

# A Comparative Study on the Role of Participatory Teaching to Increase the Creativity of Students in Theoretical and Practical Courses of Bachelor of Architecture\*

Mahdi Ahadzadeh<sup>a</sup>- Ahmadreza Keshtkar Qalati<sup>b\*\*</sup>- GholamHossein Naseri<sup>c</sup>- Vadih MolaaSalehi<sup>d</sup>

<sup>a</sup> Ph.D. Candidate of Architecture, Faculty of Art and Architecture, Branch of Semnan, Islamic Azad University, Semnan, Iran.

<sup>b</sup> Assistant Professor of Architecture, Faculty of Art and Architecture, Kharazmi University of Tehran, Tehran, Iran (Corresponding Author).

<sup>c</sup> Assistant Professor of Architecture, Faculty of Art and Architecture, Branch of Damghan, Islamic Azad University, Semnan, Iran.

<sup>d</sup> Assistant Professor of Architecture, Faculty of Art and Architecture, Branch of Semnan, Islamic Azad University, Semnan, Iran.

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## ABSTRACT

The teaching method in the art-related fields of study, especially architecture, is one of the challenging subjects due to the integration of the theoretical and practical fields. Educational institutions should train people competent both in theoretical concepts and in executive and professional activities and who can play a constructive role as architects in society. In this regard, one of the important educational subjects is how to promote creativity during the training courses, which has been always a matter of discussion among experts and researchers. Participatory teaching, aimed at higher interactions between individuals and educational environments, plays an important role in promotion of the constructive interaction between the environment and individual, and besides improving the quality of education, promotes creativity. The present study aimed to investigate the participatory teaching programs in the field of theoretical and practical training courses to improve creativity. To do so, case and control teaching groups have been formed, and the results obtained from the two groups have been compared. The statistical population of the study includes the students of Architecture (Bachelor of Architecture) who are studying in Semnan's educational institutions. They have been evaluated and compared in the theoretical and practical fields separately, with a participatory teaching approach. The results indicate that in terms of the theoretical courses, the coefficients of Torrance tests of creative thinking variable have been low in both pre-and post-tests as the lowest factor share in theoretical courses belonged to the fluency component with a value of 0.238, and the highest share belonged to elaboration with a value of 0.581. in the post-test, the highest factor share belonged to flexibility with a value of 0.675, while the lowest share belonged to fluency with a value of 0.348. Analyzing the graphical correlation between the pre-and post-test responses, it was revealed that R coefficients were very low, which is indicative of the intervention of the intervening variables in various stages of the study.

**Keywords:** Participatory Teaching, Students of Bachelor of Architecture, Theoretical and Practical Courses, Creativity.

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\*\* E\_mail: a.keshtkar@khu.ac.ir

## 1. INTRODUCTION

The teaching method and the structure of the educational system determine the quality of architectural works (Mansouri 2015). The important components of education include the individuals (student and instructor), the relationships between these people (Karimi Moshaver 2012), teaching methods (Shafaei 2018), course content (Ahmad Nejad Karimi, Mahmoudi Kamel Abad, and Azimi 2023), features of the educational environment and architectural space (Shafaei and Madani 2010), social concepts and educational institutions (Shafii Roudposhti and Mirghafouri 2009), the methodology of final evaluation of the design courses (Nadimi 2010), and the quality of students entrance in the education institution (Mansouri 2015). Design education includes theoretical and practical components in terms of form and content, in the framework of artistic, psychological, and technical issues (Mehdizadeh Saradj and Farsi Mohammadi Pour 2012). The content and method of architectural training courses do not satisfy the needs of the day (Gorji Mahlabani 2010), and the gap between the educational content in the universities and the professional market demands has made difficulties for the majority of the graduates in the job market (Lalbahsh, Ghobadian, and Azizi 2019). In this

regard, the UNESCO Union of Architects has raised some questions about the role of architectural training in the preparation of graduates for the professional space and the relationship between the training and professional work (Rieckmann 2022). Despite various studies, the academic educational system does not meet the objectives, and there are few studies to investigate the effectiveness of education on professional needs (Collazos, Pozzi, and Romagnoli 2021). Meanwhile, the need for an educational system that can create an overlap in all subjects is felt more than before (Pozzi, Flavio, and Donatella 2023). The participatory teaching method can boost the attention among the learners due to the increase in interest in being present in the class (Lalbahsh, Ghobadian, and Azizi 2020). The present study, aimed at investigating participatory teaching in the theoretical and practical fields, seeks to answer the question of “to what extent the participatory teaching approach has been effective in the promotion of students’ creativity in theoretical and practical subjects”.

## 2. RELATED LITERATURE

There are numerous studies in the field of architecture, a part of which is presented in Table 1.

Table 1. Related Literature

Researcher	Title	Objective
Hojjat (2012)	Evolution of architectural education in Iran, from chest-to-chest education to shoulder-to-shoulder education	Comparison of traditional and modern education methods
Talishi et al. (2012)	Nurturing Design Ability of Novice Architects Designers Designing, Implementation, and Testing a Constructivist Learning Environment	The effect of event knowledge and pattern development in improving the ability of beginner designers The effectiveness of constructivist education in the expansion of architectural education methods
Mahmoudinejad (2013)	Explaining the basics of teaching creativity in bio-based architecture	Educational toolkit (headline and master program of bio-based architecture)
Ahmadi (2013)	The position of the discussion group in the creative process in architecture education	Proposing a model of combining critical thinking with a creative approach to the design process
Nikkar et al. (2013)	An Explanation of the Goal Construct and its Application in Generating Motivation in Architecture Novice	18 applications based on the theories of 1. goal setting, 2. goal orientation, and 3. motivation
Keshkar Ghallati (2014)	Revising the teaching method of postgraduate architecture education based on a systemic approach	The effect of the systemic relationship (components: (components and concepts of lessons) and the whole: (curriculum) in the efficiency of the system (learning)
Saghafi et al. (2015)	Investigating the Impact of DCIS Teaching Method (Direct Collaboration of Instructor and Student) on the Learning Process of Architectural Design Basics (Module I)	Improving performance in the method of direct student-instructor collaboration
Karbasi and Sadram (2016)	Architectural Education: Training or Mentoring? Reflections on the The mission of Architectural Teachers	Comparing teaching in the workshop with the speed of the modern world and as a result, the distortion of education due to the need to adapt to the speed of changes

Most educational approaches are based on one of the following (Johnson, Johnson, and Smith 2007).

**Individual approach:** In this approach, the individuals work together and strive only for their personal success. The individual's performance is evaluated based on a pre-determined criterion, and his/her scores do not impact others' (Mojez, Ghorbani, and Rahimi 2016).

**Competitive approach:** Individuals compete alone to achieve individual goals (Lalbahsh, Ghobadian, and Azizi 2019).

**Participatory learning approach:** In this approach, individuals work together to achieve shared goals and strive to improve their learning and that of others (Lalbahsh, Ghobadian, and Azizi 2020). They not only do not compete, but also help each other responsibly and share in successes and failures.

Participatory learning is a structured and disciplined

educational approach in which small groups collaborate to achieve goals (Dahri et al. 2021). It is defined as collaboration to achieve shared goals (Yang 2023). In the participatory learning program, people help each other to learn in small groups (Veldman and Kostons 2019). This approach is an educational instrument with the help of which small groups of students work together to increase individual and collective learning and discuss and solve problems (Slavin 2006). Teaching with the participatory approach is based on the following principles (Tamimy, Rashidi, and Koh 2023):

1. The principle of positive correlation
2. The principle of promotion and face-to-face interaction between students
3. The principle of individual responsibility
4. The principle of social skills
5. The principle of group processing.

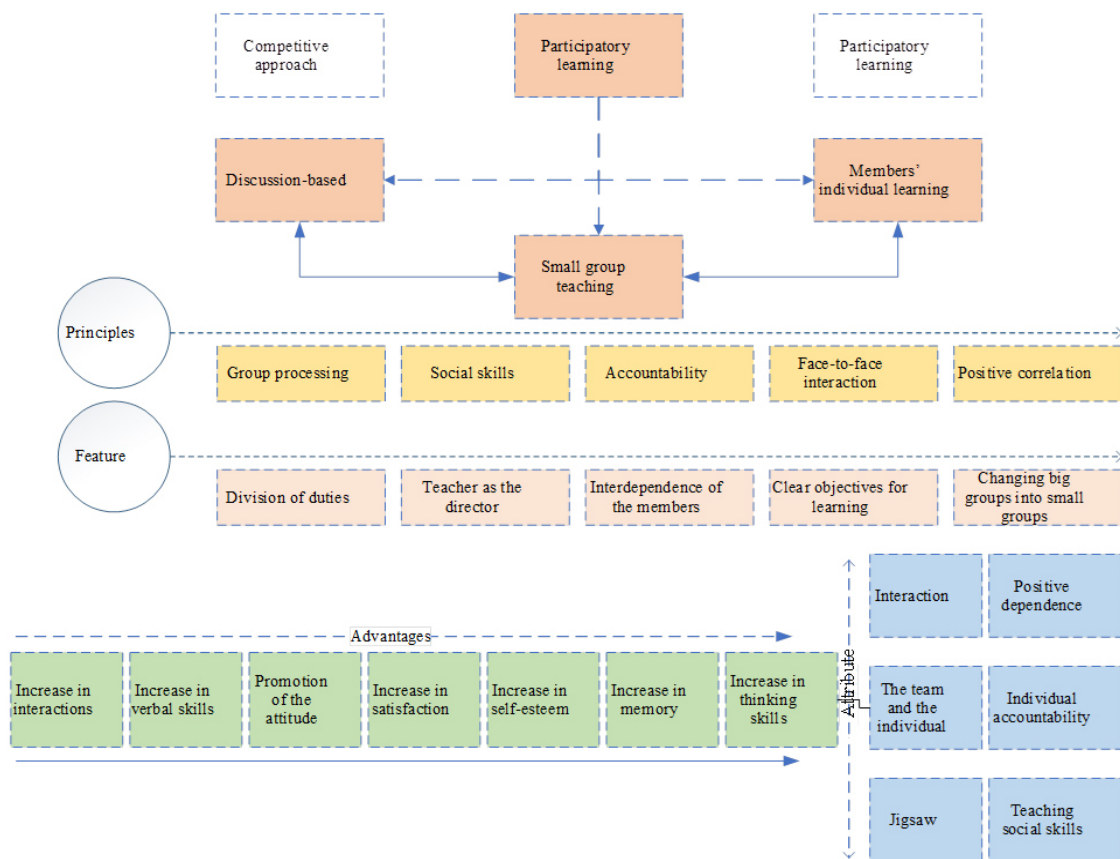


Fig. 1. Participatory Learning Chart

A positive correlation is created by giving a role to each student in the group (Simonsmeier et al. 2020). According to this principle, it is explained to students that they are dependent on others, and one cannot be successful working alone. A group's success depends on the efforts of each and every person in the group. The teacher, while having face-to-face interactions with the students, predicts important details. Close interaction and eye contact between individuals

increase relationships and promote the group's performance (Eskasasanda 2020).

Individual accountability makes the group results recognizable and group members know to help each other. Since the group members may possibly experience the participatory conditions for the first time, the teacher should teach them social skills and help with better relationships (Lalbahsh, Ghobadian, and Azizi 2020). The teacher should monitor the

path to achievement of objectives and effective relationships between the members. Finally, the group members report their performance and each member should explain about his/her effectiveness and elaborate the solutions to improve group work (Laal, Geranpaye, and Daemi 2013).

Participatory groups usually consist of four to six people who are heterogeneous in terms of learning ability, amount of progress, race, etc. The goals should be clear and achievable, and the teacher should be the director, and make sure that all members of the group accept the responsibility of doing part of the work. Finally, the group evaluates its performance and identifies the strong and weak points for self-analysis (Peng et al. 2020).

Various roles should be given to group members because having specified roles makes each student shine in the field of his/her ability, or practice a skill (Laal, Geranpaye, and Daemi 2013).

Creativity is the process of solving various problems and obviating the shortages and stalemates. It is developed after the problem statement, and it is followed by hypothesis formulation and exploration to find a solution. Then, the hypotheses and solutions are verified (Clark 2015). Creativity is to realize a product that is new, original, and unexpected (Stenberg and Lubart 1999). Historical creativity first emerged in human history and nobody has brought it up (Bretzmann 2013).

Creativity is not necessarily innovation (Christenson, Reschly, and Wylie 2012). Innovation can be realized only when it might be considered as a creative solution for production. Creativity indicates the required, but not sufficient conditions for innovation (Shalley and Zhou 2004). Innovation includes three stages: 1) Convergence of a function to fulfillment and concept finding, 2) Concept development, and 3) dissemination of the concept (Skinner, Kinderman, and Furrer 2009).

In participatory creativity (Maher 2012), usually more than one person plays a role in the group (Maher 2010) and all individuals show their creative aspects at various levels (Sherhiy and Karwowski 2014). In the explanation of the position of creativity, the group suppositions have been ignored, while

participatory creativity combines the suppositions in a new way (Sternberg, Kaufman, and Pretz 2001). The participatory creativity process improves the visual and auditory power of the learners, increases their recognition of the surrounding environment, and consequently, improves their interactions (Saunders, Lewis, and Thornhill 2007). Despite numerous studies on creativity in design, it is still difficult to provide an accurate definition (Smith and Miller 2005). However, it seems that besides creativity, imagination is also important because the mental image is one of the most important components of creativity in design (Milliken, Bartel, and Kurtzberg 2003).

### 3. METHODOLOGY

The present study is a quasi-experimental research that uses pre-and post-tests. The statistical population includes the students of architecture in Semnan's universities and higher education institutions in the 2021-22 educational year who counted up to 321 students. 73 students were randomly selected and divided into case (26 students) and control (24 students) groups (24 in pre-pilot study and 23 post-pilot) using cluster sampling. To do so, among the universities in Semnan (including the state, private, and Azad universities), the number of samples was determined using the cluster method based on the ratio of the population. The duration of the research, in which the participatory method was used, was six 90-minute sessions (in two 45-minute sections). For the theoretical courses, six 30-minute sessions were used. The experimental designs for theoretical and practical courses were provided separately, and the results obtained from various courses were also analyzed separately. To evaluate the dependent variable (nurturing creative thinking), the Torrance test of creative thinking was used, due to its high validity and reliability. Originpro was used for inferential statistics analysis. The Torrance test of creative thinking, based on the definition, includes components such as flexibility, fluency, elaboration, and originality. Also, the reliability coefficient of the visual tests has been reported to range from 88 to 99% (Torrance 1974).

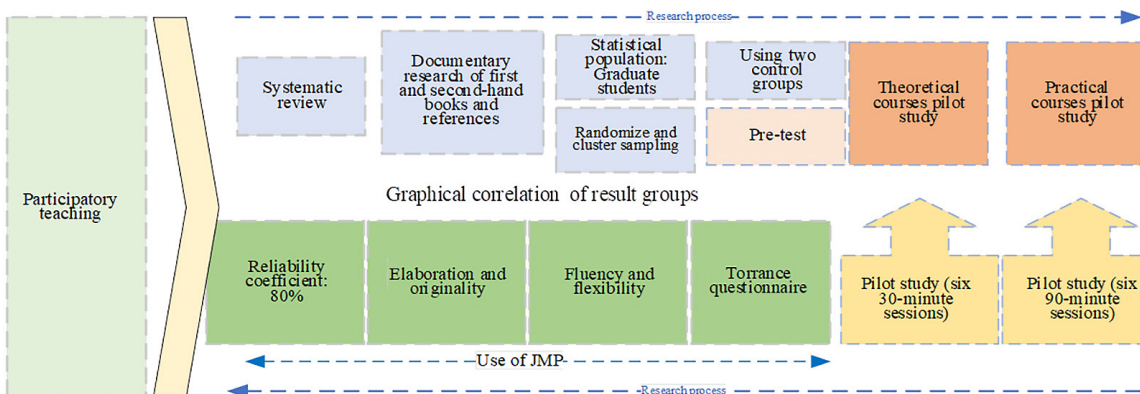


Fig. 2. Research Procedure

The theoretical courses studied include stability, metal structure, concrete structure, and electrical and mechanical facilities. In this method, the students were divided into 4-member groups who were chosen in terms of efficiency, gender, and ethnicity. After the lesson was taught by the professor, the group members dealt with the intra-group activities including problem-solving and analysis in groups, and explained to each other how they obtained the results. These activities took six sessions, and the research validity was approved by the panel of Delphi experts in a prospective study. To check the result at

the end of each course, a five-question test is given. In terms of the workshop courses, in the next step, 4-member groups of students are formed with various levels of ability. To increase the correlation, and ensure the achievement of shared interests, all group members should be justified by the professor. The course instructor should help the students with the selection of design subjects while creating an atmosphere for brainstorming. Then, the steps are carried out in the order of the number to hold the participatory observation training test in the case group (Table 2).

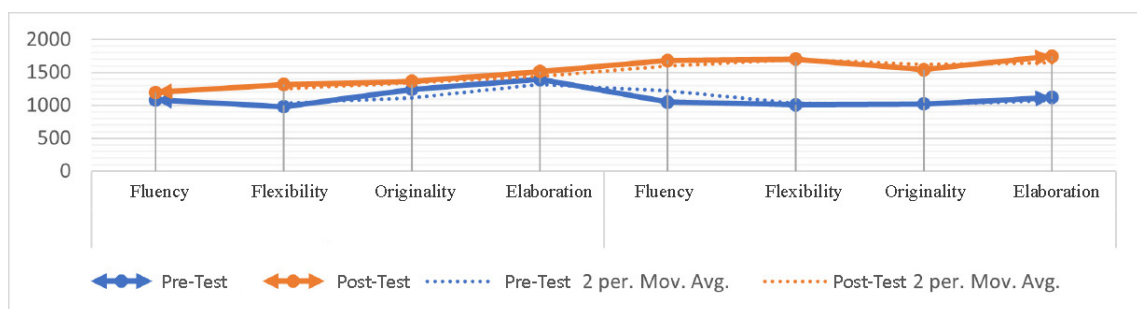
**Table 2. Steps of Carrying out the Participatory Design in the Case Group**

Order of Steps	Operational Process	Order of Steps	Operational Process	Order of Steps	Operational Process
1	Introduction	7	Formulation of the plan of spaces and their area	13	Blotting and making a form individually, while thinking together with others
2	Holding sketches	8	Choosing the right site land	14	Creating a form in different groups based on identified problems, and providing solutions
3	Creating space for discussion about problems and needs	9	Site analysis and identification of its characteristics	15	Volume and plan design individually but with consensus in the group
4	Providing a solution by each student for step 3	10	Creating a brainstorm to present ideas and listing them by one person with the priority of adapting to the surrounding environment	16	Creating a suitable environment for free self and peer criticism
5	Subtle guidance to comply with the approved framework	11	Summarizing and preparing a written report of ideas regarding the priorities	17	A continuous process of critical dialogue at all steps and the final presentation of evidence
6	Determining different groups according to the abilities of each student	12	Different ideations in different groups		

#### 4. FINDINGS

To categorize the groups, for the theoretical courses, 12 students were assigned to the control group, and 10 were assigned to the case group. Also, for the practical courses, 14 female students were assigned to the control group, and 12 female students alongside the rest of the male students were assigned to the case group. The answers had an irregular distribution, which led to different results after conducting the theoretical and design tests.

Based on the results, participatory learning has less improved the creativity in theoretical courses while it has more impacted the practical courses. In the theoretical courses, the highest increase in the Torrance creativity components belonged to flexibility (20%) and the lowest increase belonged to elaboration (4%). The creativity components were increased by 38% in practical courses, with the highest increase in flexibility (44%) and the lowest in fluency (37%).



**Fig. 3. Frequency of Torrance Creativity Components in Case and Control Groups for Theoretical and Practical Courses**

To calculate the correlation rate, the results were input into the JMP Software, and the regression and correlation were used for data analysis. To investigate

whether the data are parametric or non-parametric, the Two-Sample Kolmogorov-Smirnov Test was used (Table 3).

**Table 3. Normality of the Creativity Variables in Theoretical and Practical Courses using the Kolmogorov-Smirnov Test**

P	Kolmogorov-Smirnov T	Standard Deviation	Mean	Variable	Test Type
0.345	0.743	3.27	26.54	Creativity Variables	Pre-Test
0.323	0.812	2.34	32.21	Creativity Variables	Post-Test

As seen in Table 3, the Kolmogorov-Smirnov test is significant for the creativity variables in the Torrance test ( $p=0.345$  and  $0.323$ ). Therefore, the data is not

normally disseminated and the non-parametric analysis should be used.

**Table 4. Spearman's Correlation Coefficient of Creativity Dimensions in the Control Groups in the Test of Theoretical Courses**

Variable	Correlation Coefficient	Significance Level	Variable	Correlation Coefficient	Significance Level
Fluency	0.541	0.000	Fluency	0.817	0.000
Elaboration	0.511	0.000	Elaboration	0.695	0.000
Flexibility	0.536	0.000	Flexibility	0.743	0.000
Originality	0.614	0.000	Originality	0.802	0.000
Mean	0.550	0.000	Mean	0.764	0.000

Based on the results obtained from the case and control groups, it was revealed that there is a lower correlation between the creativity dimensions among the students, and with the conduct of a participatory learning program, the mean correlation is increased. In the control group, the 'originality' was the most correlated variable with other variables with a value

of 0.614, while 'elaboration' was the least correlated variable with a value of 0.511. After the participatory learning program was carried out in the case group, it was revealed that 'fluency' was the most correlated variable with other variables with a value of 0.817, while 'elaboration' was the least correlated with a value of 0.695 (Table 5).

**Table 5. Spearman's Correlation Coefficient of Creativity Dimensions in the Control Groups in the Test of Practical Courses**

Variable	Correlation Coefficient	Significance Level	Variable	Correlation Coefficient	Significance Level
Fluency	0.441	0.000	Fluency	0.863	0.000
Elaboration	0.445	0.000	Elaboration	0.901	0.000
Flexibility	0.396	0.000	Flexibility	0.927	0.000
Originality	0.512	0.000	Originality	0.886	0.000
Mean	0.448	0.000	Mean	0.894	0.000

Based on the results in Table 5, the Torrance creativity components in the control group are very lowly correlated to each other with a mean value of 0.448. In this group, the 'originality' was the most correlated variable with a value of 0.512, and the 'flexibility' was the least correlated variable with a value of 0.396. After the participatory learning program was carried out, the creativity components were increased by 0.894 on average. The 'fluency' was the

least correlated variable with a value of 0.863, and 'flexibility' was the most correlated variable with a value of 0.927.

The internal correlation matrix of the creativity variable in theoretical and practical courses was used for linear and multivariate regression. Based on the results in the matrix graph, it can be said factor correlation is not linear. Therefore, it would be appropriate to use multivariate regression (Fig. 4).

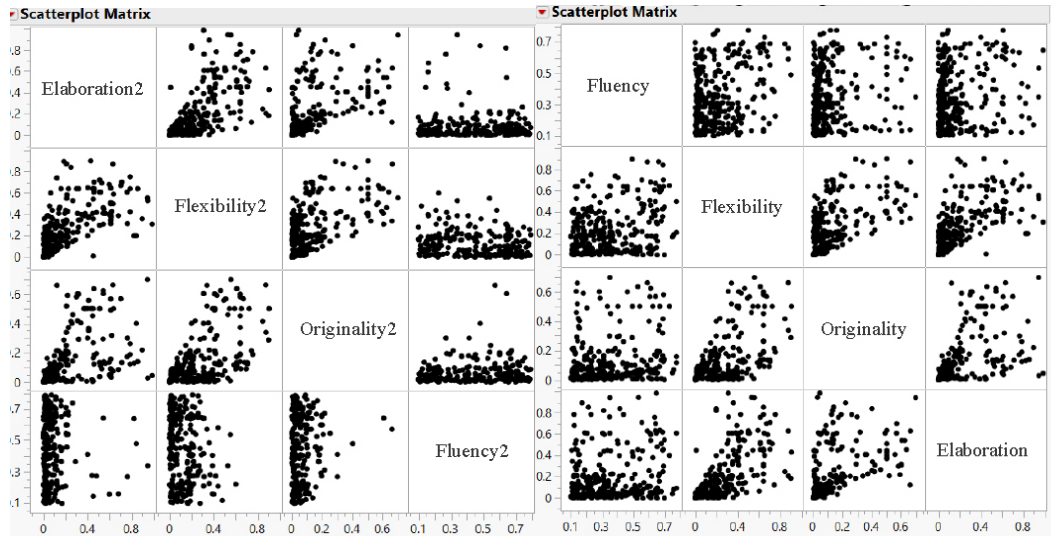


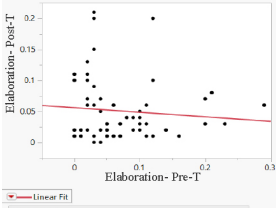
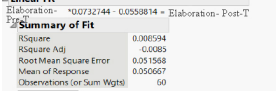
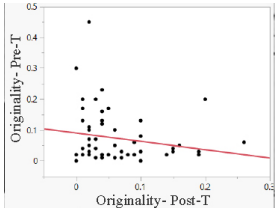
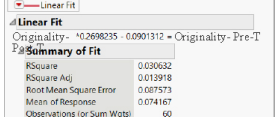
Fig. 4. Correlation Matrix of Creativity Variables in Theoretical and Practical Courses

According to the results obtained from multivariate regression, it was revealed that in theoretical courses and before the pilot study, the factor share of creativity components had a lower coefficient of determination compared to the post-pilot study. In practical courses and in the pre-test, the highest coefficient of determination belongs to flexibility (0.672) and the lowest coefficient belongs to originality (0.384). After the pilot study and extraction of coefficients of determination, it was revealed that these coefficients significantly increased, and the highest factor share

belonged to flexibility (1.000), while the lowest share belonged to originality (0.656). Then, a graphic correlation was drawn between the responses of the control and case groups to measure the effectiveness of the variables and the accuracy of the test, and it was found that fluency and flexibility had a high correlation, indicating the precise effect of the test design on these two components. However, the elaboration and originality had different answers which is indicative of the entrance of intervening variables in this field (Table 6).

Table 6. Multivariate Regression and Graphical Correlation in Torrance Creativity Components for Practical Courses

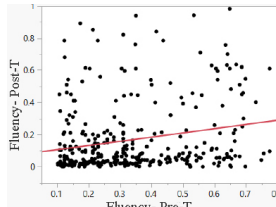
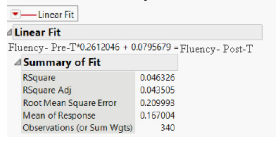
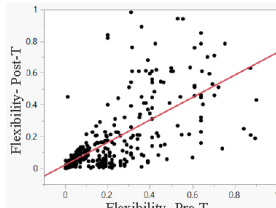
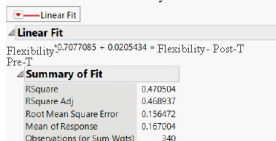
Graphic	Degree of Freedom	Significance	t	$\beta$	B	F	Coefficient of Determination	Scale
	383	0.000	46.522	0.781	1.000	527.222	0.548	Pre-Test
								Fluency
								Post-Test
								Fluency
	383	0.000	42.152	0.732	1.000	405.122	0.741	Pre-Test
								Flexibility
								Post-Test
								Flexibility
	383	0.000	40.223	0.662	1.000	217.343	0.673	Pre-Test
								Flexibility
								Post-Test
								Flexibility
	383	0.000	38.239	0.648	1.000	199.943	1.000	Post-Test
								Fluency

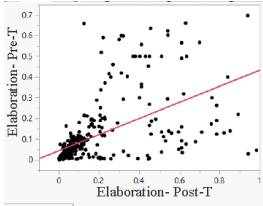

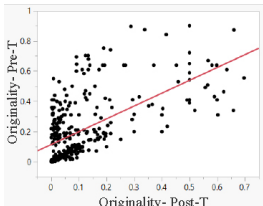
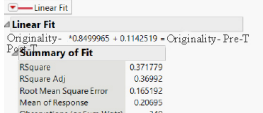
Graphic	Degree of Freedom	Significance	t	$\beta$	B	F	Coefficient of Determination	Scale
	383	0.000	8.958	0.664	1.000	201.612	0.589	Pre-Test
	383	0.000	11.134	0.662	1.000	643.623	0.811	Post-Test
	383	0.000	18.441	0.652	1.000	849.683	0.384	Pre-Test
	383	0.000	19.144	0.665	1.000	349.603	0.654	Post-Test

As seen in Table 6, the Torrance creativity variables in theoretical courses have low coefficients both in pre-and post-tests, as the lowest factor share of the component in theoretical courses belongs to 'fluency' (0.238) and the highest share belongs to 'elaboration' (0.581). in the post-test, the highest value belongs

to 'flexibility' (0.675) and the lowest value belongs to 'fluency' (0.348). in terms of the graphical correlation between the pre-and post-test responses, R coefficients are very low, which is indicative of the intervention of intervening variables in pilot studies (Table 7).

**Table 7. Multivariate Regression and Graphical Correlation in Torrance Creativity Components for Theoretical Courses**

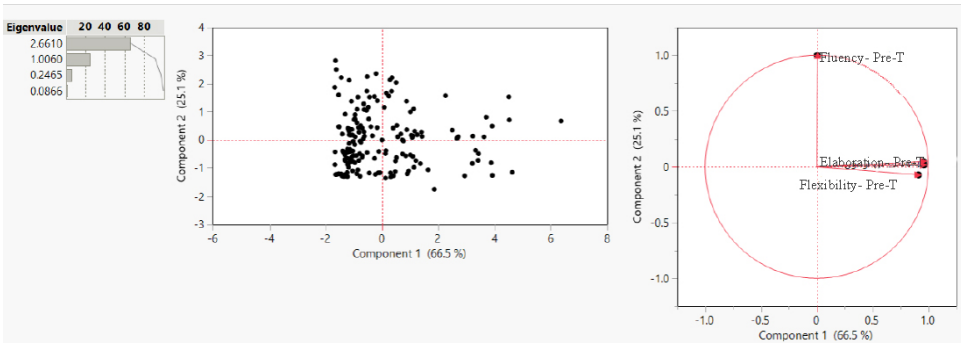
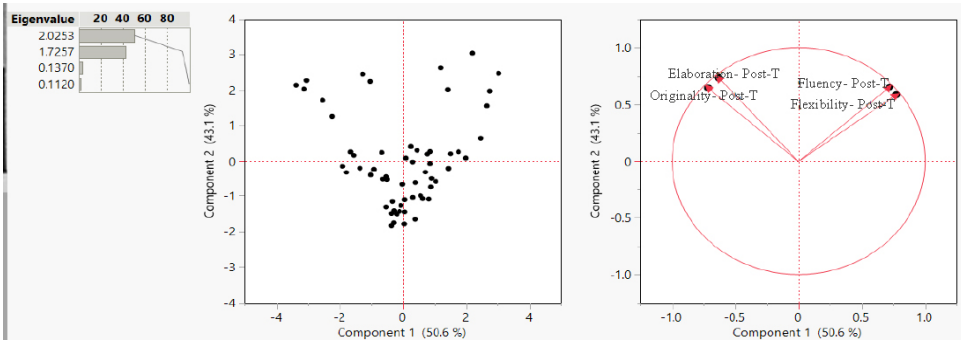
Graphic	Degree of Freedom	Significance	t	$\beta$	B	F	Coefficient of Determination	Scale
	383	0.000	46.522	0.781	1.000	527.222	0.238	Pre-Test
	383	0.000	42.152	0.732	1.000	405.122	0.348	Post-Test
	383	0.000	40.223	0.662	1.000	217.343	0.517	Pre-Test
	383	0.000	38.239	0.648	1.000	199.943	0.675	Post-Test

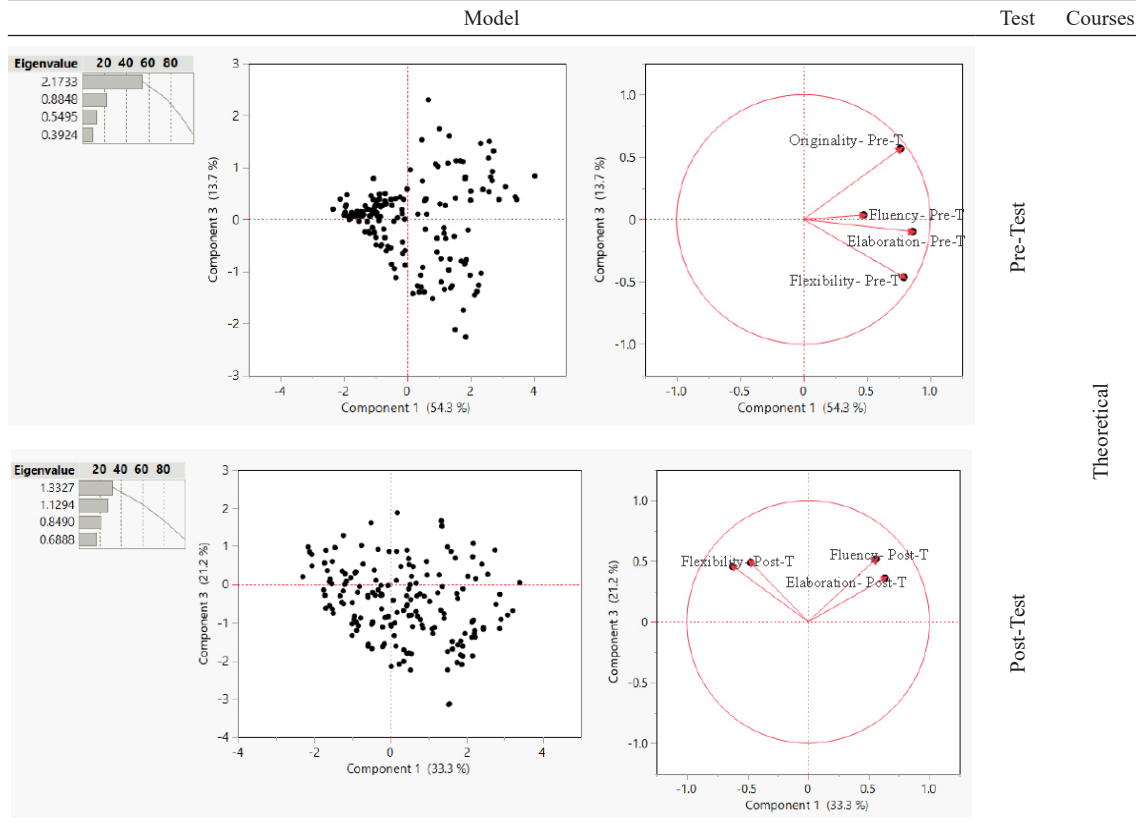
Graphic	Degree of Freedom	Significance	t	$\beta$	B	F	Coefficient of Determination	Scale
	383	0.000	8.958	0.664	1.000	201.612	0.581	Pre-Test
	383	0.000	11.134	0.662	1.000	643.623	0.628	Post-Test
	383	0.000	18.441	0.652	1.000	849.683	0.467	Pre-Test
	383	0.000	19.144	0.665	1.000	349.603	0.566	Post-Test

The PN modeling was performed for Torrance creativity components and pre-and post-tests for theoretical and practical courses. It was revealed that in the post-test step, the highest values of components were achieved for the practical courses. Also, uniform

data dissemination was observed in the post-test step, however, the increase in the value of components in the theoretical courses was not significant, and only uniformity was seen in the type of response (Table 8).

Table 8. The PN Modeling for Torrance Creativity Components in the pre- and Post-Tests

Model	Test	Courses
	Pre-Test	Practical
	Post-Test	Practical



## 5. DISCUSSION

Based on the difference between inferential and descriptive statistics, the analysis is done based on inferential statistics. The findings indicate the effectiveness of the participatory method on the quality of learning the theoretical and practical courses. It should be noted that this effectiveness has been higher in practical courses. In the theoretical courses, after conducting the pilot study of participatory learning, it was revealed that 'fluency' was the most correlated variable with other variables, which indicates that in the theoretical courses, the ability to make a significant correlation between the thought and the expression can more impact other creativity components and improve these components. In the practical courses, the quality of the provision of new solutions and answering the questions were more correlated compared to other components. It enables the student to use new thinking and view the components to improve other components.

In the next step, it is found that participatory learning increased the factor share of variables by 20%, with the highest increase pertaining to 'flexibility'. It seems the participatory learning programs are mainly focused on the provision of a new pattern and various solutions both in theoretical and practical courses.

The type of progress in participatory learning programs to answer the questions is focused on generalities and providing various solutions instead

of explaining and answering a single question. It is revealed in the PN modeling that the use of a participatory learning system can provide a mental balance between creativity variables in the theoretical and practical courses, however, these components are increased more in the practical courses.

## 6. CONCLUSION

One of the reasons behind the inefficiency of the architectural design teaching method is that it does not allow for participation and interaction between the graduates during the process of designing. Therefore, the provision of a pattern of architectural design teaching that creates a space for participation and interaction would be effective. The results of the present study about the investigation of Torrance creativity components indicate that architectural design teaching with participatory method increases the efficiency while improving the synergy. Also, besides improving the correlation, the students would feel more responsible for their environment and improve their environmental perception and imagination, and by doing so, solve the problems in groups through identification of the environmental issues. In the design workshops, besides creating a space for interaction and dialogue, the students not only improve each other's design skills, but they will seek to solve problems by explaining shared goals. Thus, the teaching of participatory architectural

design eliminates the gap between education and society. Participatory education, while describing life issues and achieving a detailed perception of the realities of society, through the organization of social relations and experience, leads to innovation and creativity. Therefore, the use of a participatory

teaching method that can meet domestic needs should be based on the cultural indicators and available capacities and platforms in the Iranian faculties. Also, the use of this method should be specially focused on the practical courses, and it should be mixed with other methods for theoretical courses.

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## CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

## MORAL APPROVAL

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

## PARTICIPATION PERCENTAGE

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

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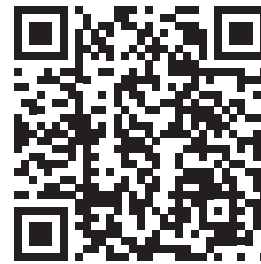
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