

Influence of Architectural Education Systems on the creativity of graduates

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ABSTRACT: The integrated teaching of practical and workshop courses and the use of a combined teaching method are important factors of architecture education. In the long-term education of architecture in the form of a master's degree, there has been an emphasis on combined education, and with the change of the six-year architecture education system to a four-year period, this education was changed in a separate way. One of the important goals of architecture education is to promote students' creativity, and educational systems and educational processes are effective in promoting this creativity. This research, using a combined method, seeks to investigate the effect of six and four-year architecture education methods on improving the creativity of architecture graduates. Statistical community in this research, were selected from two groups of 30 graduates of architecture of Islamic Azad University of Tabriz branch, in two continuous master's and continuous bachelor's degrees. Data collection was done through Abedi's standard questionnaire and data analysis was done using independent two-sample t-test. The results of the data analysis indicate that combined education in the six-year continuous education method is an effective and targeted education due to the promotion of creativity of architecture graduates. High creativity helps architecture graduates to adopt a suitable solution and create creative designs when designing and dealing with problems, also, choosing the appropriate teaching method by the professors and emphasizing the combined education will make the students' creativity flourish.

Keywords: *Dynamic education, Architecture, Graduates, Creativity.*

INTRODUCTION

Cultivating graduates who have the ability to solve problems in design projects is one of the important goals in architecture education. Enhancing creativity is one of the most influential factors in architectural education, and architectural education methods should be planned in order to enhance students' creativity. In the long-term education of architecture in the form of a master's degree, there has been an emphasis on combined education, and with the change of the six-year

architecture education system to a four-year period, this education was changed in a separate way. The inconsistency of professors in segregated education causes a decrease in the quality of education, and as a result, students' skills and abilities decrease. This research seeks to investigate the effect of six and four-year architecture education on the creativity of architecture graduates. In [Figure \(1\)](#), the theoretical framework of the research is shown.

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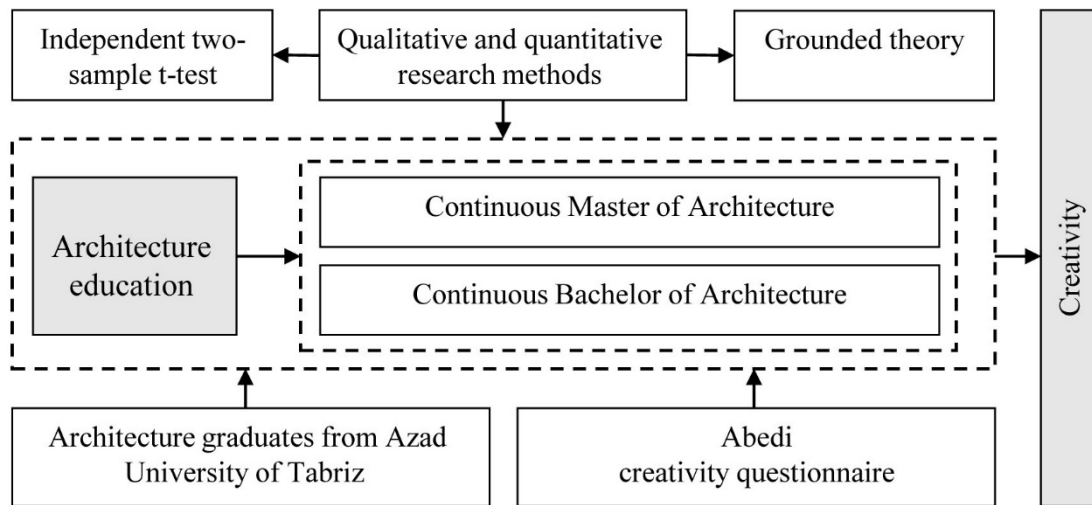


Fig 1. The theoretical framework of research

THEORETICAL FOUNDATIONS AND BACKGROUND

Obtaining a university degree in any educational system requires teaching students a certain level of skills. Teaching and learning strategies have different results in different subjects, which sometimes causes double pressure on learners (Soliman, 2017). In the design process, optimal solutions are used to create concepts by collecting and classifying suitable answers. Therefore, different solutions can be proposed for each design problem. (Parsaee, 2016). Creative learning environments are used to promote creativity in learners (Swanzy et al., 2023). One of the influential factors in the development and improvement of the scientific level of societies is education (Tasci, 2015). One of the goals of architecture education is to train an efficient workforce in order to improve the quality of people's lives (Golabi et al., 2017). Flexible education should be used in architecture education (Ghoniem & Eweda, 2018). The architectural design studio plays an important role in the development of education (Mohammed & Elbelkasy, 2016). Architectural design studio is a place for teaching architecture and doing exercises (El-Latif et al., 2020). Basic design concepts are taught in architectural design studios (Dizdar, 2015).

The purpose of architectural design studio is to improve problem solving skills in students and all courses are planned to improve these skills (Priya et al., 2020).

In design studios, students learn practical skills and engage in debate (Ustaomeroglu, 2015). In architectural design studios, models, sketches, software are used for modeling (Özeren et al., 2023).

Creativity has been with man since the beginning of his life (Mahdi et al., 2021). Attention to the creativity factor has always been seen in discoveries (Kondo et al., 2022). Creativity in the 21st century is one of the most important abilities in

various fields (Ruiz-del-Pino et al., 2022). Creativity has a great impact on success in today's complex world (Rahimi & Shute, 2021). Creativity is one of the first steps in the process of architecture education (Danaci, 2015). Creativity is one of the main factors in the education of architects, and the promotion of creativity has an impact on the future career of architects (Hemdan et al., 2022). There are many definitions for creativity (Horikami & Takahashi, 2022). Creative activity depends on a specific time and place (Doehne & Rost, 2021). Creativity produces innovative ideas (Lee & Lee, 2023). Creativity includes divergent thinking (creating multiple ideas) and convergent thinking (ability to choose the best solution) (Booton et al., 2023). Creativity is a new solution to the design problem (Vo & Asojo, 2021). Creativity is the ability to go beyond similar traditional relationships and create new forms and interpret them meaningfully (Pires & Varajão, 2024). Creativity is the ability to produce an original and appropriate work (Li et al., 2024). The core of creative thinking is divergent thinking, which involves combining unrelated information in meaningful ways (Jin et al., 2024). The methods of explaining the interrelationships between phenomena are different among researchers, but most of them talk about the existence of a relationship between creativity and innovation (Gajdzik & Radosław Wolniak, 2022). Creativity is the driving force of innovation (Li et al., 2024).

Guilford (1967) defines convergent and divergent thinking as two main forms of human thinking, linking convergent thinking to intelligence and divergent thinking to creativity. According to the theory provided by Guilford, divergent thinking comprises several important factors, including fluency, which means generating identical thoughts; flexibility, which means generating diverse and unusual thoughts; originality (initiative), which means using unique and novel solutions; elaboration, which means generating

details (Enayati & Abedi, 2016). Oo et al. (2024), in their research "Design-based learning in higher education: Its effects on students' motivation, creativity, and design skills," indicated that the performance of the experimental group was better than the control group and no significant interaction between groups and genders was observed in the development of motivation, creativity and design skills. In addition, achievement motivation affects creative performance and design skills. Aghayan et al. (2022) indicated that controlling convergent and divergent thinking can play an important role in creativity and ideation in the design process. Arvand et al. (2022) indicated that the enhancement of cognitive resilience has a significant relationship with improving the mental creativity of students of the military university through a positive impact on maintaining and training mental skills such as mindfulness and critical thinking. Rahbar et al. (2023) indicated that Considering the fact that a creativity-based curriculum in teacher training courses requires an interactive, open, and free space, along with the prescribed program, such curriculum requires free and flexible space that is in accordance with the executive requirements and features. The use of new educational technologies, as well as the integration of act technologies in all curriculum elements, is recommended. Moreover, it is suggested that change and transformation in the curriculums of the teacher-training centers should take place in an attempt to make a curriculum of teaching creativity or integrating creativity in the content of other courses, such as the course of principles and teaching methods or the course of the theories of teaching and learning which are more suitable for this work to train creative student teachers in order to take a positive step toward improving the quality of the curriculum of Farhangian university in an attempt at growing and developing the creativity of student teachers. Khorramy et al. (2022) indicated that educators emphasize divergent thinking in their training. Alizadeh Miandouab et al. (2022) indicated that the lack of a comprehensive method in teaching architecture has caused limitations in this field. Heidari et al. (2018) emphasize cooperative learning and interaction in the educational process. Sedaghati & Hojat (2019) stated that the master's degree has been more successful in all three areas of insight, knowledge and ability. Sadeghi & Hojat (2019) conducted a comparative study of contiguous and non-contiguous master's degree courses in architecture from the perspective of professors, employers, and graduates in Iran. This study used George Beredy's technique in four phases: description, interpretation, juxtaposition, and comparison. In the first phase, the content of architecture education and the goals of the curriculum have been described. Interpretations and opinions (about this content, including knowledge, insight, and ability) of professors, employers, graduates, and students of two considered courses were collected through interviews and questionnaires in the next step. The comparison was then conducted after juxtaposition. The

results indicated that they introduced a contiguous master's degree as the most suitable course. Zeinali & Farahza (2020) carried out a study to compare architecture curriculums in the top universities in the world and Iran and concluded that in top universities of the world, greater weight is given to integrative courses rather than technical courses and architectural design courses. According to the syllabus approved in 1998 in Iran, these courses include lower units at Tehran University (2013) and Ferdowsi University of Mashhad (2016). This ratio has been improved in the approved syllabus of Shahid Beheshti University (2005) and Yazd University (2017). Motiei et al. (2018) explain that the contiguous teaching of basic courses, integrated courses, and practices with an emphasis on individual and group practices can be used to increase the motivation, emotional intelligence, and creativity of architecture students to achieve a dynamic and targeted education system. Sedaghati & Hojat (2020) compared the success rate of educational courses after the Cultural Revolution. They found a significant difference between graduates of contiguous master's degree courses and graduates of non-contiguous bachelor's and master's degree courses in all areas of foundations and architecture education components. Graduates of contiguous master's degree courses were superior to the graduates of non-contiguous courses.

MATERIALS AND METHODS

In this mixed research, in the quantitative phase, a descriptive study of the causal-comparative type was used and independent two-sample t-test was used to analyze qualitative data. Qualitative data were analyzed through interviews with architects and professors based on the theories derived from library and bibliographic sources considering grounded theory. A statistical society comprised architecture graduates of the Azad University of Tabriz with two contiguous MSc and BA degrees. This study used a convenient sampling method and selected 30 graduates from each group. Graduates of contiguous MSs degrees (n=30) were chosen from students who entered the university from 1995 to 1999, while BA graduates (n=30) were selected from those who entered the university during 2000-2004. The quantitative data were collected from a creativity questionnaire by Abedi. The creativity questionnaire by Abedi consists of 60 items with a reliability coefficient of 0.83 obtained in the retest method. Items of this test are based on four subtests: originality, fluency, flexibility and elaboration. The total score of each sub-test indicates the score obtained by the subject.

RESULTS AND DISCUSSIONS

In this research, firstly, by using the information obtained from interviews with architects and professors and based on the underlying theory, coding was done and 16 initial concepts, one core category and one final core category were obtained. The results of this study are shown in Table 1.

Table 1. Categories derived from qualitative data based on the Grounded Theory

Concepts	Core categories	Description	Core category
1.Originality power 2.Contemplate 3.Creation 4.Outstanding 5.Inspiration perception 6.Flexibility 7.Curiosity 8.Flucyency 9.Innovation 10.Expand 11.Search 12.Exploration 13.Problem-solving 14.Critical thinking 15.Unique response	Creativity	The promotion of students' creativity is a substantial case in architecture education. When creativity is increased, a person deals with a problem, becomes curious, criticizes that case based on different perceptions, and can create a unique response using the power of originality and initiative.	Dynamic and targeted education: according to this category, education must be purposeful to increase the creativity of students, which subsequently fosters more productive and skilled architects

Improving the creativity of architecture students is one of the main factors of education and teaching methods. By increasing creativity, the student examines and criticizes the issue when dealing with problems, and can use the power of initiative to create a suitable answer to the problem. Based on dynamic and purposeful education, education should be planned to promote students' creativity. By improving the creativity of students, we will witness the cultivation of successful architects.

In the quantitative phase, graduates of both the old education system (contiguous MSc degree in architecture) and the new system (contiguous BA degree) filled out a standard questionnaire on creativity by Abedi. Data analysis was done using an independent two-sample t-test.

One of the following hypotheses is considered in the case of the influence of two architectural education systems on the creativity of graduates:

H_0 : in the opinion of respondents, no difference exists between the mean values of two long-term (contiguous MSc degree) and short-term (contiguous BA degree) architecture education systems.

H_1 : in the opinion of respondents, a difference exists between the mean values of two long-term (contiguous MSc degree) and short-term (contiguous BA degree) architecture education systems.

After the normality of the variables was confirmed, the independent t-test was used to test this hypothesis. The normality of observations is examined based on the Shapiro–Wilk test (Table 2).

Table 2. Normality of observations using Shapiro–Wilk test

	Shapiro-Wilk		
	Statistic	df	Sig.
Flucyency	0.963	60	0.068
Elaboration	0.972	60	0.174
Originality	0.98	60	0.439
Flexibility	0.943	60	0.007

In this Test, the null hypothesis (H_0) indicates normality, while the opposite hypothesis indicates non-normality of data. According to the significant value greater than 0.05 for the three components of flucyency, elaboration, and originality, their data can be assumed as normal data.

Since the significance value of flexibility is less than 0.05, its normality presumption is rejected. Therefore, this component must be normalized using the Box-Cox transformation (Table 3).

Table 3. Normalizing flexibility using Box-Cox transformation

Flexibility	Shapiro-Wilk		
	Statistic	df	Sig.
	0.974	60	0.222

Now, mean values are compared for regular variables. The variance equality test is an essential phase to compare mean values (Table 4).

Table 4. Variance equality test

	Levene's Test for Equality of Variances	
	F	Sig.
Fluency	0.208	0.65
Elaboration	0.708	0.404
Originality	0.876	0.353
Flexibility	0.034	0.854

Levene's Test considers the null hypothesis for equality of variances, while the opposite hypothesis indicates variance inequality. According to results obtained for all four variables, variances were equal so that a t-test can be used.

Table 5. Independent two-sample t-test using SPSS software

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Fluency	-2.983	58	0.004	-3.56667	1.19547	-5.95967	-1.17367
Elaboration	-9.683	58	0	-6.06667	0.62655	-7.32085	-4.81249
Originality	-3.161	58	0.003	-3.46667	1.09684	-5.66224	-1.2711
Flexibility	-2.587	58	0.012	-0.63795	0.24658	-1.13152	-0.14437

According to Table 5, the influence of these two architecture education systems on fluency, the Sig. (2-tailed) value equaled 0.004, which is less than 0.05. Therefore, a difference exists between the mean values of the two architecture education systems regarding the fluency component, and H_0 is rejected at the confidence level of 95%. Since the mean difference between the two groups is less than zero, the mean value of the short-term system is less than the long-term system in terms of fluency. Regarding the influence of these two architectural education systems on the elaboration, Sig. (2-tailed) value equaled 0.000, which is less than 0.05.

Therefore, a difference exists between the mean values of the two architecture education systems regarding the elaboration component, and H_0 is rejected at the confidence level of 95%. Since the mean difference between the two groups is less than zero, the mean value of the short-term system is less than the long-term system in terms of elaboration.

Regarding the influence of these two architectural education systems on originality, Sig. (2-tailed) value equaled 0.003, which is less than 0.05. Therefore, a difference exists between the mean values of the two architecture education systems regarding the originality component, and H_0 is rejected at the confidence level of 95%. Since the mean difference between the two groups is less than zero, the mean value of the short-term system is less than the long-term system in terms of originality. Regarding the influence of these two architectural education systems on flexibility, Sig. (2-tailed) value equaled 0.012, which is less than 0.05.

Therefore, a difference exists between the mean values of the two architecture education systems regarding the flexibility component, and H_0 is rejected at the confidence level of 95%. Since the mean difference between the two groups is less than zero, the mean value of the short-term system is less than the long-term system in terms of flexibility.

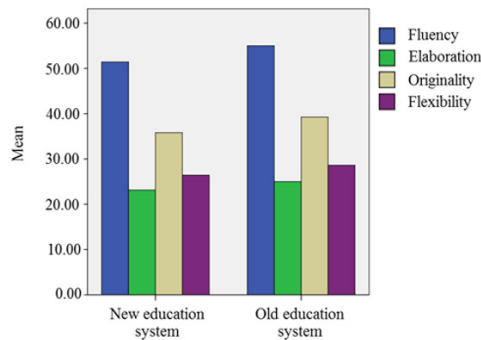


Fig 2. The mean value of creativity components in two old and new architecture education systems

Figure 2 compares four components of fluency, elaboration, originality, and flexibility in two new (contiguous BA degree in architecture) and old (contiguous MSc degree in architecture) education systems. This Figure depicts that the old education system is more influential than the new education system in terms of all four components.

The continuous master's education system (six-year period) had a greater impact on improving the creativity of architects. In this system, the high skills of the architect force him/her to examine the problem based on detailed analyzes and provide a unique answer for it. High creativity helps the architect to improve his/her design skills and choose the best design option by creating different ideas. In this system, it can be explained that integrated education allows students to improve their drawing and modeling skills. They can also choose the best option

for design by examining various factors. In this educational system, the high creativity of architects helps them to be more successful in transforming ideas into architectural designs and drawing architectural drawings, making models and drawing 3D images.

CONCLUSION

Improper teaching techniques are the most important and influential factors that lead to unproductive and inefficient architects. According to research results of the quantitative phase, the long-term architecture education system had more influence rather than the short-term education system in terms of all four components of creativity (fluency, elaboration, originality, and flexibility) (Figure 3).

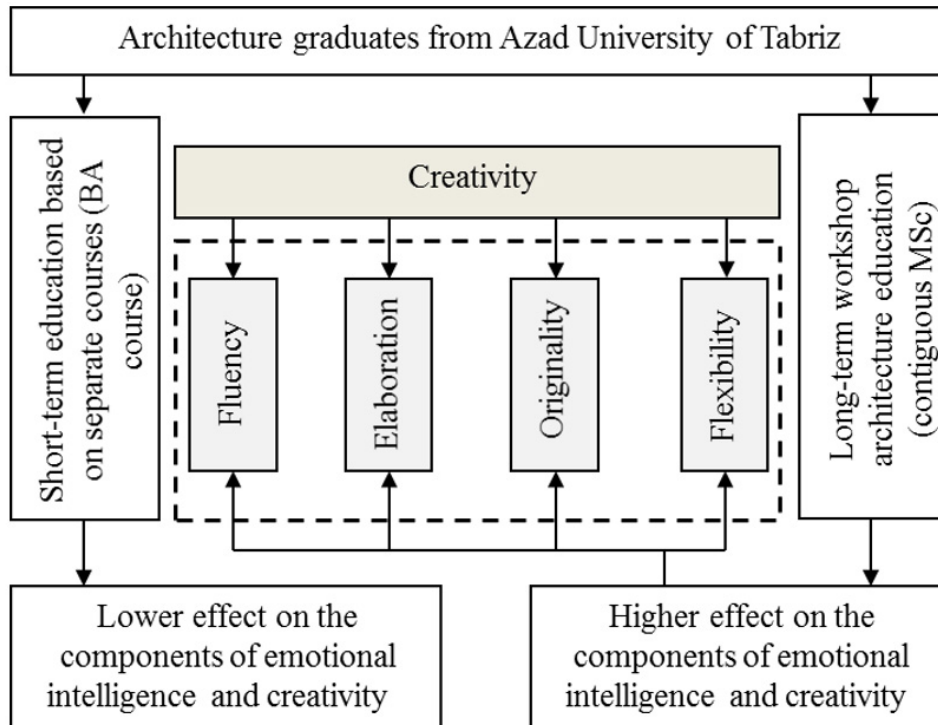


Fig 3. Model of influence of contiguous BA and MSc education systems on the creativity of graduates

If education is based on the rational method, acceptable results will be obtained. In the old education system of architecture, the basic courses were taught simultaneously in integrative courses 1, 2, and 3, which improved the skills of students in the design context, helping them to find a suitable solution for designing. The improved skills of architects. Moreover, graduates of long-term contiguous MSc courses have longer work experience and skills; hence, it is logical that these components are more in long-term contiguous MSc courses through six-year courses. The long-term architecture education system improved the skills of students by integrating the courses and coordination between professors in holding classes and selecting common practices. Nevertheless, it is essential to improve these capabilities, which

increase the self-confidence of students, motivating them to generate new ideas that, in turn, make students creative. In short-term (contiguous BA), skills and, subsequently, academic motivation of students are decreased due to miscellaneous training and personal choice of design prerequisites, non-coordination between professors in selecting practices, and lack of a logical connection between syllabuses. Hence, some measures must be taken to increase the academic motivation and creativity of students. According to this study, teaching architecture courses based on an appropriate teaching technique which was done in the long-term education system (contiguous MSc) in integrative courses- can improve the creativity of students; therefore, the long-term education system is a dynamic and targeted education that improves the quality of education (Figure 4).

Fig 4. Analytical model of the effect of the long-term educational method of architecture (six-year period) on the promotion of creativity of architecture graduates

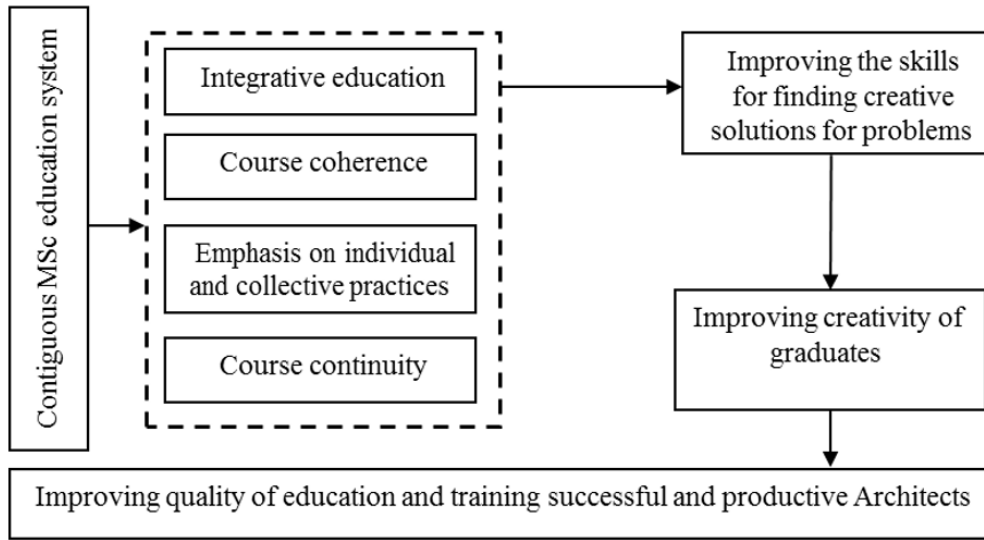


Figure 5 shows some of the problems of architecture graduates. The mentioned items have a great impact on the training of unsuccessful architects.

High creativity allows an architecture graduate to find a suitable

answer to a design problem during design and to achieve a practical design by choosing a suitable concept in his design process. Based on the research, the appropriate teaching method, such as the combined teaching method, improves the creativity of the graduates. (Figure 6)

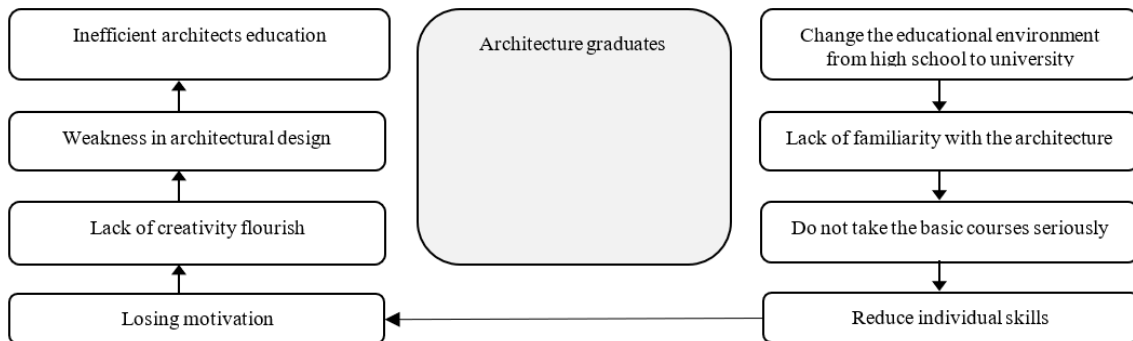


Fig 5. Some of the challenges of Architecture graduates

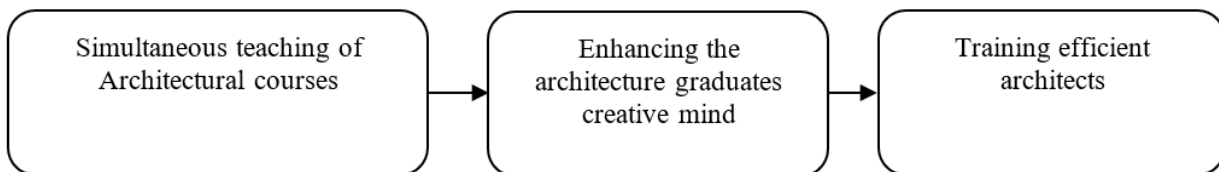


Fig.6. The effect of the combined teaching method in architecture courses on the education of successful architects

CONFLICT OF INTEREST

The author declares that they have no potential conflict of interest regarding the publication of this work. In addition, the author has completely complied with ethical issues, including plagiarism, informed consent, misconduct, data fabrication and falsification, double publication and submission, and redundancy.

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