



## DESCRIPTION AND ANALYSIS OF EDUCATIONAL FACILITIES DESIGN CRITERIA BASED ON CREATIVE THINKING FROM THE PERSPECTIVE OF EDUCATIONAL TECHNOLOGY SPECIALISTS

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### ABSTRACT

*The aim of this study is description and analysis of educational facilities design criteria based on creative thinking from the perspective of educational technology specialists. Study's method is descriptive-survey and it is polling type. Method description - is a survey of surveys. Population consists of full-time faculty members in the field of educational technology at the University of Tehran that are 36 persons. Tools for data collection are questionnaire responses depending on the research questions that the research was conducted on the Likert scale. Questionnaire's reliability obtained based on Cronbach's alpha coefficient that was 74%. To analyze data in statistical methods frequency distribution, percentage, frequency, mean, and statistical tables were used. Results of one-sample z-test were used for statistical analysis. Based on the results, obtained z for standard colors equals to 8.98, because the subjects' average (27.38) and compare it with the hypothetical average of (15) it can be said that obtained average by hypothetical population mean has significant difference. For sound scale (phoneme) equals 3.52 based on testees' mean (27.77) and to compare it with society's hypothetical average (17.5) it can be said that that obtained average has significant difference with society's hypothetical average. For thermal condition scale (heat) it was equal to 2.26 because regarding testee's average (14.77) and to compare with society's hypothetical average (10) it can be said that obtained average has significant difference with society's hypothetical mean. Therefore it can be concluded that there is a significant relationship between design criteria of educational facilities and increase in students' creative thinking from the perspective of educational technology specialists at the 5% level.*

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**Keywords:** Design, Design criteria of educational places, Creative thinking

**JEL Codes:** C11, J1

## INTRODUCTION

Educational environment defines as an all plans, facilities and tools that are been used in instruction and learning process to provide knowledge level improvement and learners' intuition. Educational environment must be physically desirable. Spaces with desirable physical quality, which refers to the spaces that in their design standard indicators such as clean air, suitable temperature, adequate moisture, light, sound, vision and good sense, energy efficiency, accessibility and communication had been provided. (Akbari, 2001).

School's architecture is the subject of debate in many countries. Truly all believed that school's architecture plays positive role in children's education all over the country. All share this belief. What is in dispute is what we want from school architecture? Does this architecture should be extended program (written resolution) and (reverence for tradition) or in unlocking the potential of individual students and give them the courage to break tradition and explore new territories?

Architecture modern ideas in different countries emphasize over freeing students' potential talent and by providing suitable physical places at schools that intended that (school be not a prison) the best moment of school be the time of showing last ring of school and the ending of school at that day to get rid of it. (Shaterian, 2008).

Certainly it can be told that most of our schools in our country remain with traditional manner of second half of past century and new schools' buildings do not have modern facilities to compare with them. Regardless of what that today there is more need to educational places with modern tools, however sometimes students do not have even first needs such as classrooms. However, the success in the field of education in addition to the total contingent of consistent and coordinated three parameters:

1. Appropriate educational environment
2. Knowledgeable and experienced teaching staff
3. Curriculum

In a way that none of them is better than the other and besides we need places and tools to upbringing and educational supplement activities because to receive international standards we need more remarkable tools and facilities (Shojaei, 2009). A good teacher can be effective in limited circumstances. But there is no doubt that suitable space and training facilities for the quality of teacher's teaching is very effective. Diversity of students, lack of desks and benches, poor quality chalk boards, lack of light, dark and cold classrooms with windows overlooking the street, unsanitary and lack of class, playground, library, chapel, laboratories and other facilities can affected teachers' instruction (Shabani, 2006). Other points that must be regarded in suitable educational places is light's rate, sound, the order of tools consists of desks and benches, board, movie screen, partition (to separate space) and room's floor. Classroom lighting should be controlled. It means classroom must be facilitated with curtain in a way that if teacher wants to use

movie and slide as well as strip movie orEpcprojector, he/she can increases or decreases classroom's lighting. Because there is parasite in class's communication and it will not let messages to be received by message receivers. For classrooms mobile desks and chair is preferable in a way that instructors can change classroom's arrangement based on their favorable arrangement for their technical instruction. Chairs with handle are not suitable for younger students because they do not have enough space to write something on them (Aliabadi, 2007). Barker narrated by (Young, 1990; Mortazavi, 1997) founder of ecologic psychology believed that there is meaningful relation between physical-architecture aspects and manner" physical-behavior subbase" that he stated it with compatible meaning. In all live creatures based on effect law and environment's affection, there is tendency to be compatible with environment. In this way the child will try to be compatible with environment around him/her and have harmony with it and based on Piaget's view to be compatible with environment is a kind of two forms of intelligence in human being. At first the child try to arrange environment based on his/her internal system and intelligence but because this cannot be possible all the times, the child faces points and factors that are relative to his/her prior experiences, therefore he/she must try to be compatible with new experiences. So child is not mare obedient. In other term as it can be seen from schema1, to be compatible with environment can be a balance between (internalizing and externalizing). (Moghadam, 1898). Based on chart 1 it can be said that to connect child with environment in compatible way, the child must affect environment internalizing and he/she experiences affects from environment as well externalizing. New studies regarding the way of physical environment on facilitating learning activities shows that today instructors need more than a room to teach students. In fact experiences of any person in life and skills that he/she gains is related to environment condition and it is mutual product of that person and an environment that he/she lives in, activity as a main agent of child's growth and learning is a process that in term of child's environment and place caused his/her overall growth and environment affected child's manner by providing opportunity and persuaded him/her. (Shariatmadari, 2006).The environment should provide adequate protection for the child's optimal development. The expression of Duduk (2000) "Applying the spirit of the children and their Involvement with permanent, is the fruit of a modern class. Past instruction of children was preparing them for life in a factory. Classroom as a behavioral camp in the context of a learning center is an entity that can be designed according to the traditional square or rectangular shape. Because the equal value of the total space of all units in the shape, depending on how the class is being arranged, can only be one responsive activity, while in the new educational approaches, the possibility of multiple activities is essential. In this way there should be a class' form that can provide a flexible environment for training to become a dynamic and alive activity and get out of a lecture mode with centrality of teacher. Meanwhile Dick James quoted from lip (Dyck, 1994) (Man, 2002) introduces wide L form as a model which has basic features of today's flexible classes and gives teachers different choices in organization of their classes to facilitate students' growth in learning various activities.

(Akbari, 2010) in a research called light's practical thoughts in educational spaces concluded that to control severe sunlight by designing concrete, metallic, wooden, plastic and cloth shutters outside the apartment or by creating sunshades that their exact dimension are measured by place's climate and the state of earth and orientation of sun lights in various hours and seasons can be used and if using current condition be inevitable, by installing prior made horizontal and vertical curtains exist in markets, such as various controllable curtains or common ones with the proper thickness, we can prevent sunlight from entering. By using natural light, proper and monotonous light must be provided to environment. With the use of electric lighting needed light can be obtained and be promoted to optimal level. SadeghiRavesh and Tabatabaei (2007) in a research called appointing thermal comfort confine in dry weather conditions concluded that the results achieved in the development process along with the environmental assessment of the local thermal comfort is essential because the determining of amount, energy loss is been prevented in high level. More than 60 percent of Iran's area is located in the dry and droughtier climate so to identify comfort zones in this climate has remarkable importance. Based on the results, the study of thermal comfort in summer conditions  $27^{\circ} - 8/21$  and for winter conditions  $23^{\circ} - 4/20^{\circ} \text{C}$  were assessed and optimal relative humidity were estimated as range of 53% - 18% respectively. Recommended temperature range while ensuring compliance with internal conditions is prevented the energy's transitory consumption. Shafaei and Madani (2009) in a study called the roles of designing children's educational spaces based on creativity model concluded that

Child's game and group' spartnership, not only in educational plans but also based on architecture's means and ingredient in skeletal and functional systems is possible. To use natural ingredient is not sufficient and these ingredients by having changeable features can be effective to create variety in educational spaces and promoting child's creativity. Besides in study's points effective points to promote child's creativity are surveyed as separate cases and no comprehensive model in term of efficiency of stated points and their relation to promote children's creativity, can be seen. With this explanation, the most important achievement of this study is the model of creativity's point's relationship and reaching children's educational spaces design points based on stated model. Tak and Garrett (1998), (Seneh translation, 2003) in a research called brain's efficiency improvement with schools' creative design, concluded that new studies in term of brain and brain's learning method to teachers and parents, has created new attitudes about teaching and learning. Modern researches not only presented new findings but also have contributed to the renovation of the old learning. The findings suggest that the idea of the top left or right brain dominance is misleading. The brain is more complex than it would be to comment on it in such a way. With one function of brain we cannot face math and with other function to face with music. Brain-based researches are not separated from education and training, but their approaches are those that make educational benefited. Brain-based research with some suggestions, too late to sit down once, but they also offer operational insights and perspectives, even the construction and preparation for the schools play space. Generally it should be stated that classroom's form designing thought must generated by possible communication understanding in social-physical space and learning's appointing nature

and there cannot be one peculiar form to all classes in various social rivers but based on stated condition, it can be said that effects of a form of classroom in classroom's flexibility and to increase students' creative thinking is a crucial point. In this way in term of stated points the main aim is that old patterns be separated and we find modern attitude toward the role of students and school's skeletal space. Attitude that caused learning in school be more remarkable and we use our educational spaces to increases students' creativity in the best way and to promote students' tendency to study and keeping on it and in a way they will not feel that they are spending their times in prison.

Therefore, in order to achieve the above objectives, the following questions were answered during the study:

- 1) To what extent is there a significant relationship between criteria of color and students' creative thinking promotion from the perspective of educational technology specialists?
- 2) To what extent is there a significant relationship between the criteria of light and students' creative thinking promotion from the perspective of educational technology specialists?
- 3) To what extent is there a significant relationship between the criteria of sound (phoneme) and students' creative thinking promotion from the perspective of educational technology specialists?
- 4) To what extent is there a significant relationship between the measure of thermal (heat) condition and students' creative thinking promotion from the perspective of educational technology specialists?

## Method

Because researcher's aim is to describe and analyze educational spaces design criteria in term of creative thinking model based on educational technology specialists, research's study method is descriptive-mensurative in polling kind and it surveys ideas of some of educational technology's course specialists based on creative thinking model. Study's population consists of all specialists (faculty members) in the field of educational technology at the full-time universities of Tehran such AllamehTabatabai University, ShahidBeheshti University, TarbiatMoalem University, TarbiatModares University, Tehran University, Tehran Azad University(Sciences and Research Branch) that are 36 people and they were teaching till 2010-2011 academic year. In term of data collection in this study, the researcher made questionnaire responses depending on the research questions and how likert scale is done. The averages score of each person for each question and all questions were clear and based on above criteria were used to measure the variables of ordinal scale. In order to obtain tool's reliability, Cronbach alpha coefficient test is used and its' amount to measure light was 77/0, for standard color was 90/0, the standard sound (audio) was 72/0, a measure of thermal (heat) was 82/0 and in the mean 4 standard it was74/0 and its' credit was approved. To examine questions, descriptive statistics such as frequency, percentage, frequency, mean, and statistical tables were used to help. In Inferential statistics, single-sample z-test has been used.

## Findings

Since the main part of research activity is its data's analysis, in current study collected data has been analyzed using spss software and descriptive and inference findings obtained from data's analysis is been presented. The descriptive statistics of the questionnaires are presented initially. To survey research questions, single-sample Z-test was used.

First question: To what extent is there a significant relationship between criteria of color and students' creative thinking promotion from the perspective of educational technology specialists? For the first question, we use single-sample Z statistic method in a way that if the relationship be meaningful and specialists believed in color's scale role to improve creative thought , 4 and 5 choices means much and very much must be selected. Therefore we compare specialists' opinion average that is mean of received score which is 15 (because score's total in term of being 6 statements is 30). Therefore at first specialists' scores are being collected in several questions that are related to color agent and then total in term of being color's six statements scale, a score among 6 to 30 will be gain. Based on these scores, scores' average of 36 specialists to color's scale will be gained, if differences between two averages are be meaningful, the question will be verify , if not research's question will be rejected. As can be seen in Table 1, 6/66 percent of specialists believed that a color criterion to increase creative thinking is very effective while 3/33 percent believed that the impact is enormous.

As can be seen in Table 2, Z obtained for criteria colors equals 8.98 and it is meaningful with 000/0 significance level in 8.98 levels ( $p \leq 0/05$ ). Therefore zero hypothesis is rejected and research's question is verified, based on testees' average (27.38) and to compare it with society's hypothetical mean (15) it can be concluded that obtained average has meaningful difference with society's hypothetical mean and first question is verified in 0/05 level. So it can be said that there is significant relationship between standard color and enhance in students' creative thinking from the perspective of educational technology specialists.

Second question: To what extent is there a significant relationship between of light's criteria and students' creative thinking promotion from the perspective of educational technology specialists?

For study's second question, we use single-sample Z statistic method in a way that if the relationship be meaningful and specialists believed in light's scale role to improve creative thought , 4 and 5 choices means much and very much must be selected. Therefore we compare specialists' opinion average that is mean of received score which is 20 (because score's total in term of being 8 statements is 40). Therefore at first specialists' scores are being collected in several questions that are related to color agent and then total in term of being light's six statements scale, a score among 8 to 40 will be gain. Based on these scores, scores' average of 36 specialists to light's scale will be gained, if differences between two averages be meaningful, the question will be verify , if not research's question will be rejected.

As can be seen in Table 3, 56/55 percent of specialists believed that a light criterion to increase creative thinking has enormous efficiency while 44/44 percent believed that the impact is much.

As can be seen in Table 4, Z obtained for light's criteria equals 6.58 and it is meaningful with 000/0 significance level in 8.98 levels ( $p \leq 0/05$ ). Therefore zero hypothesis is rejected and research's question is verified, based on testees' average (34.02) and to compare it with society's hypothetical mean (15) it can be concluded that obtained average has meaningful difference with society's hypothetical mean and first question is verified in 0/05 level. So it can be said that there is significant relationship between light's criteria and students' creative thinking promotion from the perspective of educational technology specialists.

Third question: To what extent is there a significant relationship between sound (phoneme) criteria and students' creative thinking promotion from the perspective of educational technology specialists?

For study's third question, we use single-sample Z statistic method in a way that if the relationship be meaningful and specialists believed in sound's (phoneme) scale role to improve creative thought , 4 and 5 choices means much and very much must be selected. Therefore we compare specialists' opinion average that is mean of received score which is 17.5(because score's total in term of being 7 statements is 35). Therefore at first specialists' scores are being collected in several questions that are related to sound (phoneme) agent and then total in term of being sound's seven statements scale, a score among 7 to 35 will be gain. Based on these scores, scores' average of 36 specialists to light's scale will be gained, if differences between two averages be meaningful, the question will be verify , if not research's question will be rejected.

As can be seen in Table 5, 27/7 percent of specialists believed that a sound criterion to increase creative thinking has enormous efficiency while 52/7 percent believed that the impact is much and 19/4 percent believed that efficiency was in a mean level.

As can be seen in Table 6, Z obtained for sound (phoneme) criteria equals 3.52 and it is meaningful with 0/0004 significance level in 0/05 levels ( $p \leq 0/05$ ). Therefore zero hypothesis is rejected and research's question is verified, based on testees' average (27.77) and to compare it with society's hypothetical mean (17.5) it can be concluded that obtained average has meaningful difference with society's hypothetical mean and third question is verified in 0/05 level. So it can be said that there is significant relationship between sound (phoneme) criteria and students' creative thinking promotion from the perspective of educational technology specialists. Fourth question: To what extent is there a significant relationship between the measure of thermal (heat) condition and students' creative thinking promotion from the perspective of educational technology specialists?

For the fourth question, we use single-sample Z statistic method in a way that if the relationship be meaningful and specialists believed in thermal 's scale role to improve creative thought , 4 and 5 choices means much and very much must be selected. Therefore we compare specialists' opinion

average that is mean of received score which is 10(because score's total in term of being 4 statements is 20). Therefore at first specialists' scores are being collected in several questions that are related to thermal agent and then total in term of being thermal agent's four statements scale, a score among 4 to 20 will be gain. Based on these scores, scores' average of 36 specialists to thermal scale will be gained, if differences between two averages are be meaningful, the question will be verify , if not research's question will be rejected.

As can be seen in Table 7, 27/7 percent of specialists believed that a thermal (heat) criterion to increase creative thinking has enormous efficiency while 36/1 percent believed that the impact is much and 36/31 percent believed that efficiency is in a mean level. As can be seen in Table 8, Z obtained for thermal criteria equals 2.06 and it is meaningful with 0/03 significance level in 0/05 levels ( $p \leq 0/05$ ). Therefore zero hypothesis is rejected and research's question is verified, based on testees' average (14.77) and to compare it with society's hypothetical mean (10) it can be concluded that obtained average has meaningful difference with society's hypothetical mean and first question is verified in 0/05 level. So it can be said that there is significant relationship between thermal (heat) criteria and enhance in students' creative thinking from the perspective of educational technology specialists.

As can be seen in table 9, descriptive scales are stated because of specialists' ideas and it can be seen that average for color, light, sound and thermal variables are 34.02, 27.38, 27.77 and 14.77 respectively. Standard deviance for them is 0.355, 0.229, 0.486 and 0.386 respectively.

## CONCLUSION AND DISCUSSION

In this study, the standards-based educational model of creative thinking from the perspective of educational technology specialists (faculty) of Tehran University was studied. Based on first and second questions, research's results show that one of the main features of educational spaces is the importance of color and light components to change classes' pattern regarding modern teaching methods. One of the most important techniques in the design of spaces and providing comfort is light which to provide physical and emotional comfort is very effective. This study confirmed the results of the third and fourth questions are appropriate learning environment should be free of the annoying sounds that provide thermal comfort to satisfy a need for physical and mental. In new methods of teaching, emphasis is on student-centered teaching methods and collaborative group.

Based on educational technology specialists some components of educational spaces like: color, sound, light and thermal condition is necessary to design schools' space in term of students' creativity. Using educational space standards to promote creativity and to have succulence spirit in students has positive effects and persuaded them to be interested in educational spaces.

Regarding research's first question (standard color), no research has been done in this case that can refer to in this case.

The second research question (a measure of light), the results of this research is like Akbari (2010), he found that to control sunlight, concrete, metal, wood, plastic and cloth shutters can be used out of building or sunshades that their exact dimension are measured by place's climate and the state of earth and orientation of sun lights in various hours and seasons, can be used. If current condition is inevitable, by installing prior made horizontal and vertical curtains exist in markets, such as various controllable curtains or common ones with the proper thickness, we can prevent sunlight from entering. By using natural light, proper and monotonous light must be provided to environment. With the use of electric lighting needed light can be obtained and be promoted to optimal level. Regarding research third question (standard sound), no research has been done in this case that can refer to in this case.

Research's fourth question (a measure of heat) and the results obtained, it can be said that they (results) have consistency with (SadeghiRavesh and Tabatabaei, 2007). Based on the results, the study of thermal comfort in summer conditions  $27 - 8/21$  and for winter conditions  $23 - 4/20$  ° C were assessed and optimal relative humidity were estimated as range of 53% - 18% respectively. Recommended temperature range while ensuring compliance with internal conditions is prevented the energy's transitory consumption. So in term of research's results it is recommended that the color of classroom's walls must be bright color to prevent gazing resulted in light reflection. In this way some colors such as colorless blue (fess), milky, green, much colorless and white can be used. Because in educational spaces usually natural and artificial colors are used it should be florescent lights with direct to monotonous and motley lighting. Also, the lovely and lively collection of educational spaces benefit from natural conditions, easy access to educational facilities, noise control and use in arrangement and decoration and tasteful school and classes are offered as educational spaces where sound centers are far from being made. To provide a uniform space, the desired acoustic device placed in the body of the class. The maximum distance between the speaker and the listener, without the use of devices is 25 meters in a 140 degree angle so that the head of it is the location of the speaker. However thermal conditions features should be considered. Some latitude with respect to change in different parts of the country to comfort conditions in Iran is recommended temperature to be 5/21 to 29 degree Celsius in summer and 20 to 7/25 ° C in winter. Relative humidity range of 30 to 65% in these two chapters is proposed. It is suggested that the use of an appropriate color space research in the field of education in motivation and academic achievement in elementary, middle and high school should be done and research in the field of noise pollution schools and ways to resolve it must be done.

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