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Comparison of creativity-oriented educational program in the field of architecture of three universities of Tehran, Shahid Beheshti and science and technology

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ABSTRACT

The main purpose of teaching architecture is to achieve general efficiency and cultivate creative talent, transfer of knowledge and general skills of the architecture profession to students in this field. Currently, the curriculum planning of architecture education in Iranian universities is based on the approvals of 1300 and the educational program and approach has not been specifically evaluated for students' creativity. The purpose of this study is to evaluate the application of divergent thinking and creativity in the programs and approach of teaching undergraduate architecture in the universities of Tehran, Shahid Beheshti and Science and Technology. Because it seems that in the architecture education system in Iran, more than divergence, the focus is on a convergent approach that does not allow students to be creative during education. This can further lead to a reduction in creative approaches in contemporary Iranian architecture. Therefore, the longest and most important universities of architecture in Iran have been selected for study. The question is how to explain the curriculum of architecture universities in order to develop student creativity? The present applied research is of quantitative type and finally the statistical results have been analyzed by interpreting qualitative data of how architecture is taught in these universities. The raw data obtained from the questionnaire to test the hypotheses with the help of computer and software for each university were recorded and analyzed through SPSS21 software and converted into the information used. Based on the findings, by reviewing and redefining the rules and standards that include all relevant and appropriate factors in the development of curriculum that will be the basis of individual creativity based on divergent thinking, it is possible to provide educational development in terms of creativity. Also, the feedback of statistical results showed that the subsets of readiness, development, evaluation, upbringing and insight, considering the importance of divergent thinking, will be effective in the emergence of creativity in the eyes of students and professors of these universities if included in the curriculum approach. Based on this and in comparison, Shahid Beheshti University has been more successful than the other two universities in implementing the divergent curriculum and approach. Because the curriculum approach in this university has been able to diverge in the approaches by modifying the curriculum approved by the Ministry of Science and Research and determining the extracurricular courses that develop creativity and also providing the possibility of closeness between professors and students and emphasizing the architectural criticism course to foster creativity. Enter your training.

Keywords: *Architectural Education, Curriculum, Divergent/Non-Conformal Thinking, Creativity, University*

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1. Introduction

Since design is a creative topic and teaching it, which deals with the flourishing of creative talent, is also a creative endeavor in itself requiring continuous creative efforts by instructors and planners toward communicating with students. Creativity is among the most significant functions of the educational system. This is due to the fact that it is among the most prominent human traits and has played a special role in human development [1]. In line with studies and reviews of the undergraduate curriculum of architectural engineering, the primary purpose of teaching this major is to achieve general efficiency and cultivate creative talent, knowledge transfer and general skills of the architecture profession to students. Such a definition of the objcttve is quite broad and can be planned for in multiple and varied ways [2]. In understanding the current state of Iranian architecture and its origins and evolution, one can not neglect modern architectural education, the content of this education and the institutions in charge of it. The work of architectural education from the professional field to the field of universities, began in certain institutions in the early 20th century, culminating with the establishment of the first new school of architecture in Iran at the University of Tehran in 1939-1940. This development transformed architectural education in the country and changed the fate of Iranian architecture. Nearly two decades later, the National University's School of Architecture became the second architectural school in the country. It was established using previous experiences as well as certain European schools. During the third phase of university education - the years after the Islamic Revolution - the number of of architectural schools in the country increased. "Meanwhile, the programs that were dictated to the schools by the councils and planning staffs were limited to the title of the course plus the number of units of each course and they played no role as far as policies and the methods of teaching architecture in these schools" [3]. At present, architectural education system and curriculum planning in Iranian universities at the undergraduate level is in accordance with the general specifications, curriculum and course titles approved by the High Planning Council in 1921. A total of 147 units need to be taken and passed, of which about 27 units are related to general studies and the remainder are specialized architectural courses.*1* Apart from the specific subjects in the field, nothing else is specifically identified and the extent of the creativity of students in the programs to be undertaken by each university has not been assessed.

Undergraduate courses in architectural engineering, as far as efficiency and public concept, is to gaining requisite knowledge and ability to produce architectural works, critique and analysis of architectural works in a wide field including building/construction technology, principles of maintenance and restoration of buildings, prevailing theories in creating man-made spaces, etc. The courses offered for this major are based on such a concept and are in service of the design courses. Considering that architectural education, especially architectural design, is one of the most important and challenging topics in the world, its teaching method, especially in architectural design, is of great significance. Workshops are among the most essential parts of architectural schools and require an environment helping foster creativity and experience-based learning. But in addition to determining the curriculum plus architectural-related units affecting the development of a student's creativity, it is necessary that the general approach and curriculum of universities ultimately consider the specific objective of creativity and nurturing creative architectural graduates.

Hence, the *purpose of the present study* can be stated as assessment of programs and approaches of undergraduate architectural education in Tehran, Shahid Beheshti and Science & Technology universities, in order to apply divergent/non-conformal thinking to enable the emergence of creativity among students and graduates.

Furthermore, the *research question* is to what extent does changing the curriculum and approach of architectural education based on divergent thinking and the emergence of creativity meet the expectations of students in this field and whether it has the ability to improve the quality of education in architectural universities in Iran? In addition, of the studied universities, which program and approach was most in line and more suitable for divergent thinking?

The *research hypothesis* suggests that according to students in this field, the divergent thinking approach in architectural curriculum, may also help to improve the teaching methods of architecture, and by reexamining and redefining the rules and standards in this field, pave the way for individual creativity.

2.Research Literature

2.1. Research Background

In this section, the closest sources to the present study's objectives are introduced as its

background. Accordingly, research that analyzed and took into consideration the reexamination of academic architecture curricula, and preferably in the universities in question, were assessed.

-Elaheh Sadat Hosseini & Associates, in their article, "The role of creative thinking and learning styles in teaching architectural design" (2019), sought to prove the assertion that teaching architectural design depends on the learner and his/her personal characteristics and the instructor will be unable to devise a satisfactory teaching method without first knowing these personal traits characteristics. Among the effective factors in learning architectural design, due to their importance within the design process and the relationship between teacher and learner, creative thinking and learning styles were studied in this research. This study did not compare universities as far as teaching creative architecture at the level of curriculum development [4].

-According to Sadeghi, Maal-Amiri & Raisi, in their article, "Presenting a conceptual model for measuring creativity" (2019), the prevailing educational system should endeavor to improve the educational path; Because the lack of understanding and knowledge of executives and decision makers concerning factors affecting the cultivation of creativity, induces improper and untimely decision making and eliminates opportunities and possibilities for the development of creativity in education and prevents the institutionalization of creativity[5].

-In his 2013 dissertation, Potter gathered the views of faculty members of universities and higher education institutions to develop methods toward underpinning the creativity of students. Creativity was examined from the perspective of individuals as well as their education. In the study, 358 faculty members participated in online surveys and eight academic units at the undergraduate and graduate levels were surveyed, and the findings revealed that creativity in education depends on teaching, motivation and encouragement [6].

The purpose of Casakin's 2010 research was to define the creative motivation of architecture and engineering design students based on various theories. In this study, motivation is defined as a set of beliefs, themes and groups that we know toward developing creativity. The statistical population consisted of 52 architectural and 60 engineering students. The findings of the questionnaire contained guidelines and instructions for enhancing architectural design and engineering educational programs [7].

-Sedaghati & Hojjat in their 2019 article, "The content of architectural education in Iran and the success rate of undergraduate studies in conveying this content", examined the requisite content for teaching creative architecture and its impact on the success of undergraduate studies. Based on the findings, the three foundations of knowledge, ability and insight constitute the content of architectural education. The greatest success of education is in transferring/conveying the foundations of ability, which is done only at an average level, and in the two components of knowledge and insight, the level of success of which is generally lower than average [8].

In all these papers, creativity in education was studied, especially in the context of architecture, utilizing the statistical method and analyzing the views of students. However, particular universities or a comparison of their architecture curricula was not included in any of these studies.

2.2. Significance of Divergent/Non-Conformal Thinking in Creativity

Guilford describes creativity as a set of abilities and traits leading to creative thinking. He was the first to distinguish between intelligence and creativity. He considered intelligence as convergent thinking and creativity as divergent thinking.

According to Guilford, convergent thinking is the consequence of predetermined thinking, such as there is always a right or wrong answer, while in divergent thinking there is no definite answer and there may be many possible answers that are logically correct. In Guilford's theory, quoted by Ghasemi & Euclid, divergent thinking consists of several factors, the most important of which are: (Figure 1)

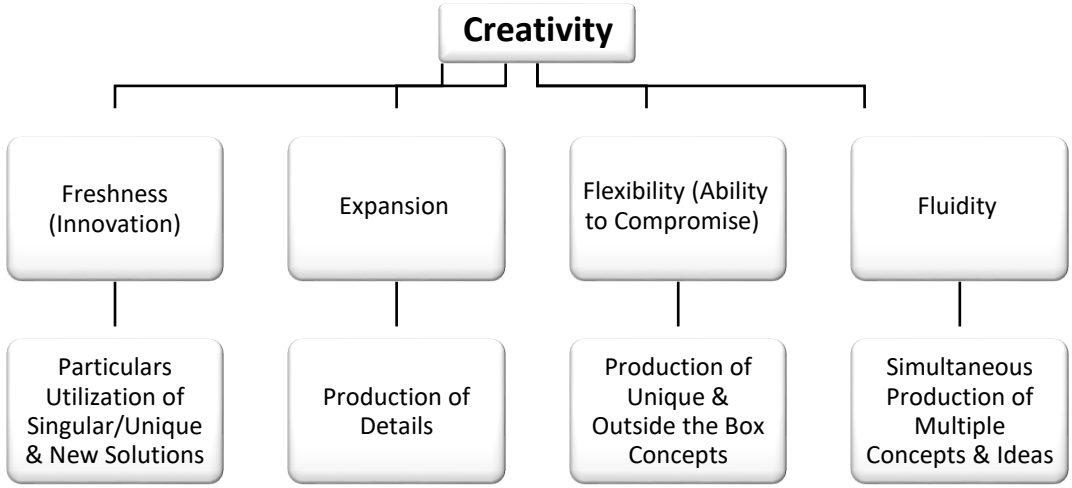

Figure 1. Aspects of Creativity & Divergent/Non-Conformal Thinking Within Guilford's Theory, Source: (Author Using Ghasemi & Euclid, 2005: 61)

In any society, creativity has its distinctive features. In fact, it can be stated that cultures are divided into two main groups: individualistic cultures and collectivist cultures. Each of them have certain beliefs, values, and attitudes that affect their educational, social, economic, and political systems. Collective and Eastern/Oriental societies are organized according to social rules and individuals adapt to their social group during socialization. In these cultures, there is a hierarchical relationship between individuals and they are raised to accept social and family rules and norms. Ultimately, what matters in these communities is gaining the approval and support of the community and the group. However, in Western societies, a person's growth, abilities and preferences are important and the individual is free to pursue his/her interests and fewer rules are set in place for people and individuality is the root of many behaviors.

Viewing creativity from a convergent perspective, regardless of social conditions, leads to the elitist dilemma we face in our society. This elitist view is problematic since it focuses excessively on talent. However, if we view and ponder creativity not only on talent, but also on creative experience, then all human beings have creativity [9].

In Iran, it is key to focus on societal culture and the environment in order for creativity to flourish. In light of the prevailing imitation culture dominant in the country, it is crucial to ditch this mental and educational framework. As mentioned above, divergent/non-conformal thinking is an arena of creativity in the individual that should be supported within the culture and the community. Nietzsche, the German intellectual and philosopher, points out that in societies where human beings and their success are measured by a single framework and model, creativity and genius will not emerge [10]. Therefore, in Iran, taking into account its important cultural role, universities should support, promote and bolster "outside the box" thinking. The following defines the understanding, development and objective of creativity: (Table 1)

Table 1-Effective Points on Understanding Creativity & Elucidating Its Objective

Understanding & Developing Creativity Quoted by [11]	Purpose of Teaching Creativity Quoted From [12]
Creativity is one way of thinking & has no bearing to intelligence	Knowing students by their creative talent
Creativity as a process & not as an outcome or product	Realizing creativity talent in oneself
Ability to be creative via becoming knowledgeable	Belief in the growth of creative talent and striving for it
Creativity is a scalable/developmental subject	Familiarity with the importance of creativity in life
Divergent/non-conformal thinking is the source of creativity	Familiarity with factors of growth & inhibition of creativity
Creativity, independence of thought & self-confidence align & go together Curiosity & desire to know & experience various things is within creativity	Becoming interested in creative thinking, activities

Sensitivity & understanding of issues that require developed is part of creativity	
Growing & enhancing creativity via experimentation, experience & exploration -Creativity is a form of controlled imagination -Producing something new, different & unique through creativity	Utilizing the power of creativity in solving life problems

Source: (Author Using Sam Khanian 2005 & Parbeh 2013)

Consistent with the above, it can be stated that the observance of two main conditions is necessary for the possibility of teaching creativity:

1- First off, the idea that creativity is inherent and only a few have it should be discarded. Of course, it is true that some are more creative, but others can, if properly nurtured, develop proportionate creativity.

2-It is required to transform the educational environment in such a manner where it is possible to express and develop creative thoughts and actions. Convergent as well as outside the box thinking should coexist together and we should not be tied down to inflexible and rigid rules. According to the researcher's findings, the following are the requirements and stages of creativity: (Table 2)

Table 2. Essentials & Stages of Creativity, Source: (Author Using the Referenced Sources)

Readiness	At this stage, the individual, with the guidance and encouragement of the coach, examines the problem and finds the initial motivation. This motivation may arise from the individual's itself due to dealing with a problem or crisis. Curiosity, understanding the problem, being interested and willing to resolve it, inner conversation with oneself or imaginary conversation between oneself and another person are the characteristics/features of this stage [13].
Intuition/Vision	In the insight phase, the individual analyzes what one has already studied or learned and discovers existing relationships. At this stage, the parts that are related to the subject matter to be resolved become prioritized and the rest are left out. This stage can occur while performing tasks and engaging with architecture-related issues and pursuant to learning the primary method [14]
Development	Creativity can be developed by engaging in activities that provide the greatest opportunity for fostering it. The media and information resources can create collective awareness and bring creativity forward to the realm of public discourse. Providing context for growth of a divergent culture in society, experiment, experience, research, sensitivity to issues and the need to seek new information are factors in the development of creativity [10]. Furthermore, knowledge creation is among creativity development indicators. New knowledge additionally requires core research toward adapting to the prevailing circumstances [15].
Cultivation	Creativity cultivation methods are based on three pillars of motivation, skill and ability [16]. Creative thinking skills and work skills and intrinsic motivation can exist in all individuals, but dependence is nurtured through motivation related to the social environment [14]. Fostering creativity is the thoughtful processing of information to innovate in relation to real-world conditions.
Assessment	Creativity arises from a situation wherein creative people, in addition to sufficient expertise and knowledge, also have the ability to evaluate creative ideas [17]
Intuition/Vision	At this stage, the individual analyzes what he/she has studied and/or learned & discovers the existing relationships [13].

Interestingly, in order to develop creativity in architecture, the International Union of Architects, as an institution under the auspices of UNESCO, aims to create a platform for knowledge sharing, helping to give rise to creative and collaborative solutions for architectural development and with a special focus on sustainable development. This union divides the capability of curricula in architecture education into two groups of design*1* and knowledge*2* [14].

2.3. Creativity & Architectural Learning

In most countries around the world, higher education systems are progressing as effective organizations and have advanced to the point that they have accepted the role and importance of knowledge production (scientific creativity) as a distinct role and function. Creativity can be introduced into formal education in two manners. The first is to teach it as a new lesson or skill. Another way is to reshape the curriculum. According to Sam Khanian, the second is superior to the first [11].

Nik lukman, Nik Ibrahim, Utaberta in 2012 introduced a qualitative study of hierarchical disciplines of cognitive skills as a method to ensure architectural learning and achieving educational objectives. The field of architecture and especially

its workshops need a combined curriculum to provide the ideal learning process for their students. There is near unanimous consensus by experts in architectural education as well as architecture professionals that the process of teaching architectural design in the form of design workshops should be the focal point of architectural education. For example, "Gwak" describes design as the central factor of architectural education, "Parquet" calls it the basis/foundation of architecture and "Newton" considers it the heart of architectural education [15,16]. A part of the learning objectives in architectural design workshops is to train architecture students capable of critical and creative thinking.

-In any educational system, the degree of success is directly contingent on the objectives planned for it. After devising objectives, careful planning is undertaken to achieve it. In relation to education, this planning is conducted by defining the suggested courses the students should take/pass, and ultimately, their degree of success is assessed and evaluated [17]. The curriculum has distinct divisions in terms of its types and levels, of which the formal (explicit) curriculum, the hidden (implicit) and the useless are among them [18]. A formal or explicit curriculum is a curriculum that contains explicit and published goals, content, and methods supported by the education system [19]. The content of the curriculum should be in such a manner where learners can, based on their favorite skills, easily take a step towards acquiring knowledge and expressing creativity [20]. It is very important the content of the curriculum be utilized in a way that increases the motivation and ability of the learners. New technologies enable the curriculum to attain the appropriate flexibility and attract the motivation and attention of all students to learn the content being taught [21]. A curriculum that can provide learners with up-to-date and basic knowledge and skills for future careers, or help them in skills training, is certainly and verifiably more useful by highlighting the creativity of individuals [22]. A curriculum that is tailored to the mental, physical, or emotional development of learners and takes into account individual differences, is able to increase individual learning capabilities and hence emphasize divergent culture and individual creativity. Via the assistance of new technologies, which are tools for the development of creativity, the content of the curriculum can be adjusted to suit the individual characteristics of learners, thereby increase their learning [23]. The following figure describes the application of the requirements and stages of creativity in changing the shape and manner of architectural educational programs. (Figure 2).

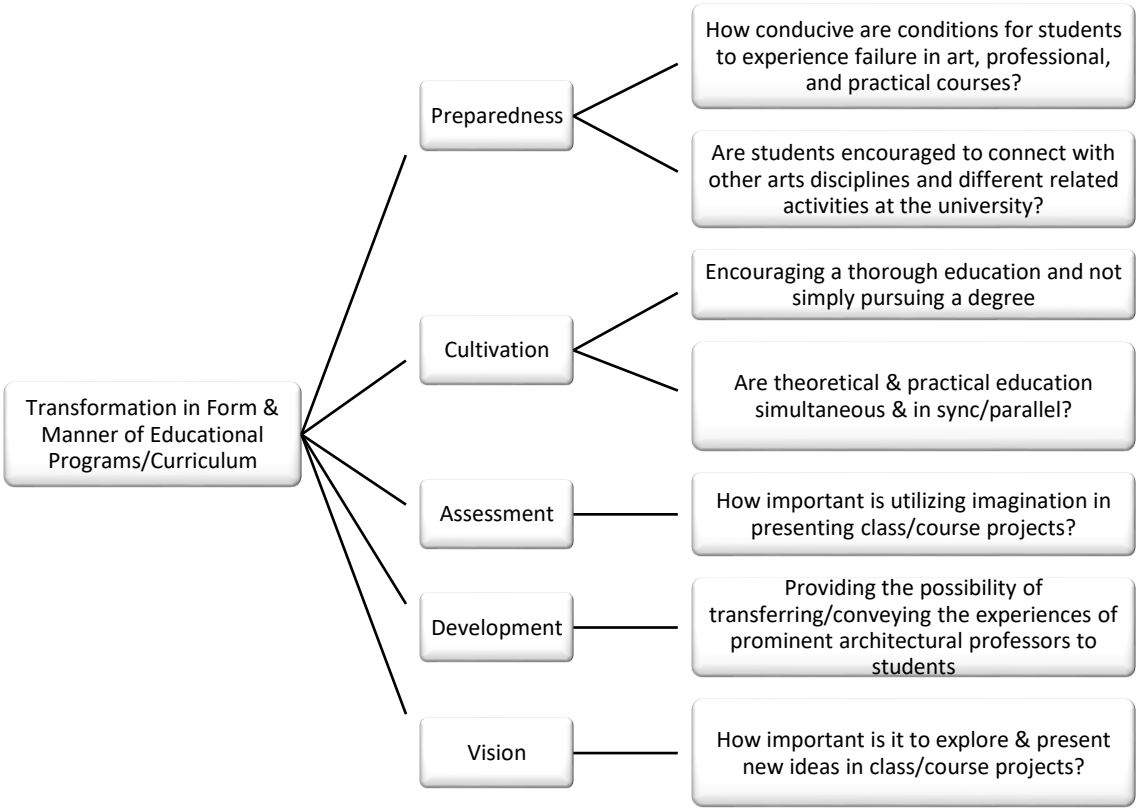

Figure 2-Description of Requirements & Stages of Creativity Concerning Transformation in the Form & Manner of Architecture Educational Programs, Source: (Author)

Ejtehadi (2018) believes that pursuant to the establishment of the University of Tehran and thereafter other institutions of higher education in Iran, practically the only focus has exclusively been on the transfer of knowledge (education), with the production of knowledge (scientific creativity) and the dissemination of knowledge (technology) totally neglected. Meanwhile architecture as a construction process of organizing spaces is a creative activity based on science-experience, art and technology. Hereinafter, creativity in Tehran, Shahid Beheshti and Elm va Sanat (Science & Technology) universities shall be evaluated and examined via quantitative and qualitative statistics [24, 25].

Universities Analyzed In This Study

Tehran University's College of Fine Arts, as the pioneering founder of academic architecture in the higher education system of the country, has a brilliant and long history [26]. The architecture department of this university, with more than 60 years of educational experience, was the original architecture department in Iran and has the largest faculty in the architecture and urban planning colleges throughout the country. The very first architecture college professors had completed their studies at the University of Rome. They adopted a method of teaching architectural design largely derived from the method of teaching architecture at fine arts colleges as well as the Bouzare School in Paris. The university's approaches to architecture over the past half century have had a profound impact on the spaces created and forms of contemporary Iranian architecture and have nurtured many Iranian architects and urban planners [2]. The impact of the College of Fine Arts has been and is to such an extent where it has influenced the educational policies and practices of other art and architecture schools in the country.

The National University of Iran (later Shahid Beheshti) was the first private sector non-governmental university established in the country with the intention of reforming higher education in Iran [27]. This college's ateliers were not just a place for drawing and related work, there were real discussions going on. Professors and students interacted with each other and analysis and thinking had an elevated status within the design process [28]. By the end of the 1960s, the development period of the National University of Iran's College of Architecture had come to a conclusion and the college's personality had been formed [29]. During the development of the College of Architecture, there were multiple non-architectural design courses offered; But most of these courses had little to do with architectural design [30].

Iran's Science & Technology University is a public university, the core of which was established in 1929. The basis for the Science & Technology University was a German school established in Tehran during the Qajar dynasty.*2* The Science & Technology University's College of Architecture & Urban Planning was established some 46 years ago. It has a very good reputation as a major industrial university with decades-long educational and research experience. Despite the development of the university, setting up separate and stand-alone faculties, colleges and departments has remained an elusive goal for this university, with its College of Architecture & Urban Planning maintainng most of its education curriculum in its original form [31].

According to the findings of the theoretical literature of the research, the components to be evaluated for evaluating creativity in educational methods and approaches are: the amount and manner of attention to readiness, development, evaluation, nurturing and insight in the field of creativity and divergent thinking.

3. Research Methodology

This is an applied quantitative and qualitative type of research. The research method is a combination of descriptive-analytical, plus survey and case study methods. Statistical data analysis was performed through a questionnaire. The subsets of readiness, development, evaluation, upbringing and insight have been assessed based on "changes in the form and manner of curricula and materials" with regard to the importance of divergent/non-conformal thinking toward the emergence of creativity. Data collection tools are questionnaires and narrative interviews, narrative and content analysis consistent with theories and examples available in the country.

Questionnaire analysis was performed using SPSS software and interviews were analyzed using interpretive method.

The raw data for testing the hypotheses were recorded utilizing virtual questionnaires for each university and converted via the SPSS21 software. The interviewees were students or professors at each of the universities. The online questionnaires of this research wee completed by accessing the virtual networks/groups of the architectural universities, established as a consequence of the COVID-19 pandemic. Next, the data were analyzed in two stages. The first stage was descriptive analysis in the form of descriptive statistics tables (frequency, percentage, mean,

standard deviation and variance) and the second stage was inferential analysis utilizing the univariate t-test of the research hypothesis. Finally, views were expressed on the acceptance or non-acceptance of the statistical hypothesis.

The universities were selected because of their longevity in the field of architectural education. Specifically, Fine Arts College, University of Tehran (Established in 1939-1940); Architecture & Urban Planning College, Tehran's Shahid Beheshti University [formerly National University] (Established in 1959-1960); Architecture & Urban Planning College, Tehran's University of Elm o Sanat or Science & Technology (Established in 1973). The validity and credibility of the questionnaire's content has been confirmed by 10 professors and experts in this field. Cronbach's alpha as a criterion for checking and confirming the reliability of the questionnaires was 0.889 (using SPSS12 software). Therefore, the level of difficulty of the questions are similar.

Table 3. Cronbach's Alpha Mean, Case Processing Summary Source: (Author's Calculations)

	%	N
Case Valid	16	88.9
Exclude	12	11.1
da	18	100
Total		

Table 4. Statistics on Reliability to Computate Cronbach's Alpha

Cronbach's Alpha	N of Items
0.884	24

Source: (Author Calculations)

First, the questionnaire was experimentally tested at the University of Tehran. For this purpose, professors and PhD students in architecture were posed with questions. Ultimately, questions were asked of 50 people until sufficient responses were received and collected. Henceforth, at each university, 50 samples of complete virtual questionnaires were randomly selected and analyzed.

4. Result & Analysis:

Creativity Assessment Based on Divergent/Non-Conformal Thinking in the Studied Universities

As explained in the research method, questionnaires were reproduced in the three studied universities to test the research hypothesis. Research questions were distributed according to the frequency distribution of gender, employment status, education and university of study or their workplace of those participating in the questionnaire: (Table 5)

Table 5. Frequency Distribution of Gender, Employment Status, Education, Plus the University And/Or Place of Work of the Studied Individuals

Options	Abundance	Frequency of Abundance	Cumulative Frequency Percentage
Female	21	42	42
Male	29	58	100
Total	50	100	
Professor	11	22	22
Student	37	74	96
Researcher	2	4	100
Total	50	100	
Undergraduate	18	36	36
Postgraduate	15	30	66
PhD	17	34	100
Total	50	100	
Tehran University	16	32	32
Shahid Beheshti University	17	34	66
Science & Technology University	17	34	100
Total	50	100	

Source: (Author)

Thereafter, in line with the questions in the table below, educational development and experiences were examined separately for each of the universities in question. The reliability of the questionnaires (utilizing SPSS12 software) is also presented in the table below. One can be confident that the difficulty level of the questions is similar and the nature of the measured variable was such that it justified the utilization of the questionnaire.

Table 6. Average of Educational Development & Experiences Questions by Universities, Source: Author

Row	Questions	Tehran University	Shahid Beheshti University	Science & Technology University
1		11.4	00.4	45.3
2		11.4	83.3	55.3
3		22.3	08.4	36.3
4		78.3	00.4	82.3
5		33.4	17.4	64.3
6		33.4	08.4	18.4
7		33.4	4.33	00.4
Total		96.3	07.4	71.3

In terms of educational development and experiences as a factor to enhance creativity, the highest average belonged to Tehran University, Shahid Beheshti University and Science & Technology University, respectively. In the following, the research hypotheses are examined through inferential statistics. To evaluate the research hypothesis, a univariate t-test was utilized. The findings of the following table demonstrate what the average of the creativity education variable (as a course) in the target universities are: (Table 7)

Table 7. Findings of Univariate T-Test of Education Based on Creative Curriculum Change in Tehran, Shahid Beheshti and Science & Technology Universities, Source: Author

	Quantity	Average	Standard Deviation	T Stat	Degree of Freedom	Significance Level
Tehran University	10	65.3	41.0	99.4	9	
Shahid Beheshti University	7	75.3	60.0	26.3	6	
Science & Technology University	8	84.3	41.0	81.5	7	

The findings reveal that creativity education average in a Tehran University course is equal to 3.65, and it is 3.75 in Shahid Beheshti University, and last but not least, it is 3.84 in the Science & Technology University. Also, the significance level of the test is equal to 0.00, which is smaller than the test error value (0.05), hence the null hypothesis is rejected. In other words, the average of the mentioned variable is equal to (3.74 = 3.34 * 3.34 + 0.34 * 3.75 + 3.32 * 0.32) which is higher than the average. Hereinafter, "Curricula transformation as far as divergent/nonconformist thinking" was assessed by way of 12 questions. (Table 8)

Table 8. Questions Related to Requirement Assessment of Creative Approach in Architectural Education Curriculum, Source: (Author)

1	Changing curricula based on divergent/nonconformist thinking can be effective in increasing the creativity of architects
2	Prioritizing exploring and presenting new ideas in class/course projects is effective in increasing the creativity of students and architects
3	Providing conditions for students to experience failure in art, professional, and practical courses is effective in increasing the creativity of students and architects
4	The importance of imagination in presenting class/course projects is effective in increasing the creativity of students and architects
5	Encouraging a thorough education and not simply pursuing a degree is effective in increasing the creativity of students and architects
6	The degree of concurrent and parallel theoretical and practical sides of education is effective in increasing the creativity of students and architects
7	The importance of exploring and presenting new ideas in the university's class/course projects is desirable
8	Experiment & failure (trial & error) conditions are provided for university students in artistic, professional and practical dimensions
9	Students are encouraged to connect with other arts disciplines and different related activities at the university
10	Providing the possibility of transferring the experiences of prominent professors of architecture to students is effective in increasing the creativity of students and architects
11	There is encouragement for a thorough education & not just striving for a degree at this university
12	Theoretical & practical education in this university is simultaneous & in sync/parallel

The comparative graph of the abundant frequency of these questions is as follows: (Figure 3)

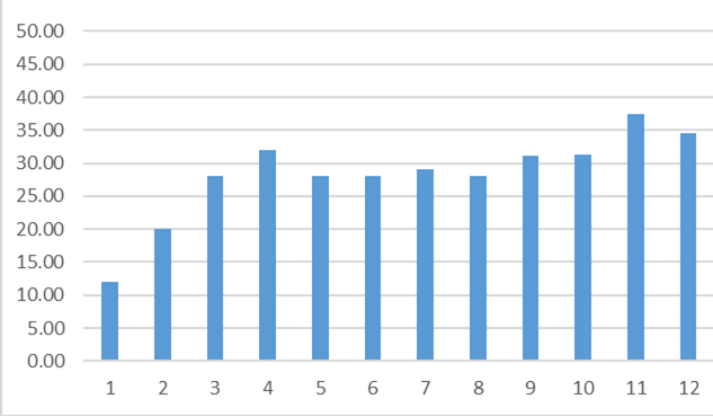

Figure 3. Comparative Graph of high Percentages of Change in Curricula Based on Divergent Thinking, Source: (Author)

As you can see, question 12 seems to have had the most emphasis. Therefore, among the factors of "change in curricula based on divergent thinking", simultaneous theoretical and practical education in the studied universities had the greatest impact on creative architectural education. Finally, the comparative mean of the questionnaire is hereby comparatively presented for the three studied universities: (Figure 4)

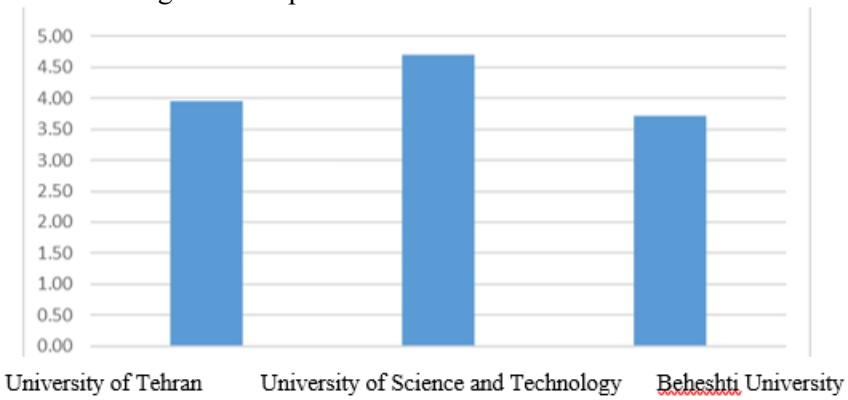

Figure 4. Average Of the Questions Regarding the Experiences & Transformations of the Educational Programs In The Three Under-Study Universities, Source: Author

Regarding the questionnaire findings concerning the experiences and developments of the educational program toward creative education, Shahid Beheshti University obtained the highest/best results.

In addition to this statistical analysis of the degree of divergent and creative thinking in the architecture education of the studied universities, it is possible to interpret statistical data according to the characteristics of each university and the teaching conditions in them. Shahid Beheshti University, by holding various classes and courses outside the approved curricula, has provided the possibility of educational maneuvers to apply more creative teaching methods and pay attention to the occurrence of this creativity in the works of students. An approach that exists in the other two universities, but does not have the favorable conditions and diversity of Shahid Beheshti University. On the other hand, among the courses approved by the Ministry of Science and Research that can be considered for teaching creativity, the course of architecture criticism at Shahid Beheshti University has a special value compared to the other two universities.

Also, the teaching method of architecture in this university indicates a close relationship between professors and students. It seems that such conditions have also been effective in the possibility of students' creativity in practical projects. Because the creative approach in presenting innovative and sometimes deconstructive ideas is done with more confidence due to the close relationship between professor and student. In fact, the close and positive relationship between professors and students is a platform for students' creativity. The educational characteristics of each university and their approach to the courses classified in different areas of creativity are presented in the following table:

Table 9. Comparative materials affecting the creativity of architecture education in the important schools of architecture Source: (Authors)

University of Science and Industry	Shahid Beheshti University	University of Tehran	Related courses approved by the Ministry of Science	Component
The effect of professors' attitudes and beliefs on students Special preparation approach for new students in design preparation course Emphasis on exercises with the obvious goal of teaching form and volume composition Emphasis on students' mastery of computer simulation Limitation of time in presenting theoretical and practical content in the undergraduate course	Holding various classes and courses outside the approved curriculum	Providing basic design preparation courses with three titles: Architectural Design Basics 1, Architectural Design Basics, and Architectural Design Basics for students to address their skills and preparation deficiencies that were not provided during high school.	Architectural expression, architectural design, sketch, presentation of architecture with the help of computer, human, nature of architecture, theoretical foundations of architecture	**Readiness**
			Internship, architecture and construction workshop, specialized language of architecture, new building technology	**Development**
			No relevant approved course was found in this field	**Breeding**
			World architecture, familiarity with the principles and methods of operation of the architectural heritage department	**Assessment**
			Contemporary architecture, village design analysis, familiarity with the principles of conservation and restoration, contemporary architecture	**intuition**
Paying attention to student preparation by deepening the teacher-student relationship Emphasis on design and architectural foundations Emphasis on new architectural design tools	Pay attention to courses outside the approved curriculum Pay attention to the field of insight	Emphasis on architectural design courses Attention to the conceptual dimension of architecture Emphasis on lessons affecting the evolution of thinking	**Conclusion**	

5. Conclusion

In this research paper, it was endeavored to assess and evaluate the programs and approaches to undergraduate architectural education in the Tehran, Shahid Beheshti and Elm-o-Sanat (Science & Technology) universities in order to apply divergent/nonconformist thinking to enable the emergence and creativity of students as well as graduates. Since academic education as a process leads to learning and learning induces change in ways of thinking, attitude and behavior, the application of divergent/nonconformist thinking in the architecture curriculum can lead to creativity in Iranian architecture. Therefore, instead of emphasizing creativity-related materials, the present study has focused on changing or modifying the approach of the architecture school's curriculum toward valuing divergent/nonconformist thinking. In this study, the students were not directly asked about their views regarding the extent of divergent/nonconformist thinking practices in their university, however, the degree and level of focus/attention to options, plus an analysis of percentages, revealed the true degree/level of focus and approval of this approach in their university.

All three of these universities were established prior to all to the Islamic Revolution. The process of teaching architecture in these three colleges were initially founded on Western European education systems, influenced by the architectural education curriculum of the Paris School of Architecture, the University of Florence Architectural College and the Bauhaus School of Architecture. There have been changes implemented within the educational system of these universities over the decades. In general, this educational system has given rise to the development of architects with dominant artistic, technical, executive as well as engineering creativity.

According to the findings of this study, it can be inferred that from the perspective of the respondents, by revamping and redefining the rules and standards of education based on divergent/nonconformist thinking, creativity in Iranian schools of architecture can be achieved and given birth to. Hence, the research hypothesis can be confirmed and verified. Therefore, in light of the importance of divergent/nonconformist thinking in the emergence of creativity, the subsets of preparation, development, evaluation/assessment, upbringing and insight based on "change in the

form and manner of curricula and materials" should be focused on in the development of university curricula. At present, it appears that Shahid Beheshti University has been more successful (than the other two universities) in the field of program implementation and its approach to the curriculum toward bringing the creativity of architectural students to the fore regarding divergent/nonconformist thinking.

Compliant with the findings of this study and what has already been stipulated, the following suggestions and recommendations for improvement is hereby delineat
ed:

-Delegating authority and developing the decision-making and education capabilities of the architectural college regarding the formulation of new rules, norms and regulations taking into account the different nature of the field of architecture as an interdisciplinary field of art and humanities

-Analyzing the views of students and professor's vis a vis the educational decisions of the scientific faculty/group, their participation in educational matters with regard to the possibility of their different/divergent perceptions and views on issues

-Extensive implementation of the research topic to evaluate the views of other stakeholders (faculty members and students) on the prevailing learning culture

-Evaluation and assessment of students both performance-wise and theoretically, in accordance with educational content and consistent with the abilities and unique situation of each student

-Creating face-to-face and intimate relationships between professors and students in line with the nature of practical learning activities in the field of architecture.

In the current situation, it seems that Shahid Beheshti University, despite having a similar background to the other two universities at the beginning, through different decisions at the management level to emphasize the teaching of effective courses such as architectural criticism and courses outside Approved curricula that allow for the divergence of divergent thinking in education, as well as the provision of close communication between students and faculty, are evident in more than two other case studies. Thus, both in the field of program implementation and curriculum approach, divergent thinking and students' creativity has been considered. This has been deduced both through quantitative data and through their interpretation based on the comparative table of curricula affecting creativity in the target faculties.

In the findings of similar researches such as "The role of creative thinking and learning styles in teaching architectural design" (1398), the influence of the teacher on the individual characteristics of the student in the impact of teaching methods on creative thinking was mentioned. Shariati University has provided the ground for this personal knowledge by creating a closer relationship between professors and students. According to the results of research [6], this also affects the way of teaching, motivating and encouraging creativity in education. Also, according to Sadeghi, Mal Amiri and Raisi's research in the article "Presenting a Conceptual Model for Measuring Creativity" (2019), which emphasized the effort to improve the educational path, this was achieved by adding courses outside the approvals of the Ministry of Science in this university. Is [5].

Considering the classification of architecture criticism courses and courses outside the approvals under the category of fostering creativity and the role of teacher-student relationship in the development of creativity, Shahid Beheshti University can be considered in the components of fostering and developing effective on students' creativity in a more correct direction. Evaluated to two other universities.

Footnotes

1-Ministry of Culture & Higher Education, "Supreme Planning Council, General Program Specifications & Course Titles for Undergraduate Courses in Architectural Engineering", Department of Arts, 1998

2-Negotiations/debate during the 140th session of the 6th Majlis (National Assembly); 7 September 1927

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