008; Temedgon, 2006; Arnon, 2003; Farahpour, 2009)
	Risk-Taking	(Cheng Wong, 2001)
	Ambiguity	(Tabaeian, 2021)
	Increasing Activity and Play	(Azemati, 2008; Akrami, 2004; Shams Dolat Abadi, 2019; Olenj et al., 2015)
	The Mental Peace of the Child	(Pavlovsky, 2019; Tabaeian, 2021)
	Intelligence and Talent	(Sternberg, 2001)

Systems	Characters related to Creativity	Summary of References
Human (Individual)	Age Group	(Hosseini, 2009; Torrance and Hensley, 2003)
	Free Cooperation (Communication) with Peers	(Paulus, 2000; Olenj et al., 2015)
	Challenge	(Brittin, 2015; Fjortoft, 2004)
	Child's Sex (Male or Female)	(Aminifar and Azemati, 2023; Smith, 2016; Tekushi, 2015; Tabatabaei Yeganeh et al., 2022)
Functional	Flexibility of Functions	(Shafae, 2010; Akrami, 2004; Mahmoudi, 2012)
	Variability of Arrangement	(Azemati et al., 2016; Archia, 1999; Noroozian, 2018)
	Manipulation in the Environment	(Malek, 2012; Noroozian, 2018)
	Function Versatility in the Open Space	(Shenickson, 2022; Poor Momen, 2019; Shafae, 2009; Tabaeian, 2021; Azemati, 2008; Maraashi, 2020)
	Stimulating Feelings in the Environment	(Azemati, 2008)
	Happy Environment	(Tabaeian, 2021; Maraashi, 2020; Hosseinpourian, 2011; Torrance, 1975)
	Freedom and Lack of Restriction	(Floyd, 2011; Azemati, 2008)
	Reward and Incentive	(Bor, 1998; Welf, 2013)
	Exploration of the Environment	(Azemati, 2008; Shafae, 2009; Tabaeian, 2021; Hosseinpourian, 2011)
	Play and Physical Stimulation	(Aminifar, 2022; Beikomi, 2021; Hosseinpour, 2012; Hojjat, 2018; Olenj et al., 2015)
	View and Landscape	(Saivan, 2004; Barten, 2016)
	Control, Security, and Safety	(Maraashi, 2020; Akrami, 2004; Dudek, 2012; Fleming, 2014; Bates, 2018; Kolwa, 2017; Tan, 2007; Olsen, 2008; Azemati, 2008; Olenj et al., 2015)
Physical	Color Diversity	(Moltafet et al., 2017; McCoy, 2002; Edwards and Springett, 1995; Torrance, 1975; Kamelnia, 2019; Kolwa, 2017; Azemati, 2020; Toosi, 2011; Tabatabaei Yeganeh et al., 2022)
	Natural Elements of the Environment	(Tabaeian, 2021; Hosseini and Rafiee, 2020; Karimi Azari, 2014; Movahedi, 2019; McCoy, 2002; Daneshgar, 2011; Salivan, 2004; Barten, 2016; Shenickson, 2022; Olenj et al., 2015; Mozaffar et al., 2009)
	Shape and Area of Spaces	(Aminifar, 2022; Shenickson, 2022; Ansell, 2009; Jennings, 2006; Shafae and Madani, 2010; Hornecker, 2005; Olenj et al., 2015)
	Light	(Aminifar and Azemati, 2022; Kokabi Salehi, 2016; Temedgon, 2006; Christensen, 2004; Toosi, 2021; Tabatabaei Yeganeh et al., 2022)
	Variety of Spaces (Open, Semi-Open, and Closes)	(Shenickson, 2022; Temedgon, 2006; Shafae, 2009; Mardomi and Delshad, 2010; Tabatabaei Yeganeh et al., 2022)
	Environment Complexity	(Shafae, 2009; Akrami, 2004; McCoy, 2002; Massen, 2017; Kraft, 2012)
	Visual Details	(McCoy, 2002; Christensen, 2004)
	Texture of Surfaces	(Moltafet et al., 2017; Tabaeian, 2021)
	Natural Materials	(Kolwa, 2017; Edwards and Springett, 1995; McCoy, 2002; Feizi et al., 2013)
	Aesthetical Factors	(Jago and Tanner, 1999; Taylor and Gossey, 1988)
	Variety of Playgrounds (Individual and Group)	(Kianian, Parvaneh, 2015; Taan, 2007; Olsen, 2008; Tabatabaei Yeganeh et al., 2022)
	Furniture	(Toosi, 2011; Noroozian Maleki, 2018; Azemati, 2016; Kamelnia, 2007; Lee, 2018; Ghofrani, 2014)

2.1. Effective Factors in Promoting the Creativity of Children in Designing the Landscape of Educational Spaces

Childhood is one of the most important periods of life. Human feelings and emotions are shaped during childhood and build the future of a person. Many factors affect the way through which the personality of the child is shaped among which, nature plays the most important role in this case. Children's perception

of nature is highly different from their perceptions of interior spaces. Nature creates a timeless and placeless sense for the child, while none of the educational tools can play the role of nature making a focus and concentration obtained by the child when watching the sunlight among trees or beauty of a flower. The reason is that landscapes encourage children to search, explore, and imagine (Kokabi Salehi and Pakdel Fard 2015).

The natural environment has been always a space

for play and physical activities of children. Children had more access to pristine environments over the past decades, which allowed them to experience adventure, exploration, and practice some life skills. This made them skilled in facing nature and sudden or unpredicted situations. Unfortunately, modern communities ignore the value of these environments for the growth of children and adolescents. Spaces for physical play and equipment for children are changed, and free play opportunities in exciting natural environments have been considerably reduced. This issue has led to less mobility of children, which has a negative and destructive effect on their health during the next periods of their lives (Brittin et al. 2015; Bell and Dymont 2008). Therefore, an educational environment that cannot provide an appropriate platform for physical activities would lead to a low rate of play and physical mobility of children. This shortage, in turn, leads to some health harms for children (Aminifar and Azemati 2023, 17).

When there is an opportunity for children to be in an environment, their activity and mobility will increase. Moreover, children have stronger creativity and play in outdoor environments compared to indoor spaces; however, the shape of these activities is different among various genders and groups. Children feel and perceive the environmental qualities (such as topography change, nature's colors, grasslands, ponds, forests, trees, shaded environments, places for climbing, and complicated and challenging spaces) (Fjortoft 2004). Evidence indicates that children are highly sensitive to partial color and light differences, and make a better relationship with the colors of nature although these are not primary colors (Kamel Niya 2011, 9). Also, children prefer mixed and complex forms rather than simple and ordinary forms. They are more interested in soft edges and curves in the landscape. When they are in natural places would use all senses and attention to receive and understand the information, so the environment becomes understandable for them. The mentioned factors would develop creativity and learning among children (Fjortoft 2004). Moreover, the best and most ideas are generated in nature and leisure time. Nature enhances the interaction between individuals, and interactions increase the creativity and flight of ideas (Collado, Staats, and Corraliza 2013). Environmental creativity is promoted in the relationship between children and natural environments, and these spaces activate the intuitive sense of children (Rigolon, Derr, and Chawla 2015). Hence, it can be stated plants and the natural environment landscapes have an important impact on creativity (Shibata and Suzuki 2004). However, the plants chosen for the courtyard of the educational environment must be thorn-less and non-toxic to prevent any risk to children (Koleva, Duman Yüksel, and Benaabidate 2017).

Educability and developability of green spaces, multiple functions and space versatility, meaningful

environment, and sense of place¹ are the underlying factors for the utility of open spaces in educational centers. Moreover, psychologists consider some factors such as heat, crowd and noise, light, and furniture arrangement necessary for effective and efficient education (Kamel Niya 2006) because environmental factors would enhance the perception, motivation, and interest phases (Batey 2012). According to studies, the landscape of educational open space plays a vital role in creating attraction and a sense of belonging to place in children, so the play and play creativity rate is higher in environments having trees and grasslands (Kytta 2002). For instance, Tabaeian (2021) examined the necessity of green space in the educational body for improving the quality of the environmental environment and the perception of students.

Moreover, the quality of learning and creativity can be improved in educational environments by relying on design elements, such as color, light, space openness (Bakhtiar Nasrabadi 2007), legible access routes², and environment furniture. Therefore, the diversity of activities, comfort conditions in the educational spaces, and some criteria such as a safe environment, legibility, and connectivity of the site (Uline and Tschannen-Moran 2008; Wang and Degol 2016; Thapa et al. 2013), distinctive and favorable view and landscape, creation of a strong mental image and sense of place for users can promote performance of educational open spaces regarding learning and creativity of them. A review of the studies on this topic indicates that this is an important subject at the national and international levels. According to the findings of various studies, the following strategies are recommended to improve the quality (promoting creativity and learning) of educational open spaces considering the users' needs (Norouziyan Maleki and Nazarpour 2017, 188):

- Pay attention to spaces' accessibility, human proportions, zoning spaces, and observing semi-public (group) and public hierarchies
- Presence of open and semi-open space (semi-closed and closed)
- Use of desirable natural views and landscape
- Multiple use of educational spaces under different conditions
- Flexibility of spaces (possibility to change furniture, composition, and segregation of spaces)
- Monitoring and control over the spaces
- Design in line with the moralities and needs of users
- Planting plants to increase users' participation
- Use of natural factors, such as plants, water, and green space to create more attractions
- Consider diverse group activities in nature (educational open spaces) to create more interactions

3. METHOD

This study includes three steps, and each step

comprises the following processes:

First step (analytical identification of systems):

The first step included identifying and classifying variables affecting creativity based on the literature reviews and selecting those variables that affected the creativity components identified in the topic literature.

The second step (surveying attitudes of architects and child experts):

in the second step, 15 experts and architecture professors took the open-ended test (with qualitative technique) to receive their knowledge and attitudes about landscape, architecture, and design. Moreover, the attitude of experts in educational sciences and psychology in the field of cognitive growth and child creativity was examined to optimize and promote the educational open spaces and develop the creativity of 3-6-year-old children. These attitudes were investigated based on the descriptive method and content analysis. It is worth noting that research samples were selected through the snowball method³.

The third step (surveying attitudes of preschool centers and kindergarten educators):

findings of the first and second steps were used in the third step, and a researcher-made questionnaire based on a five-point Likert scale was distributed among respondents to measure the score of the effect of each independent variable's component on each component of the dependent variable⁴. Research samples were chosen from the society of preschool and kindergarten educators who had 10 years experience of teaching in Tehran. The sampling process was done through a random cluster technique. Tehran was selected due to considerable racial and class diversity in this metropolis where preschool and kindergarten educators have sufficient knowledge and information about the characteristics of 3-6-year-old children due to their experiences and close relationships with them. This study used path analysis⁵ to examine the relationship between factors, and after the linear model of the relationship between variables was drawn, the relationship rate of variables was measured through AMOS26 software. This study then

examined the direct and indirect effects of variables corrected the proposed model and illustrated it as a prismatic model.

4. DATA ANALYSIS

This study uses a mixed qualitative-quantitative method. This method allows the researcher to use the depth of qualitative methods and the generalizability of quantitative techniques at the same time. Therefore, five factors (curiosity, motivation, mental peace, initiative, and vitality) were selected from the individual factors affecting creativity based on the reviewed literature on the topic. Architects and experts in the field of educational sciences and psychology who were skilled in the case of child creativity were interviewed through descriptive techniques and 10 questions. they were asked to explain how physical/functional factors of the educational environment's courtyard can be effective in increasing the factors mentioned above. The obtained results were studied and evaluated through the content analysis method based on the descriptive technique. The results were used and 48 questions were designed for the closed-ended questionnaire to survey children's educators.

4.1. Sample Selection

For the random selection of analysis subjects in this study, the number of educators in preschool centers (2155 members) was determined by referring to the Ministry of Education, and the number of licensed kindergarten educators (3047 members) was taken from the Welfare Organization in Tehran. Therefore, the statistical society of the study comprised 5202 educators, and Morgan Table⁶ was used to estimate the sample size, which equaled 357 educators.

The SPSS16.0 Software⁷ was used to assess the reliability⁸ of this study and 48 questions were designed for the 40 questionnaires filled out in the first step. Table 2 indicates that questions of the questionnaire that have Cronbach's alpha⁹ of 0.957 are reliable.

Table 2. The Reliability Coefficient of the Test after Deleting Improper Questions

Reliability Statistics	
Cronbach's Alpha	N
0.957	48

According to Tables 2, 3, and 4, no question was removed after measurement of Cronbach's alpha.

Table 3. Summary of Processed Questions of the Questionnaire

Case Processing Summary			
		N	%
Cases	Valid	40	100.0
	Excludeda	0	.0
	Total	40	100.0

a. Listwise deletion based on all variables in the procedure.

Table 4. The Reliability Rate of Questions in the Questionnaire distributed among Kindergarten and Preschool Educators

Cronbach's Alpha	N	Cronbach's Alpha	N	Cronbach's Alpha	N
0.956	33	0.956	17	0.957	1
0.956	34	0.956	18	0.956	2
0.957	35	0.957	19	0.956	3
0.956	36	0.956	20	0.957	4
0.956	37	0.956	21	0.957	5
0.957	38	0.956	22	0.957	6
0.956	39	0.956	23	0.956	7
0.956	40	0.956	24	0.956	8
0.956	41	0.957	25	0.957	9
0.956	42	0.957	26	0.956	10
0.956	43	0.956	27	0.957	11
0.957	44	0.956	28	0.957	12
0.957	45	0.957	29	0.957	13
0.956	46	0.957	30	0.957	14
0.956	47	0.956	31	0.957	15
0.956	48	0.957	32	0.957	16

Content Validity¹⁰ and Face Validity¹¹ were used to determine the questions' validity, and the researcher consulted with 10 educators with more than 10 years experience of working with 3-6-year-old children, and then experts confirmed the validity of the closed-ended questionnaire.

134 questionnaires were filled out, and since the minimum acceptable rate for KMO equals 0.6 in the analysis of factors, the KMO value reported in Table 5 equals 0.871 indicates that the size of the selected sample (n=134) is suitable for analysis.

4.2. Analysis of Factors

Out of 419 distributed closed-ended questionnaires,

Table 5. KMO Test and Bartlett's Test

Measurement of Sampling Adequacy		0.871
	chi-squared	3.267E3
Bartlett's Test	df	1128
	Sig.	0.0

In Bartlett's test (Table 5), the null hypothesis was rejected by consideration of df=1128 and chi-squared=3267 at a confidence level of 99%. Therefore,

questions in the child educators' questionnaire are significant and adequate in terms of correlation, so factor analysis can be used in this study.

Table 6. Total Explained Variance, Before and After Rotation

Factor	Initial Eigenvalues			Derivation of the Sum of Squared Charges			Sum of Rotation of Square Charges		
	Total	Percentage of Variance	Cumulative Percentage	Total	Percentage of Variance	Cumulative Percentage	Total	Percentage of Variance	Cumulative Percentage
1	15.563	32.423	32.423	15.563	32.423	32.423	6.946	14.472	14.472
2	3.035	6.322	38.745	3.035	6.322	38.745	3.788	7.892	22.363
3	2.072	4.317	43.062	2.072	4.317	43.062	3.686	7.678	30.042
4	1.657	3.452	46.515	1.657	3.452	46.515	2.644	5.508	35.550
5	1.540	3.208	49.723	1.540	3.208	49.723	2.384	4.967	40.517
6	1.470	3.062	52.785	1.470	3.062	52.785	2.368	4.933	45.450

Factor	Initial Eigenvalues			Derivation of the Sum of Squared Charges			Sum of Rotation of Square Charges		
	Total	Percentage of Variance	Cumulative Percentage	Total	Percentage of Variance	Cumulative Percentage	Total	Percentage of Variance	Cumulative Percentage
7	1.392	2.899	55.684	1.392	2.899	55.684	2.365	4.928	50.378
8	1.303	2.715	58.399	1.303	2.715	58.399	1.939	4.040	54.418
9	1.218	2.538	60.938	1.218	2.538	60.938	1.860	3.875	58.298
10	1.197	2.495	63.432	1.197	2.495	63.432	1.800	3.750	62.042
11	1.051	2.189	65.621	1.051	2.189	65.621	1.718	3.579	65.621

The EFA has been used in this study by employing the main factors, which load factor (eigenvalue of factors) is used to determine factors. After Table 6 was examined, 11 factors are extractable and explorable because of their load factors that are greater than 1. However, the explained variance of each factor indicates that the rest of the extracted factors explain less than 4.9% of the variance; therefore, the first seven factors were chosen as the main factors. Because the sixth factor only had two variables with a reliability coefficient less than 0.7 (0.561) after

distributing variables in factors in the next step, two questions related to factor 6 were deleted and EFA reached six main factors.

Questions related to the mentioned factors were outlined, and these factors were interpreted based on the common content of questions related to each factor. It means that the semantic corresponding (synonym) of each factor was highlighted by psychology and architecture variables. The main factors have been named in Table 7, and classified based on the system.

Table 7. Reliability of Factors and Questions of the Questionnaire associated with each Factor

Factor	System	Relevant Questions	Reliability Coefficient
Environment Invitation to Participation and Experience	Human (Individual)	2, 12, 20, 22, 23, 26, 27, 31, 37, 40, 42, 43, 46, 47, 48	0.915
Psychological Wellbeing	Human (Individual)	8, 10, 17, 21, 29, 33, 36, 41	0.829
Stimulating Natural Elements of the Environment	Physical	3, 5, 9, 14, 15, 16	0.79
Function Versatility	Functional	1, 4, 6, 7, 13, 35, 45	0.742
Environment Vitality	Physical	18, 19, 28, 44	0.738
Environmental Motivation	Functional	11, 25, 30, 34, 38, 39	0.778

In this study, therefore, two factors of psychological well-being and environment invitation to participation and experience are considered as human (individual) factors, two factors of stimulating natural elements of environment and environment vitality are considered as two physical factors and two function versatility and environmental motivation factors were identified as functional factors. The mentioned factors were identified as effective variables in the study (Table 7). These factors are described as follows:

Environment invitation to participation and experience (participation and experience): This study showed that the behavioral performance of children can be improved by making children participate in the arrangement of furniture and elements of open space such as walls or light blocks that can be moved by children. For example, some places in the courtyard of the educational environment can be assigned for exhibiting children's works to

invite children to participate and experience.

Psychological well-being: circular and curved forms and various gardens with different plant species for children to plant, harvest, and irrigate, and a variety of colors in furniture, bodies, and or colorful tapes and lights on the floor lead to the psychological well-being of the child.

Stimulating natural elements of the environment (stimulating natural environment): This study showed that fruiting plants and colorful plants during different seasons or tall and evergreen trees play an effective role in developing the creativity and liveliness of a child. Also, the use of natural elements such as furniture in an open space (a large stone or tree trunk as a sitting place) and a water passage (shallow stream) can promote motivation and creativity in children.

Environment vitality (livable environment): use of water (dynamically and statically), bright,

luminous, low-light, and shading spaces would make an environment livable. Also, tree swing in the educational open space makes the environment livable for the child.

Function versatility (behavioral performance): flexible furniture, multifunctional spaces (e.g., gazebo and tree house), and foldable and portable walls in the open space lead to versatility and developed creativity of the child. Moreover, some panels that are suitable for a child's height can be used to paint murals or create 3D puzzles, and the color and materials of the floor can be changed to separate open spaces with different uses, which results in better behavioral performance of the child.

Environmental motivation (motivational

environment): design different yards (for sciences, mathematics, sports, etc.) and a yard for animals (aquatics, birds, and pets), and using a wall for free painting or completing projects can increase motivation in the environment and develop the creativity of children.

After the linear model of the relationship between variables was illustrated in this study, AMOS26 Software was used the rate of relationship between variables was measured, and the proposed model was revised by examining the direct and indirect effects of the variables. The mentioned model was illustrated as a prismatic model and then was analyzed. The model was compared with the fit indicators to ensure the model's accuracy.

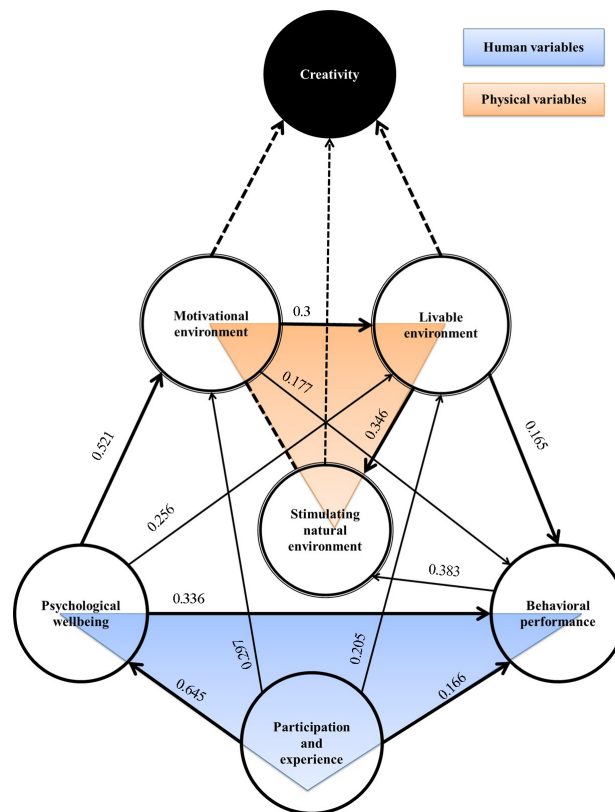


Fig. 1. Prismatic Model of the Relationship between Variables

As shown in the prismatic model (Fig. 1), three human variables (participation and experience, psychological wellbeing, and behavioral performance) and three physical variables (stimulating natural environment, livable environment, and motivational environment) would grow and develop the creativity of children in the educational open space.

Regarding the validation of research findings and since it is important to use the opinions and ideas of children to create a desirable environment for them, a statistical society of 3-6 years old children was randomly selected from 24 districts of Tehran, and 60 children (including 35 girls and 25 boys) were chosen as sample size. Considering this point that children show some meanings in their paintings that are

different from adults' perception of painting, it was necessary to ask children to explain their paintings. It was also essential to do a semi-structured interview with children to examine and observe the child's behavior throughout the conversation as a questioner. Children's drawings and paintings were examined. They showed features of a desirable educational open space through the following options: play devices and sports fields for individual and collective activities, presence of sun, clouds, and sky, variety of plants, animals, dynamic and static presence of water, diverse routes and spaces (open, semi-open, semi-closed, closed spaces), presence of human (family and friends), and various height codes and staircase.



Fig. 2. Children's Painting and Semi-Structured Interviews with them Implied Confirmation of Research Findings and the Effect of Physical and Functional Factors of Architecture considered in this Study on the Children's Creativity Growth.

Previous findings of research were confirmed in the semi-structured interviews with children. The factors mentioned in the paintings and interviews by children indeed overlapped with factors extracted in Table 7. Participation and experience, function versatility, stimulating, livable, and motivational natural environment were the factors observed in the post-test of children's opinions.

5. DISCUSSION AND CONCLUSION

The physical and functional features of educational open space provide a highly suitable opportunity for the development of a child's creativity. Using a qualitative-quantitative method, this study found a factor model that can explain the design features of educational open spaces that can affect creativity. These factors included "environment invitation to participate and experience, psychological wellbeing, stimulating natural elements of the environment, function versatility, the vitality of environment, and environmental motivation."

This study indicated that the behavioral function of children can be improved by involving them in the arrangement of furniture and elements of open spaces, such as light walls or blocks that are movable by children. For example. Some places can be allocated for the exhibition of children's paintings and works in the yards of the educational environment inviting them to participate and experience. Moreover, circular and curved forms, a variety of plants with diverse plant species for plantation, harvesting, and irrigation by the child, and also the presence of various colors in the furniture, walls, and or colorful tapes or lights in the floor can lead to the psychological wellbeing of the child. The fruiting plants or plants with colorful

leaves in different seasons or tall and evergreen trees are effective in developing the creativity and vitality of a child. Moreover, the use of natural elements as furniture of open spaces (large rock or tree trunks as sitting places) and water passages (shallow streams) would promote motivation and creativity in children. The use of water (dynamically or statically), and the presence of bright, luminous, dim, and shading spaces would lead to environmental vitality. Also, tree swing used in educational open spaces makes the environment livable for the child. The presence of flexible furniture, multifunctional spaces (e.g., gazebo and tree house), and folding walls in the open space bring versatility and child creativity. Moreover, some panels that are suitable for a child's height can be used in the yard of educational space allowing them to draw murals and create 3D puzzles or change the color and materials of the floor to separate open spaces with diverse uses, which results in better behavioral performance of child. Design various courtyards (for sciences, mathematics, sports, etc.) and a yard for animals (aquatics, birds, and pets) also assigning a wall for completing projects or free painting can increase the motivation of the environment and develop the creativity of the child. Further discussion of the factors mentioned above based on the questions constituting these factors can lead to a list of principles for designing an open environment for children, which can be a topic for future studies. It is recommended to conduct another study and examine the effect of the relationships and connections between closed and open educational spaces on creativity. Moreover, gender can be added as a control variable in future studies.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

MORAL APPROVAL

The authors commit to observe all the ethical principles of the publication of the scientific work based on the ethical principles of COPE. In case of any violation of the ethical principles, even after the publication of the article, they give the journal the right to delete the article and follow up on the matter.

PARTICIPATION PERCENTAGE

The authors state that they have directly participated in the stages of conducting research and writing the article.

ENDNOTE

1. Sense of place means people's subjective perception of the environment and more or less conscious feelings in the micro-environment making an inner relationship between person and environment so that the person's understanding and feeling is linked and integrated with the semantic context of the environment. this feeling is a factor that converts the space to a place with specific sensory and behavioral features.
2. Legibility is a quality that creates a certain mental image of space in the mind of the audience facilitating the perception of space and routing.
3. The snowball sampling method is used when researchers do not have access to individuals who provide considered specifications. Cases or individuals are identified step by step based on the judgment and introduction of previous cases. Step-by-step identification continues until no new case is identified or the case does not provide any new or considerable information (Qoljaji, Naderifar, and Goli 2016).
4. The causal-comparative study aims to reach the cause (independent variable) based on the effect (dependent variable), so this is a retrospective study. This research plan is used when an independent variable cannot be manipulated due to its features, and the researcher tends to find the cause by studying the effect (Naderifar 2015).
5. Path analysis is used to identify topics, determine factors, assume the initial layout, and test the significant relationships based on the effective paths of relations. This technique is based on the regression analysis that has a structural aspect with several dependent and independent variables. The researcher examines interactions between several variables simultaneously through direct and indirect effects by using statistical mechanisms in the path analysis (Hamidzadeh 2020).
6. Morgan Table is one of the most used tools for measuring the size of a statistical sample. This table can be used for estimating sample size when society variance or error percentage is not available.
7. Statistical Package in Social Science
8. Researcher-made questionnaire is reliable if its questions provide validity and reliability so that it is clear whether the questionnaire has measured the considered quantity or not and whether the questionnaire achieves the same results under the same conditions.
9. Cronbach's Alpha Results: this method is used to measure the internal consistency of measurement tools, including questionnaires or tests that measure various features. In these instruments, the answer given to each question can take different values.
10. Content Validity is a kind of validity that is usually used for examining components of a measurement instrument. The content validity of a measurement instrument depends on its constituent questions. If the questions represent some specific features and skills that the researcher tends to measure, the test has content validity. The constituent questions must represent various parts of selected content when formulating the instrument (such as designing a questionnaire) to ensure content validity.
11. Face Validity is a kind of validity in which, experts and scholars of statistical society are asked to determine whether questions are appropriate for the research objective.

REFERENCES

- Amabeli, Terza. 1995. *The flourishing of children's creativity*. Translated by Dr. Hassan Qaimzadeh. Tehran: New World Publishing. [in Persian]
- Aminifar, Zinat, and Hamidreza Azemati. 2023. The Role of Physical Features of the Schoolyard in Increasing Children's Physical Activity, Viewpoints of 8–12-year-old Students in Tehran City, Iran. *Armanshahr Architecture & Urban Development* 1541: 17-27. <https://doi.org/10.22034/aaud.2023.286409.2477>. [in Persian]
- Aram Fard, Mansoureh. 2003. Ways to foster creativity in children. *Success* 4(42): 24-25. [in Persian]
- Bakhtiar Nasrabadi, Hasanali. 2007. Investigating the Physical Space Condition of Isfahan Schools With Respect to Standards of Schoolsâ Renovating, Developing and Equipping Organization. *Teaching and Learning Research* 4(2): 33-42. https://journals.shahed.ac.ir/article_2121.html. [in Persian]
- Batey, Mark. 2012. The measurement of creativity: From definitional consensus to the introduction of a new heuristic framework. *Creativity Research Journal* 24(1): 55-65. <https://doi.org/10.1080/10400419.2012.649181>
- Bell, Anne, and Janet Dymont. 2008. Grounds for health: the intersection of green school grounds & health-promoting schools. *Environmental Education Research* 14(1): 77-90. <https://doi.org/10.1080/13504620701843426>
- Brittin, jeri, Dina Sorensen, Matthew Trowbridge, K. Lee Karen, Dieter Breithecker, Leah Friends, and Terry Huang. 2015. Physical activity design guidelines for school architecture. *Plos one* 10(7). <https://doi.org/10.1371/journal.pone.0132597>
- Collado, Silvia, Henk Staats, and Joze A. Corraliza. 2013. Experiencing nature in childrens summer camps: Affective, cognitive & behavioural consequences. *Journal of Environmental psychology* 33: 37-44. <https://doi.org/10.1016/j.jenvp.2012.08.002>
- Fjortoft, Ingunn. 2004. Landscape as playscape: The effects of natural environments on childrens play & motor development. *Children youth & Environments* 14(2): 21-44. <https://doi.org/10.1353/cye.2004.0054>
- Hamidzadeh, Mohammad Reza. 2020. Path analysis. *Encyclopedia of Economics* 3(1): 1-3. https://encecco.ihe.ac.ir/article_4913.html?lang=fa. [in Persian]
- Hassanzadeh, Akram. 2015. What and why causal research method - a comparison in behavioral science research, *6th National Conference on Management, Economics and Accounting*. <https://civilica.com/doc/599965/>. [in Persian]
- Hosseini, Afzal Alsatat. 2008. *The nature of creativity and its cultivation methods: Ašan Quds Razavi*. Publications: behnashr. [in Persian]
- Kamel Niya, Hamed. 2006. *Instructional language for designing learning environments*. Sobahan Noor Publishing House, Tehran. [in Persian]
- Kamel Niya, Hamed. 2011. A new perspective on the design of learning environments. *Architecture and Culture Journal* (41): 13-6. <https://www.magiran.com/volume/58824>. [in Persian]
- Karimi Azari, Amir Reza. 2014. Effective design principles on promoting children's creativity in residential space, PhD thesis, IUST. https://www.iust.ac.ir/files/arch/Doc/chekide_doctora/amir_reza_karimiazar.pdf. [in Persian]
- Khakzand, Mehdi, and Saeed Babaei. 2016. A framework for designing the open spaces in the children's educational centers based on the (Seven Cs) with emphasis on Prove the learning. *Technology of Education Journal (TEJ)* 10(4): 305-318. <https://doi.org/10.22061/tej.2016.552>. [in Persian]
- Kokabi Salehi, Seyedah Mani, and Mohammad Reza Pakdel Fard. 2015. The role of the presence of nature in architectural spaces on the growth of creativity of elementary school children, *the first conference of arts and crafts in civil construction, architecture and urban planning, Tabriz*. <https://civilica.com/doc/607182/>. [in Persian]
- Koleva, Irina, Ülkü Duman Yüksel, and Lahcen Benaabidate. 2017. ECOLOGY, PLANNING and DESIGN. Fez, Morocco. <https://www.researchgate.net/publication/319649880>
- Kytta, Marketta. 2002. Affordance of children's environments in the context of cities, small towns, suburbs and rural village in Finland and Belarus. *Journal of environmental psychology* 22(1-2): 109-123. <https://doi.org/10.1006/jevp.2001.0249>
- Norouziyan Maleki, Saeed, and Mohammad Taqi Nazarpour. 2017. Identifying the architectural components effective in improving students with emphasis on open spaces in schools based on the document of fundamental transformation of education. *studies of education and learning* 10(2): 165-193. <https://doi.org/10.22099/JSLI.2019.29978.2585>. [in Persian]
- Priyanto, Dwi, and Abu Dharin . 2021. Students' creativity development model and its implementation in Indonesian Islamic Elementary Schools. *Pegem Journal of Education and Instruction* 11(3): 81-87. <https://www.pegegog.net/index.php/pegegog/article/view/1318>
- Qoljaei, Fereshteh, Mahin Naderifar, and Hamida Goli. 2016. Snowball, a purposeful method in qualitative research sampling. *Journal of Development Steps in Medical Education* 14(3): 171-179. <https://www.magiran.com/p1771426>. [in Persian]

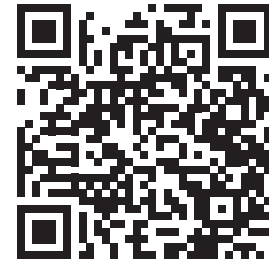
- Rigolon, Alessandro, Victoria Derr, and Louise Chawla. 2015. 15 Green grounds for play and learning: an intergenerational model for joint design and use of school and park systems. *Handbook on Green Infrastructure: Planning, Design and Implementation* 281. <https://doi.org/10.4337/9781783474004.00023>
- Shafaei, Minoo. 2008. The principles of designing educational spaces for 3-6 year old children with the approach of promoting their creativity in Iran. Doctoral Thesis of Architecture, Faculty of Architecture and Urban Planning, IUST. https://www.iust.ac.ir/files/arch/Doc/chekide_doctora/mino_shafai.pdf. [in Persian]
- Shibata, Seiji. Suzuki Naoto. 2004. " Effects of an In door Plant On Creative task Performance and Mood". *Scand g Psychol* 45(5). <https://doi.org/10.1111/j.1467-9450.2004.00419.x>
- Siavashpour, Bahram, Mojtaba ShadlooJahromi, and Hasan Nodehi. 2016. The role of green space children's educational environment to strengthen the sense of place attachment (Case study: elementary schools in region 2 of Shiraz). *Environmental Sciences* 14(4): 105-120. https://envs.sbu.ac.ir/article_97764.html?lang=en. [in Persian]
- Tabaeian, Seyede Marziyeh. 2021. The Optimum Design of Open and Green Spaces in Educational Complex to Improve Students Perception and Quality of Educational Environment Case Study: Girls High Schools in Isfahan. *Journal of Iranian Architecture & Urbanism(JIAU)* 12(1): 127-139. <https://doi.org/10.30475/isau.2020.214757.1339>. [in Persian]
- Tabatabaei Yaganeh, Reyhaneh Sadat. 2022. The Design Principles of Open Learning Spaces to Improve Creativity of Preschooler Girls & Boys, doctoral thesis in architecture, Faculty of Architecture and Urban Planning, Isfahan University of Arts. <http://library.aui.ac.ir/dL/search/default.aspx?Term=6958&Field=0&DTC=108>. [in Persian]
- Tabatabaei Yeganeh, Reyhaneh Sadat, Farhang Mozaffar, Minoo Shafaei, Bahram Saleh Sedghpour. 2022. The effect of children's gender on the outdoor design of kindergartens and preschools based on Islamic thought. *JRIA* 10(2): 104-123. <https://doi.org/10.52547/jria.10.2.3>. <http://jria.iust.ac.ir/article-1-1548-en.html>. [in Persian]
- Thapa, Amrit, Jonathan Cohen, Shawn Guffey, and Anne Higgins-D'Alessandro. 2013. A review of school climate research. *Review of educational research* 83(3): 357-385. <https://doi.org/10.3102/0034654313483907>
- Uline, Cynthia, and Megan Tschannen-Moran . 2008. The walls speak: The interplay of quality facilities, school climate, and student achievement. *Journal of Educational Administration* 46(1): 55-73. <https://doi.org/10.1108/09578230810849817>
- Wang, Ming-Te, and Jessica L. Degol. 2016. School climate: A review of construct, measurement, and impact on student outcomes. *Educational Psychology Review* 28(2): 315-352. <https://doi.org/10.1007/s10648-015-9319-1>

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