

DESIGN CRITERIA OF CHILDREN'S SCIENTIFIC-RESEARCH CENTER FORMULATION (STUDENT RESEARCH-CENTER)

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ABSTRACT

The lack of research and analysis in Iranian educational system has made it possible for education to take shape within the theoretical framework and has its own limitation. The result of this process is the lack of optimal productivity of mental and intellectual abilities of children and adolescents. Student research center has been developed in order to expand the research and innovation culture in the country, but there have not been investigations and studies to evaluate and design these spaces. This research, as one of the first guidelines in the field of criteria for designing student research centers, seeks to identify design indicators that affect the design quality of researchers and their impact on creativity and research mood. Based on the field studies, preliminary discussions and the conceptual model of the purposeful questionnaires were prepared, and the relationship between the statistical (SPSS®) factors was measured; then the research model was evaluated between the three groups of students, teachers, employees and architects. The results of the analysis indicates that the physical factors, social-sensual factors, and functional factors are the foremost important criteria of design student's research center that should be considered in the design of the architects.

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1. INTRODUCTION

Research and innovation are developed in a society that provides educational and cultural systems, fields and context for it; according to this basis, the most important and fundamental element of the research system is the expert human resources who are capable of, capacities and necessities of research skills [1]. Scientific growth and development is achieved through research, and it is based on the development of research thinking through which countries could be able to generate knowledge instead of using other people's thoughts. The expansion of the culture of studying, exploring and researching is not only a necessity of educational institutions but also an inevitable part of the wisdom age, and it is an imperative of our society that educators and policymakers manage to change and take

control of a new environment which advances technology, scientific and technical revolution has created the spirit of research and the desire to learn new techniques among members and educators of the body of education, and all students and teachers and etc. to gaining knowledge, research and identify current situation and bring it to the optimal point. Therefore, it is necessary to create grounds for those who are interested in research and have research mood to deepen their learning's. In view of the fact that in traditional teaching, students cannot learn from the knowledge they learn in their everyday lives. In order to have a constructive educational system, the traditional system must be transformed into guidance-based, problem-based education [2]. This requires the creation of student research center [3]. In creating a science-based center, with tendencies toward educational technology, can be used as a general model to develop the optimal and dynamic learning methods for a broad range of educational systems. Referring to the student's research center in the country and considering few studies of educational and research spaces in the country, this research seeks to perceive the effective criteria for assessing and designing student's study based on a comprehensive view. Providing this comprehensive view is an appropriate basis for formulating policies and strategies for expanding the culture of study in children and adolescents and for the growth and prosperity of the country.

2. THEORETICAL BACKGROUND OF RESEARCH

2.1 PLACE OF RESEARCH IN THE FIELD OF TEACHING AND LEARNING CHILDREN

In linguistically aspect, means of research is focused on searching, interrogating, investigating [21]. That is the processing of information, with a systematic process, belonging to a certain range of sciences which has a collective identity and involves innovation. Research and innovation are developed in a society that provides the educational and cultural system with the appropriate context. On this basis, the most important fundamental element of the research system is the expert human resources who have the capabilities, capacities, and necessities of research skill [4]. The lack of research and analysis Iran's educational system has made it possible for education to take shape within the theoretical framework and has its own limitation. The result of this process is the lack of optimal productivity of mental and intellectual abilities of children and adolescents [5]. The main purpose of the school lessons is to enable elementary students to solve the problem in their everyday lives, and teachers must be able to link students with the daily lives [6]. A problem-solving research program needs to include the emotional and cognitive basis and evidence-based data on the importance of culture and diversity, etc [7]. For a successful problem-solving and research, training should include qualitative strategies required for reasoning and use research, project-based learning, and solving a collaborative problem for children [8][9].

Studies indicate that designing research spaces for students should be aimed at teaching skills and problem-solving research [10]; and improve student skills by means of using strategies such as observing, expressing, breaking down, communicating, and implementing problems [11].

2.2 CHILD AND THE CONCEPT OF LEARNING

Childhood is the first and foremost important period of life and a prelude to personality changes of an adult man whose psychological needs are more complex than physiological needs; therefore,

recognition of children in the psychology of child development is considered to be the main and important issue [12]. On the other hand, research suggests that in childhood, children's creativity and creativity are established, and the best time for advancement creativity occurs between the ages of 2 and 11 years [13]. As a result, by enhancing and educating the individual and creating the environment and conditions for him, from the very beginning of childhood, opportunities can be provided for the flowering of children's creativity. The stability and survival of any society requires that the set of beliefs, values, behaviors, attitudes, knowledge, and skills be transferred to new generations. The construction of this transition is through schools and research centers.

2.3 CHILD AND THE CREATIVE RESEARCH ENVIRONMENT

The environment has a direct and decisive influence on any living creature, which affects behavioral choices and utilizes the senses. Therefore, it should pay particular attention to the requirements of all categories of users [14]. The environment affects the child and personality in a variety of ways and increases his creativity. It is said that children learn and understand through interaction with the physical and social environment [14]. The environmental requirements of children in connection to educational and research environments include mobility, comfort, competence, and control, thus the environment must have characteristics of the adventurer of movement and disorientation, stimulating all the senses in a balanced manner, and teaching interaction with the environment and innovation [15]. Table 1 shows the relationship between the child and the environment.

Table 1: Relationship between the environment and the child (Torabi, 2930, adapted from [16][17])

Child and Environment Relationship	Evolution of Learning	Cognitive Growth	Play in the Environment and Touch the Natural Elements	Name and Ranking Knowledge Learning Simple Aspects and Natural and Forbidden Environment Treatment	
		Emotional Growth	Sense of Belonging		
			Tendency Towards Being in Exterior Spaces		
	Evaluative Growth	Judging on Elements and Places	Humanitarian value, Moral value, Naturalistic value, Negative value, Scientific value, Symbolic value, Subjective value, Aesthetic value, Authoritative value		
	Cognitive Evolution	Balance with Physical Environment			
		Balance with Social Environment			
	Sexual and Social Evolution	Result of Childs Absence in The Public Environment	Psychological	Isolation	
			Sensual	Adult Dependency	
				Obesity and inappropriate Nutrition Habits	
	Emotional Evolution	4 up to 7 Years Old	Home as Center of the World		
		8 up to 11 Years Old	Ignorance of Home and Searching for Around		
		12 up to 16 Years Old	Absorbing with Social and Public Centers		
		17 Years Old	Cars as World Center and Exterior Space as Significant Surrounding Environment		

Nowadays, in architecture and interior design, concentration to the concept of enhancing

creativity in the design of spaces and suitable areas for children in the pursuit of excellence and promotion of creativity, are among the issues discussed in the scientific community [18]. The nature and characteristics of creative thinking have long been of interest to researchers, and since the personality of an individual develops from an early age, the researchers focus on the relevant creativity for this age [19]. Creativity, like other human talents, is largely acquired and not specified to individuals; and the growth of creativity is in need of conditions and during special education [20]. In a systemic view, how to architecture, equipping educational and research environments for children, especially kindergartens elementary schools, the principles and elements that makeup it, such as the proportions of the components, the scale, the type of organization of space, color, light, sound, open spaces, etc. can have significant effects on children. Obviously, proper learning environment makes learning easy, brings joy and pleasure to the kids. The design principles that can help children's creativity grow in research spaces include the characteristics of colleagues, fitness and scale, visual visibility, and fluidity of space. The use of natural environments, elements and natural stimuli such as ghosts, light, coloring and creating empty spaces, creating reflective spaces and open and green spaces, spatial evaluation, etc.) Space communication to motivate group work can be effective in promoting children's creativity [21].

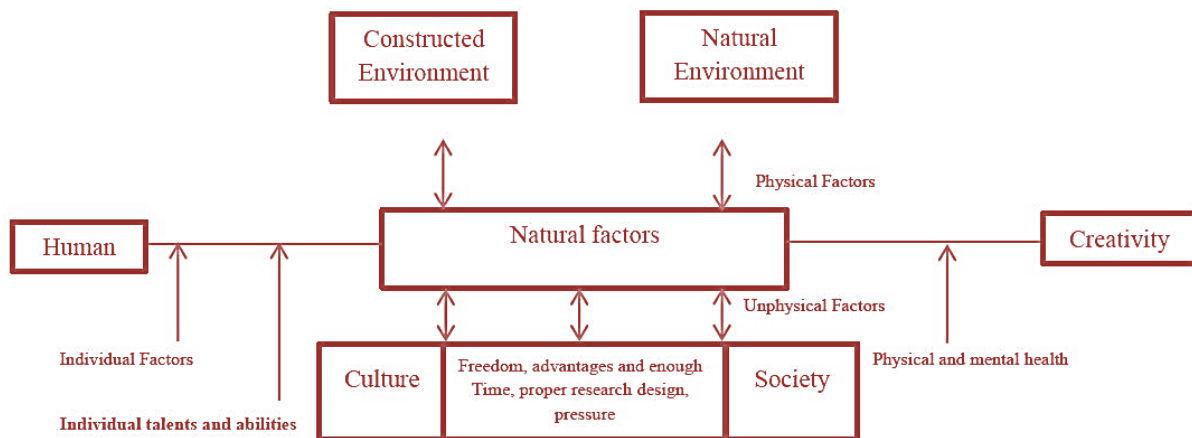


Figure 2: The Impact of Different Factors on Creativity (after [19]).

3. Student Research Centers

Creating the conditions and facilities that help to creativity development and the improvement of students' knowledge and abilities, is one of the basic goals of education [22]. The realization of this goal, due to its differences in student abilities and the plurality of student populations, requires access to appropriate resources and facilities [23]. Research design in student levels and its role in research promoting at the national and regional levels are among the most important strategies that can have a significant impact on human, political, social, economic, and cultural development [24]. For this purpose, a program was set up in 2001 by the Deputy Minister of Education and Science of the ministry responsible for the establishment of student research institutes in all provinces [25]. Student researcher center is a central scholarly research center that is trained and educated in order to identify and provide the context for the growth and guidance of talents and the development of individual and group creativity of students wide spreading the culture of study, research, and analysis

among them, in two forms Governmental and Nongovernmental Organizations are established and administered [26]. Given the goals and responsibilities that the Supreme Council has developed for the study of student research centers, and with a review of the student's research centers in Country, the following criteria can be introduced for designing these spaces.

Table 2: Student Research Center Design Criteria.

Dimension	Criteria
Functional	Access and location
	Proper spatial performance
	Functional Coherence of Spaces
Physical	Materials and colors
	The light of the spaces
	Dimensions of spaces
	The combination of open and closed spaces
	Desirable arrangement
Socio-Perceptual	Rhythm Existence
	Innovation and creativity
	Complexity in space organization
	Social creator interactions and collaborative spirit
	Suitable audiovisual features
	The clarity and comprehensibility of the spaces
Encoding of spaces	

4. METHODOLOGY OF RESEARCH

4.1 CONCEPTUAL FRAMEWORK OF RESEARCH

Based on a comprehensive view at the subject literature and global experiences, the conceptual model of the research has been developed in the form of 3 indicators and 15 sub-indicators (Table 2). The important point in developing a conceptual model is a comprehensive view at the variables that affect the design of student research center. So, for example, socio-perceptual dimensions have been mentioned in fewer studies and have been emphasized in this research.

4.2 RESEARCH STRATEGY

Research strategy exists in such a way that quantitative and qualitative data are collected simultaneously. In this context, a large share of the data has been collected in the form of a survey and a questionnaire, and a number of interviews have also been conducted with a number of contributors to the survey. In order to achieve a comprehensive analysis of components and indicators developed in the conceptual model, a combination of survey research methods and content analysis have been used. In data collection based on the questionnaire, a field survey of the samples was used. To evaluate the model, the indicators were measured from three groups of students, architectural experts, and teachers, 1000 individuals were selected as the statistical population.

- ✓ Regression
- ✓ Linear regression is one of the statistical techniques for data that can study the linear relationship between a set of independent variables with a dependent variable in a manner in which the relationships between the independent variables are also to be considered.
- ✓ F Test, ANOVA (one-side variance analysis)

The F test or one-side variance analysis is used to test the difference between the averages of the variable in more than two groups (even 3 more groups). In this test, which is an extension of the T-test or two independent samples, the comparison of the meanings and multiplicity of the population, is easier than the T-test. In the F test, the variance of the whole society is decomposed into its initial factors, for this reason, it is also called the variance analysis test. Also, with this test, we can make multiple comparisons among the groups.

5. RESULTS AND DISCUSSION

One of the output tables of the multi-variable regression test is a summary model Table 3. This table deals with the correlation coefficient between variables and the adjusted coefficient of determination.

Table 3: Model summary of analysis.

Model	R	R ²	Adjusted R ²	Std.Error of the Estimate
1	0.748	0.647	0.523	0.838
Model	df	F	Sig.	
1 Regression	10	22.856	0.000	
Residual	89			
Total	99			

Dependent variable: Student's research design quality.

The results from the above table indicate that the value of the correlation coefficient R between variables is 748, which indicates that there is a strong correlation between the set of independent variables and the dependent variable. On the other hand, the value of the adjusted coefficient of R square is 647%, which indicates that 64.7% of the total changes in the design of student's research center depend on the three general variables listed in the equation. The model is evaluated in the ANOVA table.

According to the significance of the F test value, at an error level of less than 0.002, it can be concluded that a regression model consisting of three independent variables and a dependent variable is a good model and a set of independent variables can explain the level of student research quality. The next output is the coefficients table, which shows the effect of each design element in the model.

Table 4: Coefficients of statistical analysis.

Coefficients					
Model	Non-standard coefficients		Standard coefficients	t	sig.
	B	Std. Error	Beta		
Constant	0.105	0.296		0.356	0.02
Functional Factors	0.007	0.058	0.427	0.124	0.03
Physical Factors	0.210	0.039	0.482	5.419	0.000
Socio-perceptual Factors	0.023	0.013	0.361	1.865	0.05

*Dependent variable: The quality of designing student research centers

In the above table, if the level of significance is less than 0.05, it indicates the relationship between the variables. The beta number also specifies the type and severity of the relationship. The findings of the above table indicate that based on the sig column, all of the model column variables have a significant relationship with the index of design quality criteria in student research center. The beta number also shows the type and severity of this relationship (negative inverse relationship, Positive relationship is direct). Therefore, the beta number determines the extent and severity of the effect of each of the influential factors. The study of beta coefficient shows that the degree of

influence of the physical index and the –socio-perceptual index is higher. Therefore, the results show that simultaneously, based on the physical principles, observing social-perceptual factors, students' participation and research mood will be affected. Then, in order to understand the results of the three groups of users, the ANOVA test was used; the results of the analysis of variance are expressed in Table 5.

Table 5: Variance Analysis of ANOVA.

Users	Functional Dimension	Physical Dimension	Socio-perceptual Dimension
	F=3/085 Sig:0.004	F=3/674 Sig:0.001	F=4/043 Sig:0.008
Students	Style A	Style A	Style A
Teachers and staff	Style B	Style A	Style B
Architectural Experts	Style C	Style B	Style C

In order to compare the research design indices, students' grades in one of the users of these spaces were studied through one-side variance of mean, F and a significant level of indicators obtained in each of these three user groups. The results of the table indicate that based on the significance level obtained in the indicators in which that have a sigma less than 0.05, there is a significant difference between the factors, but in cases where the significance level is higher than this value, it is shown that there were no three groups in the index from the perspective of respondents. Then, according to the results of the homogeneous subsets table obtained from the ANOVA statistical model, each of the 8 towers is classified according to the desired index, which is named in Groups A, B, C, and the averages for each of them is listed in the table. The results indicate that there are significant differences between the three different indicators among the views of the three different groups. Consequently, in designing these spaces, the criteria for designing architects should be aligned with the satisfactory spaces for students using the evaluation framework based on the criteria shown in Table 1.

The total of analysis in this research indicates the significant effect of physical, functional and socio-perceptual indices in student's research center design. Based on the results of study, the influence of each factors and the degree of effectiveness can vary. The adaptation of a conceptual model extracted from literature and international experiences combined with the nature of the students' research center in the country and the empirical use of this model illustrates the effectiveness of the model in assessing and recognizing the design criteria for students' research center.

6. CONCLUSIONS

The results of the analysis indicate that it is essential to focus on the socio-perceptual factors along with the design of physical and functional dimensions. The results of the model analysis show:

- Observing the principles of the body is the first step in the research spaces of the students. In designing, architect's checklist and the use of warm colors, proper body rhythm should be considered; proper lighting of spaces should be considered.
- The second step is the socio-perceptual dimension, in this regard; the target age society should be evaluated and taken into account in accordance with the principles of learning and design mood. The design must be such as to enhance the mood of collective participation, innovation and creativity in students, and cause to interesting in the research process.

- Appropriate arrangement of spaces and furniture in order to promote social interactions and promote students' sense of belonging to research spaces can lead to the development of the mood of research in society.
- As the results, created environments affect not only the physical aspects of student research but also through their psychological organization, development and flourishing of the mood of creativity. If these environments design properly to physical characteristics and psychological development of students and children, it would carry the positive features such as complexity, smoothness and fluidity on the development of creativity and innovation of children and students.

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