Research Article

Neuroscience and Psychiatry: Open Access

The Effect of the Optimal Design of the Educational Space on the Promotion of Creativity

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Received: 27-7-2023, Manuscript No. npoa-23-108135; **Editor assigned:** 01-8-2023, Pre QC No. npoa-23-108135; **Reviewed:** 14-8-2023, QC No. npoa-23-108135; **Revised:** 21-8-2023, Manuscript No. npoa-23-108135 (R); **Published:** 28-8-2023; DOI: 10.37532/npoa.2023.6(4).74-79

Abstract

Creativity is one of the great features of human thinking. The present research was carried out with the aim of the effect of the optimal design of the educational space on the improvement of creativity. The current study was a descriptive analytical design that was carried out by regression or prediction method. The statistical population of the present study was all high school students in Tabriz city in the academic year 2019-2020. 370 of them were selected as the sample and the questionnaire of optimal design of educational space and creativity was distributed among them. Data were collected using SPSS software version 19 cases were analyzed. Statistical analysis of the data was Pearson correlation coefficient and regression. The findings showed that there is a significant relationship between variation in space detail, the use of natural materials, variability in coloration, variety in lighting, flexible and flexible space, and the existence of flower and plant with cognitive creativity. This difference is significant at P <0. 01 is meaningful. Based on the findings of this study, educational providers are recommended to consider environmental components and external education in students' creativity, and take into account students' and students' environments.

Keywords: Design • Educational • Creativity • Cognition

Introduction

At the beginning of the third millennium AD, the world is moving towards progress at a tremendous speed. Meanwhile, the education of each country has a major contribution among other factors. Among the existing educational courses, the high school course should have a significant and decisive role to continue the path for other courses in the minds and spirits of teenagers and future makers of the country. Many of the developed countries have revised the curriculum of their different educational levels based on the cognitive education of four literacy including science, technology, engineering and mathematics. If until a decade ago, reading and writing literacy was considered one of the abilities of every individual, today computer literacy is even more effective in improving the position of every member of the society. In all these four branches, students' creativity is considered as a basic ability [1]. In this regard, creativity as one of the prominent human abilities has always been studied by cognitive science researchers with different approaches.

Creative thinking is the process of sensing problems, issues, gaps in information, missing elements, hypothesizing and guessing about deficiencies and testing the hypotheses of the mind and finally conveying the results. Creative thinking consists of four main cores, which are: fluidity, meaning the ability to produce many thoughts; Innovation means the ability to produce innovative and unusual ideas; Flexibility means being prone to produce diverse and diverse ideas, and finally, expansion means being prone to pay attention to details [2]. Using special thinking skills and the ability to provide multiple solutions in different situations, a creative person always acts in an effective way and adapts well to existing uncertainties. In recent years, studies have shown that the structure of creativity is a skill and therefore it can be acquired and taught [3]. The ability of education has opened up a wide field for benefiting as much as possible from the potential of this superior mental force, and it has been a hope for many production and industrial centers, and it has led them to strive to improve their ability. Due to the fact that creativity

is a multi-dimensional structure, its definition and measurement faces difficulties. There are many definitions about creativity, but there is no agreement about the operationality of any of them [4]. However, it can be pointed out that creativity is defined mostly in relation to the concepts of innovation and usefulness [5]. That is, the innovation and usefulness of producing an idea or product is accepted as the main feature of creativity [3].

One of the solutions for creative support in cognitive education and increasing creativity is designing an educational space. The educational space that is designed with the aim of strengthening creativity should, beyond creating a classroom to present the curriculum, also create the possibility for students to learn by being in a situation. Based on this, the educational environment designed based on cognitive education should introduce students to creativity in solving open problems, invite them to discovery and search, and encourage them to experiment and deal with phenomena. In the field of cognitive education, strengthening students' creativity and increasing their ability to solve open problems is considered as one of the main priorities. Also, the creativity and initiative of action is very important for the scientific growth and promotion of the country. A society that can provide the creativity of the young generation, especially students, will definitely benefit from scientific growth and prosperity. The Education Organization, as the guardian of this department, can create a suitable platform for the intellectual growth of students [6]. According to Torrance and Goff's point of view, creativity consists of four main factors, which are:

Initiative: one of the skills that seems necessary for the development of creativity.

Innovation is created by removing normal and habitual thinking and by thinking about unusual and unusual things [2]. **Curiosity**: Torrance and Goff, after their studies on different subjects, mentioned courage, honesty, curiosity, and the desire to take risks as characteristic traits of creative people. Other researches also show that a person's curiosity is effective in the creativity process and that creative people are usually curious. Also, one of the characteristics that distinguish creative people from others is their curiosity.

Motivation: Motivation plays a very important role in creativity and innovation. [6]

In order to develop creativity, it is not enough to just teach content or plan for the development of creative talents, but people should be helped to recognize the points where motivation and skill match each other or the intersection of creativity. The place of intersection is a powerful combination because creativity is possible at this point.[1]

According to Torrance, creativity has constituent elements such as the domain of skills, creative thinking skills and motivation.

Imagination: Many innovations and inventions are the result of the power of imagination. One of the dimensions of the imaginative method is that a person puts himself in the place of something else.[2]

Researches show that children's abilities and creativity are established during childhood and adolescence, and the best development time for creativity and imagination occurs at these ages. During these years, they are more influenced by the environment and are naturally curious about their environment. However, educational spaces lack proper design. Most of them are established in residential spaces and even apartments and with painting and coloring, they have apparently become an educational environment.[7] All physical factors of the environment such as light, scenery, sounds and even noise and visual pollution can have a positive or negative effect on the growth of creativity. Although many studies have been conducted in the field of the effect of the environment on creativity, including the social environment, but the effect of the design of the environment and its related factors on creativity has received less attention.[8] The studies that have been done in these fields have shown that design factors on creativity and learning have been less discussed. The review of these studies shows that human behavior, interactions and use of space can be affected by space and spatial communication. Many studies show that the physical environment affects cognitive creativity. Since the physical environment is cognitively and perceptually stimulating, it can strengthen creativity [9].

In order to increase children's creativity, all environmental factors such as family environment, physical environment, educational environment, educational programs and systems, as well as teaching people are effective. Some of these physical characteristics of the physical environment that can affect the creativity and innovation of the users of that space are:

The variety in the details of the space is the view of the natural environment, the use of natural materials, color, light, diverse and flexible

space, the presence of flowers and plants in the surrounding environment, the presence of beautiful beds and the enjoyment of solitude. [8] Various researches about the impact of the physical environment on the promotion of creativity show that some of these environmental factors are effective in increasing cognitive creativity. [10] The shape and size of spaces can be the basis for the gathering of people and the formation of groups for interactions and social relations. The amount and type of group communication has a positive effect on the creative process. Therefore, designing the space in such a way as to increase the amount of communication has a positive effect on the quality of these interactions and also affects the growth of creativity. [11] Creating a landscape in the natural environment also has an effect on the growth of creativity. Even the presence of plants in the interior have an effect on moods and the creative process. In this regard, [12] used survey research method in their research entitled "Principles of designing children's educational space based on the creativity model" based on the integration of ideas related to the research topic and deduced the principles of designing educational spaces based on the creativity model. The results of the research based on the model were the preparation of architectural principles for the design of children's educational spaces in order to improve their motivation and creativity. The change-completionability of the space and its components, the interaction of open and closed spaces and the reconstruction of natural stimulus elements such as light, water and plants. Also, [13] showed in his research titled "The Principles of Urban Parks to Promote Children's Creativity" that by using the ideas obtained from the research model of at least one and a half academic years, educational spaces can be designed in a way. so that the child's motivation is improved and his imagination and curiosity increase and it leads to the development of the child's creativity.

Therefore, in recent years, many researches have been conducted, among the many factors influencing the growth of creativity, educational methods, emotional-cognitive aspects of children, and educational issues have been investigated; But less attention has been paid to the effect of the quality of the design space in fostering creativity. On this basis, the research intends to answer the question whether the optimal design of the educational space promotes creativity?

Research methods

The current research design was of descriptive analytical type, during which the regression method was used to investigate and predict the improvement of creativity based on the components of the optimal design of the educational space.

Society, sample and sampling method

The statistical population of the present study was all male high school students in Tabriz for two and a half years of study, and according to Morgan's formula, 370 of them were selected as a sample of the study in a multi-stage cluster random manner. The method of data collection was the questionnaire created by the researcher, the optimal design of the educational space and Torrance's creativity questionnaire, and these questionnaires were used to collect data. In the next step, the questionnaires were distributed among the subjects and the environmental design factors affecting students' creativity were investigated.

The creativity scale information collection tool: this tool has 60 items, the answers of which are specified on a three-level continuum in the form of a Likert spectrum from zero to two. The reliability of Abedi's creativity scale was obtained through retesting in 2013 in four parts of the test, respectively, fluency 0.85, originality 0.82, extension 0.80, and flexibility 0.84 [14].

The optimal educational space design scale: this questionnaire contains 48 questions that are taken from the theories proposed in this field and includes six components of diversity in space details, use of natural materials, diversity in coloring, diversity in lighting, diverse space and It is flexible and the presence of flowers and plants, whose face validity was measured by expert professors in this field, and then statistical validity was also calculated through Cronbach's alpha, and the validity of 0.83 was obtained for the entire questionnaire.

The validity of the components was 0.71, 0.79, 0.85, 0.92, 0.87 and 0.77 respectively. Also, the internal reliability of this scale was found to be 0.79 in this research.

Implementation process: In this research, the data collection method was that after obtaining the necessary permits and obtaining the informed consent of the subjects, the creativity scales and the design of the optimal educational space were implemented for all high school students. Then the collected data were analyzed with the help of Pearson's correlation coefficient and multivariate regression analysis.

Results and Discussion

Descriptive statistics, Pearson's correlation coefficient and then multivariate regression were used for statistical analysis of the collected data. In descriptive statistics, the mean and standard deviation of the variables are discussed. In the correlation method, the degree of relationship between the variables is investigated. In this research, the relationship between diversity in space details, use of natural materials, diversity in coloring, diversity in lighting, diverse and flexible space, and presence of flowers and plants with creativity is investigated. .

However, in the multivariate regression method, the creativity level has been predicted based on the above components.

(Table 1) shows the average and standard deviation of the research components. As can be seen, the average diversity in space details is 30.68, the use of natural materials is 28.60, diversity in coloring is 18.98, diversity in lighting is 21.78, dierse and flexible space is 34.32, the presence of flowers and plants is 26.89, and creativity is 79.46.

Pearson's correlation coefficient was used to examine the relationship between optimal design principles and creativity, the results of which can be seen in (Table 2). As it can be seen, variety in space details 0.483, use of natural materials 0.553, variety in coloring 0.530, variety in lighting 0.394, diverse and flexible space 0.383 and presence of flowers and plants with creativity 0.344 have a significant relationship and this relationship is significant at $p<0.01$ level. The results of multivariate regression analysis showed that the optimal principles of educational space design can predict 39% of the variance of creativity in students, that is, 39% of creativity in high school students can be predicted by the above components (Table 3). Among them, the diversity in the details of the space, the use of natural materials, diversity in coloring, diversity in lighting, diverse.

Table 1. Descriptive statistics.

Scale	Mean	SD
Diversity in space detail	30.68	6.32
Use of natural materials	28.6	5.8
Color variation	18.98	3.58
Diversity in lighting	21.78	4.51
Varied and flexible atmosphere	34.32	5.9
Presence of flowers and plants	26.89	5.77
Creativity	79.46	16.77

Table 2. Results of correlation coefficients of research variable.

Creativity	Diversity in space detail	Use of variation	Color lighting	Diversity in flexible	Varied and flowers and atmosphere	Presence of plants
1						
0.483 **	1					
0.553 **	0.630**	1				
0.530 **	0.484 **	0.480 **	1			
0.394 **	0.439 **	0.413 **	0.418 **	1		
0.383 **	0.576 **	0.495 **	0.531**	0.358**	1	1
0 344**	0 276**	0 426**	0 395**	0 466**	0.358**	
0.344**	0.276**.	0.426**.	0.395**.	0.466**.	0.358**	1

Table 3. Results of regression analysis of creativity prediction through the principles of optimal design of educational space.

Predicting variables	B	SE	Beta	T	F	R	R2	P
General model					16.12	0.644	0.394	0.001
Diversity in space detail	0.424	0.196	0.217	2.14				0.046
Use of natural materials	0.68	0.213	0.311	3.19				0.002
Color variation	0.725	0.22	0.3	3.28				0.001
Diversity in lighting	0.433	0.193	0.101	1.2				0.031
	0.38		0.134	2.35				0.02
		0.224						
Varied and flexible atmosphere presence of flowers and plants	0.68	0.213	0.311	3.19				0.002

Conclusion

Researches have shown that space is a psychological and strategic factor, and from the physical or physical dimension, it can convey good or bad feelings to humans. Space as an element, including closed interior space, open interior space or play space, is an effective element on effective education. Unfortunately, the existing spaces are often not desirable and do not help to achieve the educational goals. [15] Planning in the proper use of the school's educational space is one of the necessities of the educational system. The multi-dimensional planning model recognizes the educational goals of the students and the main and central dimensions of these essential contexts in the development of the child's whole personality and analyzes the conditions for the realization of learning at the executive level of planning. [12] In the design of many educational spaces, less attention is paid to the spiritual and psychological aspects of students. According to environmental psychologists, the educational environment should be designed in such a way that learning is easy and pleasant. Education of students, as the future builders of the society, is of great importance and can guarantee the sustainable development and progress of any society. However, in recent years, the progress and development of human societies has happened so fast that it is very difficult to predict their future changes[16].

Today, the increase in population in Iran has caused attention to the issue of designing educational spaces for them. In this article, the principles of design are explained to students. Also, other studies in this field have shown that the presence of plants in the indoor space promotes creativity in people. What has been discussed and emphasized in the present study as a new and innovative issue is that the game and group participation of the child has been examined not only in the form of educational programs, but also by means of components and elements and in physical and functional systems. [17].

It can be concluded that the environment is considered as a very important factor in creating fields of creativity, which should be considered by the designers of schools and educational spaces, and all physical and functional factors in the design space can facilitate or hinder creativity. [18] Environment has a broad definition that includes geographical environment, physical environment, social environment, cultural environment and the like. Among the most famous scientists who have researched the impact of the environment on people, we can mention Emma Beil, who has had a great impact on creativity experts. The environment plays a more prominent role than personality factors in the development of creativity. Because natural factors are very different and can be manipulated more easily than personality traits and individual talents.[19] Due to the close relationship between man and the environment, in terms of perception and behavior, each of the productive aspects are effective in the creative process of man. If the environment is too simple, the perceptual system will make little or no effort to perfect survival techniques. But in a different world, where it is not possible to find out the nature of events through ordinary observation, a process must be created to predict ambiguous situations, and this is how creativity increases through the design of the environment. [20]

The design of educational spaces such as schools is valuable because, on average, each person spends about 14 thousand hours of his life from elementary school to high school in the educational space.

Meanwhile, many school buildings have suffered serious damage due to various reasons, and this is in contradiction with the attractive environment for increasing creativity. These kinds of educational spaces, where the physical atmosphere of the school and the environment that governs the spirit and soul of the students, cause fatigue, impaired concentration, indiscipline in the scholars, and because of this, the realization of the desired goals in the field of creativity faces new problems. The diversity of natural elements has a significant effect on improving children's creativity. For example, plants with different shapes, colors and sizes of flowers and leaves in different seasons help spatial diversity. Also, different colors of the light spectrum using colored glass or creating water ponds, waterfalls, aquariums and fountains are very effective for diversity in the educational space. [21] Playing with water, planting plants by the person himself, and the like, in addition to having a significant effect on promoting motivation and releasing emotions, can be considered a suitable platform for student participation in group activities. Man is inherently and naturally very interested in the elements of nature, and many of his dreams are formed from the association of mental images about nature, and since the power of recording mental images is imagination, so it can be said

that natural elements can play an important role in imagination and creativity. [10] The current research had some limitations, such as the fact that the subjects of the research were all high school students, and that the optimal design of the educational space was compiled in the form of a questionnaire. Therefore, it is suggested that in future studies, researchers should apply the findings of the current research in a practical way in educational spaces and measure its impact on creativity.

Appreciation and thanks

The authors consider it necessary to acknowledge and thank all the dear students who helped us in this research.

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