

Investigating Effective Factors on Designing of Educational Spaces with an Approach to Increase Learning Rate and to Improve Creativity among Children

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1. Introduction

Fostering of the human abilities is often started in childhood. Fostering of the imagination power and creativity is also started in childhood. From the Freud point of view, the source of our creativities dates back to our childhood. (Shariatmadari, 1965). So, we have to pay attention to fostering creativity early on childhood. From among the many factors that are effective on a child's creativity. Recently, researchers have mainly investigated teaching approaches, emotional- cognitive aspects of children as well as educational issues. But the effect of the quality of architectural structure on children creativity has rarely investigated. Designing special spaces for children takes on special significance since a child's imagination is practically manifested between 4 to 7 year old. (Riyahi, 1991). Children will be mainly affected by environment during these years. But mentioned spaces in Iran are not suitable for children. There are many kindergartens in apartments and residential houses which apparently seem to be a childish environment with a coat of paint and coloring. Learning is interesting and funny for children in these ages. A child will show interest in learning anything that helps to do his activities and to fulfill his desires.

Many parents and teachers are highly interested in learning curricula subjects, but they fail to consider learning approaches (in what circumstances, by whom and in which method learning will have more effect on children). Learning achievement, not only depends on child himself but also on the manner of adult's behavior, society expectations, parent and teacher's skill to guiding children as well as environmental requirements. The result of the learning is an effect that will be manifested by future behavior of children and their attitude toward different issues.

(Parsa, 1991). Much educational training may be taught to children during playtime and we can easily head them in the right direction of life. We can understand child emotional condition, thoughts, and feelings at playtime. So, it is highly necessary for kindergarten instructors to consider the significance of play in a child's life and to provide suitable conditions for them to play (Mayesky, 2005).

People of any social class including men, women, the poor and the rich are allowed to have their own aesthetic system to be chosen in designing options. But children are only tiny and weak members of society who have very little effect on their surrounding environment's shape.

Children have their own imaginary world. Many children under the age of 7 visualize the world as it should be, not as it is. This is the reason why the environment that architecture designs without enough cognition differs from the space which children need it. We should bear in mind our tiny audience (children) and try to create a childish space to choose a consistent performance with regard to designing and audiences. And create a place where children play freely and observe objects and touch them. It is the space that helps children to get a better understanding of life and to learn from their environment. These centers will have both educational and recreational aspect which increases learning rate and improves creativity. To design such a complex, we should recognize children's psychological abilities and their needs. We should also be familiar with the manner of child's growth. Space which is constructed for teaching children should be built in such a way to meet following needs:

- Children know their environment better
- To learn life skills at playtime
- To be familiar with language and traditions of other cultural identity and spiritual values

By considering the fact that children and juvenile's nature are sensitive as well as their personality characteristics and the significant place they may have in the society, we are determined that spaces which are designed for children should necessarily increase learning rate and improve child's creativity. In this way, we can foster valuable talents of children and to foster and nurture their creativities and potential abilities. We should put these talents within such a social environment to foster them. It is the kind of environment that is replete with colors and symbols favored by children and juveniles, and it has the potential to increase their imagination power and will greatly affect their educational performance.

The objective of carrying this research out is to design architectural spaces for education. These spaces will discover the talent of the children while doing daily affairs like play and recreation. The shape of the construction and architectural components and space designed for them are part of the educational curriculum. The shape of the construction not only is drawn in a childish and intimate shape but it is also replete with questions which stimulate children's creative minds to find the answer. In addition to optimal use from child's leisure time, It also systematizes children's activities.

1. 1. Child

For recognizing a child, it does not suffice only to describe his internal and external behaviors as well as his feelings and thoughts, but we have to know why and how these feelings, thoughts, and interests are produced within a child. Since they know the world only by their limited experiences, when they don't have any experience about a phenomenon, they will make their own reasons to justify it. Nowadays, houses lack the facilities required for fulfilling the needs of children especially those in kindergarten. It is necessary to provide appropriate local and neighboring spaces for children who are living in small houses which are in short of enough proper space for children to play and activate, it is even necessary for those who are living in houses with more suitable facilities but they haven't opportunity to make a relationship with their peers. Children are valuable enough as consumers and citizens and we should respect their needs. We should also value children needs as much as adults when a public area is going to be designed (Parsa, 1991). Barker, as an Ecologist Psychologist believes: there is a special relation between architectural-physical aspects and behavioral aspects (physical- behavioral centers). Consequently, benches of the classroom and their arrangements have an effect on children learning (Ghaffari, 2007).

Accepting children's imaginations

Piaget considers mental revolution depending upon certain egocentrism of each period and reaching to divergence period, but in a clear stance emphasize that creativity requires keeping childish traits of a human being. Some other scholars like Torrance and Amanil also believe that the role of imaginations in people's life is undeniable.

1. 1. 1. Play and social development

Among the different plays, those games which are the result of the kid's efforts and we call as innovation plays or role-playing games are of great importance. In these games, young children imitate what they see in the activities of the adults.

Innovative plays shape the children's personality and are considered as an important medium in their education. These games are a reflection of social activities and life. There seems to be imaginary and unreal. But in this conditional environment that is the result of the child's imaginations, there are many realities. The behaviors and movements of the players are not real but their effects and emotions are true and real.

1. 1. 2. Feeling safe

The most important space felt by any child is home. Home is a space in which major perceptions of all children is naturally received. It is a sensational and in times terrifying event for a child to be separated from home and household and join social environments of different conditions. It is necessary for the child to be able to correctly discern his situation within the context and space in every moment in order to be able to easily be adapted to new environment. A maladaptive child has to easily observe the functions of the environment he enters into, otherwise, he feels unsafe. All sections of the construction should explicitly be clear including space, passages, and ways.

1. 1. 3. Colorful Environment

Colors have a great effect on the personality of a human being especially on children. They lead to emotional experiences like laughter, grief, sorrow, peace, irritability, tranquility, and excitement. This attribute is strengthened in children. They prefer vivid colors and secondary colors in a suitable combination because they have a purified soul and they are happy and joyful. This matter should be considered in designing, decoration and coloring of the internal and external spaces of the constructions. With can show an object smaller or larger than its real size by applying certain colors to it as well as heavier and lighter than its real weight. (Azmoudeh, 2012).

1. 1. 4. Creativity

The environment and space in which we are living affects our spirit and thought. Creativity is a potential ability within the human being. This ability is flourished in the proper and cherishing environment.

Creativity and its definition

Creativity is a subjective and complicated meaning, and no precise definition is defined for it until now. But creativity is not complicated in itself. We initiate creativity in our personal life. Some define creativity as describing the innovative process, some as producing a new product, and some other as describing creative

people attributes. Following definitions clarify psychologist perspectives on creativity.

Oxford Dictionary defines creativity as to create, to invent

Francis Garden defines creativity as the ability to create what we think exist. (Duffy, 2006)

Other definitions:

Glifford defines creativity as a series of abilities and attributes which lead to creativethinking.

Ghiselin defines creativity as presenting a new quality from concepts and notions

Creativity is the ability to solve problems which mind has not already learned to solve it. So, the same response may be creative for one person and non-creative for another one. (Hosseini, 1999).

Categorization of various definitions:

- producing an artwork

- An ability which grows in ideal situations

- an inborn talent special to some people (old definition):it was for this reason that people like creative artists and architectures are thought to be appointed by Gods. They considered these talents to be within some special persons and they tried to regard them as more important persons. (Antoniades, 2004).

From among the many factors that are effective on a child's creativity. Recently, researchers have mainly investigated teaching approaches, emotional- cognitive aspects of children as well as educational issues. But the effect of the quality of architectural structure on children creativity has rarely investigated. Researchers show that capabilities and creativities of the children are founded in childhood and the best time to foster creativityand imagination are between 2 to 10 years old. (Krippner, 1999). The child is affected by environment during these years and is naturally curious about his environment. (Azemati, 2008).

Researchers indicate that creativity of a child depends on his imagination power and imagination is the most significant factor in developing creativity. (krippner, 1999). Researchs on the relationship between play and stimulation of the creativity in kindergarten children showthatthere are direct correlation between stimulation of the creativity and duration of their play, because stimulation before primary school

is considered to be the first way toward learning, progressing, carrying out activities, and presenting (Trevlas et al, 2003). The play has several functions. In addition to improving child skills, play helps him to improve his imagination power (Alexander et al. , 1977). The play also makes it possible to participate in group activities. By studying the effect of group work on the development of creativity process, researchers have come to this conclusion that due to reciprocal effect of the ideas on each other, the creativity of people is flourished during their of interaction (Mamykina, 2002). Other researchs show that curiosity of a person has an effect on his creativity and creative people are usually curious. (Tamdogon, 2006), so this question may be raised that which factors when designing a kindergarten space will lead to improving imagination capability, and increase curiosity and play time of a child?

Several types of research on environment effects on developing creativity show that some environmental criteria independently affect the creativity development process. These criteria are as following:

1. 2. Natural factors of the environments

Creating landscapes of the natural environment have an effect on developing creativity. (McCoy et al. , 2002). Plants within the internal space of building affect the habits and creativity process. (Shibata & Suzuki, 2004)

1. 3. Shape and magnitude of the spaces

Shape and magnitude of the spaces may lead to assembling people, and create some groups for interactions and social relationships (Hornecker, 2005). Scale and type of the relationship between groups have a positive effect on the creativity process. so, designing a space in terms of shape, scale, and performance that increases the relationship between people will also improve the quality of the interactions and as a result, have a positive effect on creativity development.

1. 4. Decorations

Using works of children and prominent artist's work for decorating spaces also are effective on developing a child's creativity. (Edwards & Springat, 1995). After mentioning the history, these factors will be investigated and analyzed in the present research as a research model. Environmental factors such as space colors, fairs, museum, workshop, library, and green areas from the architectural systems as well as factors such as security and peace, curiosity, imagination and group plays and so on from creativity point of view have been investigating the questions of the questionnaire.

1. 5. Educational spaces

Designing a nursery school based on the children conditions definitely depends on proper recognition of their development. Physical and mental attributes within different development stages are the basis for space planning and designing. Having general perspective from the children body sizes in different ages is necessary to make a decision about the number of children who can rest in a certain space and we have to consider dimensions of the desks, chairs and proper heights of the doorknobs, toy cupboard, toilets, and taps. If space and its components are in proportion with the body size of children, they can easily use space and relative tools. Recognizing children, characteristics of the mental, emotional and social development is useful for to find kind of children's activities and plays.

2. Research Method

In this research, we have applied descriptive-analytical approach. This approach consists of description stage, explanation stage, and discovering relations among variables. After choosing the sample of case study and accumulating the data by questionnaire, we obtained the analysis method of the effective variables factors by using SPSS software. Then, according to these variables a Hypothetical Model was proposed. Then principles of designing were extracted by using path analysis method and attitude measurement from psychological and architectural experts.

1. Designing architectural spaces are effective on growth and nurture of children talents.
2. Presenting the principles for appropriate designing leads to more physical and mental safety for children.

3. Findings

Table 1: Samples studied in Iran

	Color	Shape and form	material	Light	Height
Matin 3 stars nursery Location: Isfahan, Iran Construction year: 2008	Space colors: pink for the kids under 3	ceiling over the yard space-making a kind of invitation sense at entrance	Furniture is wooden as well as frame of the windows which leads to more intimacy and friendship	Installing window inappropriate height	Appropriate height with its usage
Nursery of the Isfahan University Location: Isfahan-Iran	Using bright and sensational colors like red	Rectangular cube, inserted parapets for separating internal and external space	Using Parquet cover on the floor of the playing hall and rooms for kids under 2-4 which is a symbol of nature	Creating shades by use of trees planted in yard, and vertical blind	Using Carton Plast by 1 meter in order to protect children against injury
AlaviKindergarten and Nursery Location: Tehran, Iran	Using joyful colors like yellow, and coloring walls to create a happy space	Indirect supercision of the staffs on space and pedestrians in all floors. Creating more security by filling the gaps between fences	Using wood in making the shelves and chairs to be lighter	Inserting duct and window within classes and creating real lightening	Normal height based on educational spaces.

Table 2: Samples studied inworld

Architect :	Color	Shape and form	Material	Light	height
kekecJURE KOTNIK location: lejo- nam, Slovenia construction year: 2009- 2010	Utilizing happy colors in all aspects attracts the children and marks the nursery	The main concert of the design has origi- nated from playing tools and instruments and is asymmetrical, wooden fences are provided for children to play and learn	Utilizing Moving wooden fence is the indicator of the space im- portant and leads to more variety and attractiveness of the perspective	Light penetrates to the building from three directions as well as ceiling	Appropriate height with usage
Architects: workshop of Barbapaccod Location: Vigtola, Italy 2008-2009	Space color is mainly white to be airy	Volume decreases the visual effects of the objects volumes to increase effect of the environment	Utilizing wooden parquet in floor	Creating wide entrance doors to have enough light into the space	Appropriate height with regard to construction usage
Architect: el caracoIDemos arguitectos location: Columbia 2010	Glassy surfaces which create beautiful optical effects within the construction by a series of colorful plates, the colors are compatible with green areas	The shape of this buil- ding is indicative of an easy, quick relationship between child and society, and it evokes home which is very important	The outer covers have thermal and vocal insulation and some plates with tiny holes allow the natural light and air to pass	By the opening of the corridors, the light enters into space from all directions; it is able to prevent unpleasant light too. The light enters into house from four directions and empty space among objects leads to more light entrance	Heights of the entrances are in proportion with children's - Although building is very high, they have made the space compatible with children's size by lowering lamps

3. 1. Hypotheses test

3. 1. 1. First hypothesis

Designing architectural spaces has an effect on the children growth and flourishing

Investigating the linear relationship of the (F test) model

Using variance analysis is in order to test the linear relationship between two dependent and independent variables. According to this test, importance of the whole regression is implemented by the following hypotheses

H_0 hypothesis: designing architectural spaces has an effect on the children growth and flourishing

H_1 hypothesis: Designing architectural spaces has an effect on the children growth and flourishing

Table 3: Variance analysis

The significance level	F	Average of squares	Degrees of freedom	The sum of squares	Model	
0. 000	2. 381	0. 648	1	0. 648	Regression	1
	468. 110	275	1. 702		remained	
	468. 758	276			sum	

As respects to this fact that the significant level is less than 0. 05 in the F test, the hypothesis₀ is rejected. It means regression model is a good model and shows that designing architectural spaces has an effect on the children growth and flourishing

Computing line coefficients of regression model:

In the following Table regression, line coefficients and their standard deviation are recorded. These coefficients demonstrate increased value of dependent variable per one unit increase of the intended independent variable. It should be noted that in this condition, the impact of other independent variables is assumed fixed over the intended independent variable and dependent variable.

H_0 hypothesis: $\beta_1=0$

H_1 hypothesis: $\beta_1 \neq 0$

If the dependent and independent variable interpreted as follow:

Children growth and flourishing= Y
 Designing architectural spaces=X

Table 4: Regrisson coefficient

Significant level	t	Standardized coefficients	non-Standardized coefficients		Model
		Beta coefficient value	B The standard error coefficient	B Coef-ficient	
0.000	17.070		0.262	4.479	fixed
0.000	0.617	0.637	0.055	0.634	Designing architectural spaces

According to this fact that the gained significant level is less than 0.05% for the variable coefficient of designing architectural spaces, the $H_0: \beta_1 = 0$ is rejected, therefore independent variable (designing architectural spaces) remains in the model and explains well the changes of dependent variable. Consequently mod X of regression line is in this way

$$y = 4.479 + 0.634x$$

According to the above tests, it can be concluded that the gained regression model is valid since all of its hypotheses is correct. The relationship between a variable of designing architectural spaces and children growth and flourishing is significant too. On the other hand, according to the gained deal regression, it can be concluded that children growth and flourishing value increased to 0.634% value per increasing one unit in the X value (designing architectural spaces)

Table 5: Pearson Test in order to explain the relationship between designing architectural spaces and children growth and flourishing

Dependent variable \ Independent variable	Designing architectural spaces	
	Children growth and flourishing	Significant level
The correlation coefficient		0.637
Number		277

The result of the Pearson correlation coefficient shows that there is a correlation between two variables of designing architectural spaces and children growth and

flourishing with the value of 0. 637%. This correlation with the 0. 000 values and degree of confidence of 95% is significant. Therefore, there is a relationship between two investigated variables with the high confidence of 95% and their relationship is straight, positive and in the high level.

3. 1. 2. Second hypothesis

Offering proper designing principles, brings up more physical and psychological security for the children.

Investigating the linear relationship of (F test) model

Using variance analysis is in order to test the linear relationship between two dependent and independent variables. According to this test, importance of the whole regression is implemented by the following hypotheses

H_0 : offering proper designing principles brings up more physical and psychological security for the children.

H_1 : offering proper designing principles brings up more physical and psychological security for the children.

Table 6: Variance analysis

The signi- fance level	F	Average of squares	Degrees of freedom	The sum of squares	Model	
0. 048	3. 643	15. 390	1	15. 390	Regression	1
		4. 236	275	1164. 797	remained	
			276	1180. 188	sum	

As respects to this fact that the significant level is less than 0. 05 in the F test, the hypothesis₀ is rejected. It means regression model is a good model and shows that offering proper designing principles brings up more physical and psychological security for the children.

Calculation of line coefficients of the regression model

In the following Table, the regression line coefficients and standard deviation are indicated. The coefficient presents the increased value of the dependent variable for 1 unit increase in the given independent variable. It should be noted that the other independent variables have the same impact on the given independent variable and dependent variable.

H_0 hypothesis: $\beta_1 = 0$

H_1 hypothesis: $\beta_1 \neq 0$

The independent and dependent variable are defined as follow:

Y: the mental and physical security

X: the proper design principles

Table 7: Regression coefficients

Level of significance	T-statistic	The standardized coefficients	Non-standardized coefficients		Model
		beta coefficient value	standard error coefficient of Std. B	B coefficient	
0.000	13.576	0.414	0.851	11.550	-fixed -the proper design principles
0.001	1.906		0.078	0.449	

According to the obtained level of significance for variable coefficient of the proper design principles lower than 0.05, the null hypothesis, $H_0: \beta_1 = 0$ is rejected. Therefore, the independent variable is maintained in the model and it can express the dependent variable changes and variations (mental and physical security) properly. Consequently, the regression line model is as follow:

$$y = 11.55 + 0.449 X$$

According to the above tests, it can be concluded that the obtained regression model is valid because all the hypotheses are approved. The relationship between the two variables, proper design principles and mental and physical security in children, is significant. According to the obtained regression equation, it can be also stated that if x value is increased 1 unit, the children's mental and physical security will be increased with a value of 0.449.

Table 8: Pearson test to indicate the relationship between the proper design principles and mental and physical security

independent variable dependent variable	the proper design principles	
children's mental and physical security	the level of significance	0.001
	Pearson coefficient	0.449
	No	277

The results of Pearson correlation test indicate that there is a correlation with the value of 0.449 between the proper design principles and children's physical and mental security. The correlation is significant with a value of 0.001 and 95% degree of certainty. Therefore, there is a relationship between the two desired variables with a degree of certainty higher than 95%. This relationship is positive, direct and is in a medium level.

4. Conclusion

Nowadays, with attention to children and teenagers' characteristics and their role and position in the society, it is necessary to design a space to develop their creativity and aptitudes. Creativity is not just found in special people but it can be instructed and developed to anyone. This training and development in childhood will result in adulthood. The effective factor in developing creativity in children is playing and curiosity in the environment. Curiosity is considered as the main external factors of creativity.

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Summary

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The environment and space in which we are living affect our spirit and thought. Creativity is a potential ability within the human being. This ability is flourished in the proper and cherishing environment. An environment that is able to flourish a child's potential abilities seems to be necessary, regarding the importance of the childhood ages and learning at that time. At the first stage, an environment designed to develop a child's creativity should be able to fulfill his physical and mental needs. Securing tranquility and safety of children is the first requirement of a proper environment for children. It will prepare the ground for children's creativity. In the present research, we studied child's behavior in the environment by field studies, and some solutions and models extracted and presented to design proper environments by applying the psychological study of children and approaches to develop creativity in educational systems as well as investigating children behaviors in the environment. First of all, the present theories of the psychology about designing educational spaces is discussed and then hypothesis test is carried out by an inductive approach and applying a survey research. So, we prepared a questionnaire to measure indices and then distributed the questionnaire on some nurseries. After that accumulated data were described and analyzed by applying (SPSS) software, finally, a model is presented to show the manner of the effectiveness of the factors. It was concluded that creativity is not limited to certain people and it can be acquired and learned. Developing creativity in childhood will have major effects on adulthood creativities. The elements which have an effect on children creativity are play and their ability to explore in the environment. Stimulation of the curiosity sense as an external factor in guided discovery learning is deemed to be one of the major constituents of guided discovery learning.

Keywords: educational space, environment, child, learning rate, creativity