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Investigating How the Use of Specialized Architecture Design Software in Basic Courses Enhances Architecture Students' Drawing Skills and Creativity; Case study: The course "An Introduction to Architectural Design (3)", at Islamic Azad University (Urmia Branch)

Babak Motiei[a*]- Abbas Sedaghati[b]- Arash Mohammdi Fallah[c]

[a] Assistant Professor of Architecture, Urmia Branch, Islamic Azad University, Urmia, Iran (Corresponding Author).
[b] Assistant Professor of Architecture, Urmia Branch, Islamic Azad University, Urmia, Iran.
[c] Assistant Professor of Architecture, Urmia Branch, Islamic Azad University, Urmia, Iran.

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ABSTRACT

The advancement of software knowledge and its widespread application have significantly increased the use of specialized software in university courses. Architecture is one of the academic disciplines that extensively utilized such software due to its unique requirements. This study aims to investigate how the use of specialized software enhances architecture students' drawing skills and creativity. This study is applied research conducted utilizing two descriptive-analytical and causal-comparative approaches. The statistical population included architectural engineering students enrolled in the course "An Introduction to Architectural Design (3)" at Islamic Azad University, Urmia Branch. The participants were divided into two groups, each comprising 30 students. One group used specialized software, such as AutoCAD and Autodesk Revit (Studio A), while the other group conducted their work manually (Studio B). In this study, the required data were collected using a researcher-made questionnaire. A t-test was performed for independent groups, and a mean test was used for data analysis. The results indicated that educating architecture courses, including "an introduction to architectural design", using specialized software, enhances architecture students' creativity and drawing skills, leading to improved educational outcomes. Among the advantages of architecture software are its capabilities for its high-speed drawing, construction, and editing. Utilizing specialized software such as AutoCAD and Autodesk Revit allows designers to have better control over the design process and to examine the dimensions and sizes of the design with greater accuracy- an aspect that is somewhat overlooked in freehand design, and novice designers tend to design and arrange elements without considering the scale and dimensions of the spaces.

Keywords: Architecture Education, Design, Specialized Software, Drawing Skills, Creativity.

* E_mail: babak.motiei@iau.ac.ir

1. INTRODUCTION

Creativity plays a crucial role in architecture education, significantly enhancing designers' capabilities during the design process. It is essential for effectively teaching and learning the basic courses in architecture. By employing appropriate teaching methods in these basic courses, educators can greatly foster the creativity of novice architecture students. Architecture professors utilize a variety of techniques that require more detailed examination. In contemporary education, specialized software holds a significant place, particularly in architecture, where its application is widespread.

Given the importance of hands-oriented skills among architecture novices, the debate over the time spent on the use of software in the teaching and designing processes is a recurring topic among professors in this field.

One of the basic courses provided in the third semester of the undergraduate architectural engineering program is "An Introduction to Architectural Design (3)". After completing "An Introduction to Architectural Design (1) and (2)," students are introduced to the fundamental principles of drawing, modeling, and design. In the "An Introduction to Architectural Design (3)" course, students learn how to design spaces considering various influencing factors. Table 1 shows the syllabus and objectives of this course.

The present research aims to answer the following question: Which teaching method—using specialized software or freehand drawing—is more effective in enhancing students' drawing skills and creativity in the "An Introduction to Architectural Design (3)" course?

Table 1. Syllabus and Objectives of the "An Introduction to Architectural Design (3)" Course

Syllabus	Objectives
- Conceptual Sketches - Form Analysis in Architecture and Form Design - Facade Analysis and Facade Design - Space Analysis in Architecture and Space Design	- To strengthen the power of spatial visualization and to be familiar with the stages of concept formation - To be familiar with the factors influencing the formation of architecture, and to learn how to analyze architectural works - To learn how to design spaces considering the influence of factors affecting design - To learn how to set goals in design and utilize critical thinking

2. THEORETICAL FOUNDATIONS AND RESEARCH BACKGROUND

Education is a key factor in the development of societies. In modern teaching methods, fostering creativity is crucial for enhancing learning within educational environments (Tsirigoti, León-Mantero, and Jiménez-Fanjul 2024). Architectural education programs should be adaptable (Ghonim and Eweda 2018). Since architectural education serves as the foundational milestone in the life of every architect, emphasizing creativity during their educational years can significantly influence their future careers (Hemdan, Taha, and Cherif 2023). Defining creativity in a single sentence is challenging (Horikami and Takahashi 2022). Most researchers recognize the relationship between creativity and innovation, but explain their interconnections in various ways (Gajdzik and Wolniak 2022). Creativity has been recognized as both a symbolic and universal phenomenon in education (Lage-Gómez and Ros 2024). As a skill, creativity can be acquired and taught (Rahbar et al. 2022). It can be described as the process of understanding problems, identifying information gaps, formulating hypotheses, evaluating and testing ideas, and effectively communicating results (Rahmati and Karimi 2022). Creativity encompasses convergent and divergent thinking, insights, and any idea or production that is both original and valuable (Frith and Loprinzi 2020). Creative activities are often focused on specific places and times (Doehne and Rost 2021). Creativity significantly influences the learning process and is a capability present in everyone. However, it requires cultivation and enhancement (Salehi, Hoseini Dronkolaei, and Nazoktabar 2019).

Creativity has four main characteristics:

1. Fluency: The ability to establish meaningful connections between thought and expression, measured by the number of solutions generated in a given time frame.
2. Originality: The ability to think unusually and provide unique solutions;
3. Flexibility: The ability to approach a new problem from various angles;
4. Extension: The ability to pay attention to details while performing an activity (Piran et al. 2012).

One significant factor influencing creativity is the power of visualization. This refers to the ability to mentally analyze images and designs and create new structures based on new information. An architect must visualize a three-dimensional image by interpreting two-dimensional images and can understand its different dimensions (Karvan, Talischi, and Haghtalab 2020).

Design thinking is described as an analytical and

creative process that offers opportunities for new experiences and redesign. Architectural design thinking includes two critical stages: mental activity for idea generation and mental activity for idea evaluation and processing. Creative thinking is foundational for generating ideas, while critical thinking plays a key role in evaluating and processing those ideas. Creative thinking leads to exploration, hypothesis formation, and insights, while critical thinking facilitates justification, assessment of acceptability, and logical reasoning (Mahmoodabadi and Mirjany 2022).

Ceylan et al. (2024) examined the role of digital tools in architectural design studios. They found that the application of these tools significantly enhances students' learning in online studios, as well as in design and project development processes. In design studios, students utilized different tools at various stages of the design process and adopted various methods based on their specific needs.

Ismail et al. (2012) compared digital studios to conventional teaching methods in architectural design education. They reported that students who participated in a digital studio produced more models than those taught through traditional methods. Furthermore, the use of digital design enabled students to generate more complex and dynamic design ideas.

Asefi and Imani (2017) explored the impact of digital software on promoting creativity in architectural design education. They suggested that it is beneficial to organize the effective use of digital software within the architectural design process to enhance creativity.

Ahmadi Tabatabaie and Moosavi (2023) investigated the influence of software education on architectural creativity. They recommended that software be taught progressively and integrated alongside other architectural courses. Additionally, practical and project-based learning facilitates students' understanding of software features and fosters stable learning. They also emphasized the importance of avoiding unnecessary software education to prevent confusion, urging universities to update their programs to align with labor market needs and provide comprehensive software training.

Raouf Rahimi et al. (2020) studied the effectiveness of digital games in architectural education, particularly for undergraduate architecture students in the course "Architectural Design (2)." They concluded that incorporating digital games into core architectural courses effectively enhances students' understanding and learning.

Nejadriahi and Arab (2017) found that utilizing AutoCAD software improves the quality of working drawings. Their research indicated that AutoCAD helps users create high-quality drawings with better documentation, fewer errors, and improved readability. They also noted that understanding the pros and cons of this software increases awareness among professionals, with its proper use leading to higher productivity. In comparing AutoCAD to traditional hand drafting methods, Fakhry et al. (2021) outlined the benefits of AutoCAD, including faster editing and modification processes, time-saving capabilities, saving on designs and drawings when a design is revised and needs to be started from scratch, ease of organizing work in layers, ease of undo and redo, and ease of creating multiple copies at high speed. However, they acknowledged that its user-friendliness might impede students' critical thinking. Conversely, hand drawing fosters greater innovation and creativity, despite being more time-consuming and lacking features like an "undo" function. Soliman et al. (2019) stated that digital and computer technologies significantly influence architectural design and education. They highlighted the importance of using digital images, simulations, and virtual scenes, emphasizing the need for architectural education to adapt to these technological advancements. Hossain and Zaman (2022) stressed the necessity of Building Information Modeling (BIM) technology for undergraduate architecture students, noting that comprehending both theoretical and practical aspects is crucial in this context. Motiei (2024) reported that blended learning in architectural education yielded better outcomes in all four drawing topics, resulting in higher student scores. The enhanced academic motivation associated with blended learning and increased interaction among students positively impacted their learning and performance. Although various studies have explored creativity, architectural drawing skills, and specialized architectural software, the existing literature lacks research on how specialized software enhances students' drawing skills and creativity. This gap distinguishes the present study from previous research.

3. RESEARCH METHOD

This study is applied research conducted utilizing two descriptive-analytical and causal-comparative approaches. The statistical population included architectural engineering students enrolled in the course "An Introduction to Architectural Design (3)" in the first semester of the academic year 2022-2023, at Islamic Azad University, Urmia Branch. The participants were divided into two groups, each comprising 30 students.

One group (Studio A) used specialized software, such as AutoCAD and Autodesk Revit, for design, while the other group conducted design using hand drawings (Studio B), and the correction process was followed throughout the semester. Both studios were the same in the design topic, which was the design of a roadside restaurant, and the time allocated for practice, which was six weeks (ten hours each week). Moreover, both studios were supervised by the same professor. At the end of the practice, the students were

asked to complete a researcher-made questionnaire on creativity and drawing skills. The questionnaire was reviewed and approved by five faculty members. Moreover, its reliability was examined by Cronbach's alpha, which was estimated as 0.78 for creativity and 0.79 for drawing skills, which are above 0.7 and acceptable, as listed in Table 2. Finally, the data were analyzing using SPSS software to answer the research question.

Table 2. Cronbach's Alpha

Reliability		
	Cronbach's Alpha	N
Creativity	0.78	8
Drawing Skills	0.79	8

4. RESEARCH FINDINGS

Table 3 summarizes the data from the researcher-made questionnaires filled out by the students.

Table 3. Summary of the Data from the Researcher-Made Questionnaires filled out by the Students

	Assessed Components	Total Score Design Using Software	Total Score Free-Hand Drawing
Creativity	Deeper Thinking	132	115
	Better Visualization	140	124
	A Deeper Understanding of Space	135	103
	Innovation in Design	117	108
	Capability of Developing Architectural Design	118	109
	Fluidity in Design	124	106
	Flexibility in Design	133	108
	Finding New Design Solutions	126	118
Drawing Skills	Precise Drawing of Plans	143	104
	Precise Drawing of Sections	146	111
	Precise Drawing of Elevations	136	109
	Precise Drawing of Site Plans	149	115
	Precise Drawing of Details	138	106
	Higher Drawing Speed	137	119
	Drawing Quality	135	114
	Re-Editing Capability	143	107

To address the research question, first, the data from the questionnaire are examined descriptively. As shown in Table 4, the average total score of the eight components of creativity for the software-oriented teaching method was obtained as 128.125±8.23, which is greater than that obtained for the hand-oriented teaching (111.375±7.008).

Regarding drawing skills, the same result was obtained, and the software-oriented teaching method (140.875±5.11) obtained a higher score than the freehand-oriented method (110.625±5.09).

Table 4. Descriptive Statistics

	Design	Mean	Sd.	N
Creativity	Software	126.1250	8.23646	8
	Freehand	111.3750	7.00892	8
	Total	119.7500	11.37541	16
Drawing Skill	Software	140.875	5.11126	8
	Freehand	110.625	5.09727	8
	Total	125.75	16.38088	16

Figures 1 and 2 display a higher mean for the software-oriented teaching method in both creativity and drawing skills.

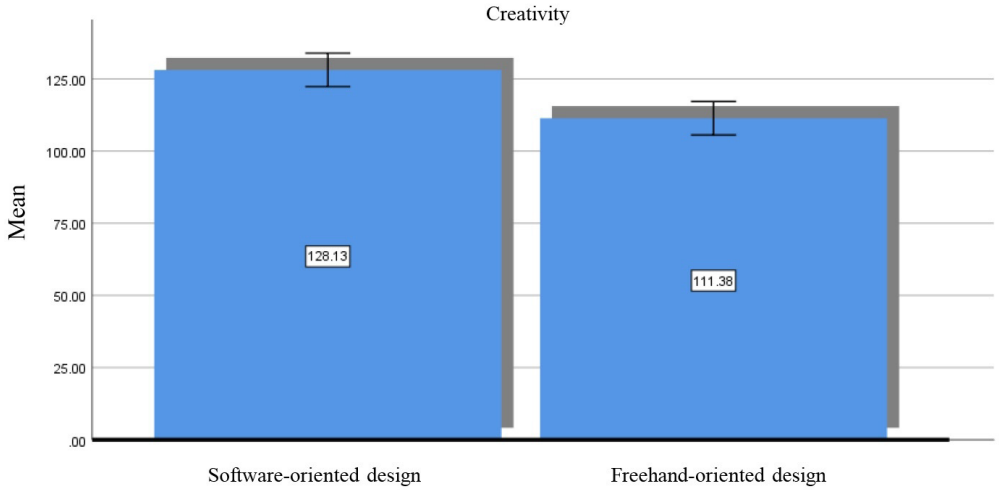

Fig. 1. Comparing two Software-Oriented and Hand-Free-Oriented Teaching Methods in their Effectiveness in Improving Students' Creativity

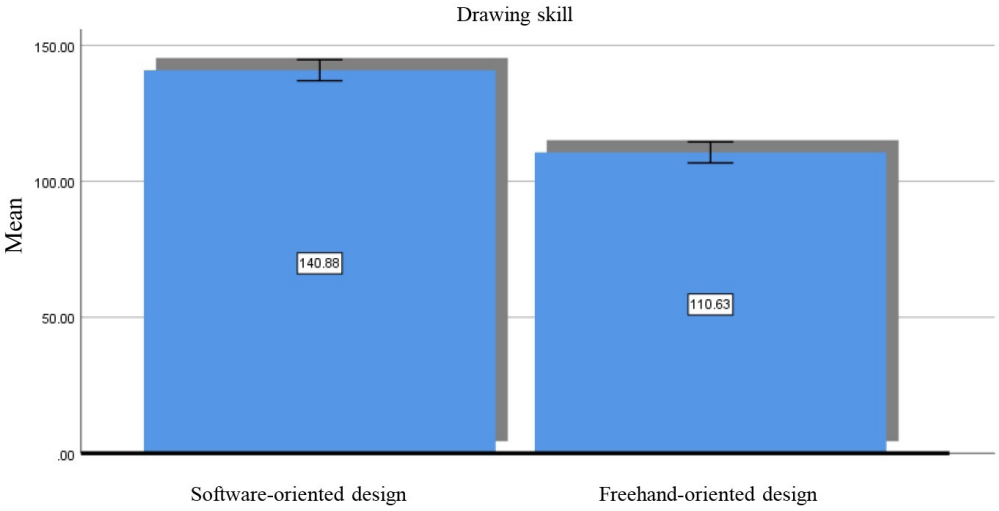

Fig. 2. Comparing two Software-Oriented and Hand-Free-Oriented Teaching Methods in their Effectiveness in Improving Students' Drawing Skills

To answer the research question, it is necessary to utilize statistical tests. To choose an appropriate test to compare the means of two independent groups (software and freehand), first, the Kolmogorov-Smirnov test was utilized to examine the normality of the observations. As seen in Table 5, Sig. is above 0.05, indicating that both variables have normal distribution. Therefore, their means can be compared using a t-test.

Table 5. Normality Test

	Kolmogorov-Smirnov Test		
	Statistic	df.	Sig.
Creativity	0.140	16	0.200*
Drawing Skills	0.182	16	0.051*

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

To use the t-test, the equality of variances was assessed using a Levene's test. As seen in Table 6, Sig. is above 0.05 for both creativity (0.528) and drawing skill (0.833), indicating that the variances are equal.

Table 6. Levene's Test for Examing the Equality of Variances

	F	Sig.
Creativity	0.418	0.528
Drawing Skill	0.046	0.833

Table 7 reports the results of a t-test to compare means under equality of variances. The Sig. value was estimated as 0.001 for creativity and 0.000 for drawing skill, indicating that there is a significant difference between the means of the two software-oriented and freehand-oriented methods at the 5% error level.

Table 7. The Results of a t-Test for Examining the Equality of Means

	t	df.	Sig.	Mean Difference	Std. Error Difference
Creativity	4.381	14	0.001	16.75000	3.82368
Drawing Skills	11.853	14	0.000	30.2500	2.55213

5. DISCUSSION AND CONCLUSIONS

Comparing the findings of the present study and relevant previous ones indicating that these results are consistent with the study by Ceylan et al. (2024), who stated that the use of digital tools has significantly contributed to better learning of students in online studios, and also with the study by Ismail et al. (2012), who indicated that the students who used digital studios in the design process produced more models with higher complexity than those taught using the conventional teaching method. They are in line with the research by Asefi and Imani (2017), who concluded that organizing the proper use of digital software in the architectural design process promotes creativity in architectural design education. They also support the results of Ahmadi Tabatabaie and Moosavi's (2014) research on the usefulness of the progressive and integrated teaching of software along with other architecture courses, and Raouf Rahimi et al.'s (2014) research in which the use of digital games, simulators, and virtual worlds in the main courses of architecture has been found effective in enhancing students' perception and learning. The results of this research are also confirmed by the study by Nejadriahi and Arab (2017), who reported that the use of AutoCAD software is effective in improving the quality of working drawings, and Fakhry et al.'s (2021) research, in which the advantages of the AutoCAD software, compared to hand drafting methods, were mentioned as follows: including faster editing and modification processes, time-saving capabilities, ease of undo and redo, and ease of creating multiple copies at high speed. However, they mentioned the promotion of creativity in the manual design method, which is inconsistent with the present result. The results of the present study are also in agreement with the study by Soliman et al. (2019), who stated that digital technology can greatly influence architectural design and architecture education, the research by Hossain and Zaman (2022), which noted that comprehending both theoretical and practical aspects is of great importance and using architecture software is effective in this context, and the research by Motiei (2024), who reported that blended learning in architectural education yielded better outcomes in all four drawing topics.

The investigations of this study indicate that the software-oriented design education method resulted in higher mean scores for creativity compared to the freehand-oriented design education method. A similar outcome was observed in terms of drawing skills. The data collected from the study clearly suggests that the use of specialized software, such as AutoCAD and Autodesk Revit, in the design process and architecture education, specifically in the course "An Introduction to Architectural Design (3)"—enhances students' drawing skills and creativity. This improvement is attributed to the high drawing accuracy, ease of editing, and modification capabilities that these software programs offer. The advantages of architectural software lie in its ability to draw, construct, and edit at high speed, allowing designers to better control the design process and accurately assess the dimensions and sizes of their designs. This aspect is often overlooked in freehand design, where novice designers may create and arrange elements without adequately considering the scale and dimensions of the spaces. Architecture novices typically engage in freehand design exercises during their first and second semesters in the courses "An Introduction to Architectural Design (1) and (2)" and "Architectural Expression (1) and (2)." Therefore, the

course "An Introduction to Architectural Design (3)" in the third semester offers an excellent opportunity for students to begin designing with software. Furthermore, learning AutoCAD is not a time-consuming endeavor, allowing novices sufficient time to acquire proficiency in this software during the "Computer-Aided Architectural Presentation" course. For future research, it is recommended to explore the use of other specialized architectural software in students' design processes and investigate its effects on additional factors, such as students' academic motivation.

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CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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PARTICIPATION PERCENTAGE

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

REFERENCES

- Ahmadi Tabatabaie, S. M. A., and S. M. Moosavi. 2023. The impact of software pedagogy on architectural creativity: Finding the appropriate method and time for teaching software to architecture students. *Technology of Education Journal (TEJ)* (18)1: 131-148. https://jte.sru.ac.ir/article_2045.html?lang=en. [in Persian]
- Asefi, M., and E. Imani. 2018. Evaluating the effect of digital software application on creativity promotion in architectural design education. *Hoviatshahr* 11(4): 79-92. https://sanad.iau.ir/en/Journal/hoviatshahr/Article/795486. [in Persian]
- Ceylan, S. P. Şahin, S. Seçmen, M. Elif Somer, and H. Kemal Süher. 2024. The contribution of digital tools to architectural design studio: A case study. *Ain Shams Engineering Journal* 15(7): 102795. https://www.sciencedirect.com/science/article/pii/S2090447924001709
- Doehne, M., and K. Rost. 2021. Long waves in the geography of innovation: The rise and decline of regional clusters of creativity over time. *Research Policy* 50(9): 104298. https://www.sciencedirect.com/science/article/pii/S0048733321000998
- Ismail, Mohd Arif, Rosnaini Mahmud, and Isham Shah Hassan. 2012. Digital studio vs. conventional in teaching architectural design process. *Procedia-Social and Behavioral Sciences* 64: 18-25. https://www.sciencedirect.com/cience/article/pii/S1877042812049804
- Fakhry, Mohamed, Islam Kamel, and Ahmed Abdelaal. 2021. CAD using preference compared to hand drafting in architectural working drawings coursework. *Ain Shams Engineering Journal* 12(3): 3331-3338. https://www.sciencedirect.com/science/article/pii/S2090447921000605
- Frith, E., and P. Loprinzi. 2020. Exercise, cognitive creativity, and dementia. In *Diagnosis and Management in Dementia* (pp. 827-842). Academic Press. https://www.sciencedirect.com/science/article/pii/B9780128158548000525
- Gajdzik, B., and R. Wolniak. 2022. Smart production workers in terms of creativity and innovation: The implication for open innovation. *Journal of Open Innovation: Technology, Market, and Complexity* 8(2): 68. https://www.sciencedirect.com/science/article/pii/S2199853122000099
- Ghonim, M., and N. Eweda. 2018. Investigating elective courses in architectural education, Front. *Archit.* Res 7: 235-256. https://www.sciencedirect.com/science/article/pii/S2095263518300177
- Hemdan, J. T., D. S. Taha, and I. A. Cherif. 2023. Relationship between personality types and creativity: A study on novice architecture students. *Alexandria Engineering Journal* 65: 847-857. https://www.sciencedirect.com/science/article/pii/S1110016822006354
- Horikami, A., and K. Takahashi. 2022. The tripartite thinking model of creativity. *Thinking Skills and Creativity* 44: 101026. https://www.sciencedirect.com/science/article/pii/S1871187122000293
- Hossain, S. T., and K. M. Ulil Amor Bin Zaman. 2022. Introducing BIM in outcome based curriculum in undergraduate program of architecture: Based on students perception and lecture-lab combination. *Social Sciences & Humanities Open* 6(1): 100301. https://www.sciencedirect.com/science/article/pii/S2590291122000559
- Karvan, Farhad, Gholamreza Talischi, and Tahereh Haghtalab. 2020. The effectiveness of semantic – symbolic model on increasing power of visualization and cognitive intelligence of Architecture students. *Biquarterly Journal of Cognitive Strategies in Learning* 7(13): 233-252. https://asj.basu.ac.ir/article_3209.html?lang=en. [in Persian]
- Lage-Gómez, C., and G. Ros. 2024. On the interrelationships between diverse creativities in primary education STEAM projects. *Thinking Skills and Creativity* 51: 101456.
- Mahmoodabadi, A., and H. Mirjany. 2022. The ratio of architectural design thinking to incompatible schemas. *Journal of Architectural Thought* 6(12): 1-16. https://at.journals.ikiu.ac.ir/article_2725.html?lang=en. [in Persian]
- Motiei, Babak. 2024. Comparison the effect of blended and differentiated education on drawing skills and improving the academic motivation of architecture novices. *Technology of Education Journal (TEJ)* 18(2): 373-386. https://jte.sru.ac.ir/article_2067.html?lang=en. [in Persian]
- Nejadriahi, H., and K. Arab. 2017. A study on the impacts of computer aided design on the architectural design process. *International Journal of Architectural and Environmental Engineering* 11(8): 1049-1053. https://core.ac.uk/download/pdf/144729804.pdf
- Piran, M. T. Aghajani, B. Shoghi, A. Rezazadeh, and A. Dehghan Najmabadi. 2012. The effect of social capital on employee's creativity in the foundry industry of Iran (The case of Kaveh industrial estate employees). *Journal of Innovation and Creativity in Human Science* 2(1): 163-183. https://sanad.iau.ir/en/Journal/ichs/Article/930903. [in Persian]
- Rahbar, A. S. Imam Jome, A. Hosseini Dehshiri, and A. Asareh. 2022. Designing a creativity-based curriculum model for student teachers: A grounded theory. *Technology of Education Journal (TEJ)* 17(1): 121-138. https://jte.sru.ac.ir/article_1825.html?lang=en. [in Persian]
- Rahmati, R., and A. Karimi. 2022. Documentary study of the effect of play on the creativity of primary school

children. *Journal of Innovation and Creativity in Human Science* 12(2): 29-50. https://sanad.iau.ir/en/Journal/ichs/Article/930627. [in Persian]

- Raouf Rahimi, M. Sh. Azizi, M. Javidinejad, and A. Sadeghi. 2021. Investigating the effectiveness of serious games in teaching architecture and the process of learning of architectural design ‖ students in undergraduate course. *Armanshahr Architecture & Urban Development* 14(36): 51-63. https://www.armanshahrjournal.com/article_142364.html?lang=en. [in Persian]
- Salehi, Mohammad, Zahra Hoseini Dronkolaei, and Hormoz Nazoktabar. 2019. The impact of family performance and intelligence beliefs on creativity among students. *Journal of Innovation and Creativity in Human Science* 9(1): 211-230. https://journal.bpj.ir/article_667906.html?lang=en. [in Persian]
- Soliman, Sara, Dina Taha, and Zeyad El Sayad. 2019. Architectural education in the digital age: Computer applications: Between academia and practice. *Alexandria Engineering Journal* 58(2): 809-818. https://www.sciencedirect.com/science/article/pii/S1110016819300602
- Tsirigoti, Argyro, Carmen León-Mantero, and Noelia Jiménez-Fanjul. 2024. Motivation for continuing education in nursing. *Educación Médica* 25(2): 100877. https://www.sciencedirect.com/science/article/pii/S1575181323000967

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