Arch Iran Med. January 2020;23(1):37-43

http www.aimjournal.ir

ARCHIVES OF IRANIAN MEDICINE

Open Access

Original Article

Technical Simulation Using Goldfish Bowl Method: A Medical Teaching Method for Increasing Student's Creativity

Mandana Shirazi, PhD[1,2,3]; Maryam Modarres, PhD[4,5*]; Mohammad Shariati, MD[6]; Afzal Sadat Hosseini Dehshiri, PhD[7]

[1]Educational Development Center, Tehran University of Medical Sciences, Tehran, Iran
[2]Department of Medical Education, School of Medicine, Tehran University of Medical Sciences, Tehran, Iran
[3]Department of Clinical Science and Education, Karolinska Insstitutet, Stockholm, Sweden
[4]School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran
[5]Nursing and Midwifery Care Research Center Membership, Tehran University of Medical Sciences, Tehran, Iran
[6]Medical School, Social Medicine Department and Health Deputy, Tehran University of Medical Sciences, Tehran, Iran
[7]Psychology and education Department, Tehran University of Medical Sciences, Tehran, Iran

Abstract

Background: Promoting students' creative thinking with new techniques is important in order to foster innovation in a pleasant educational atmosphere. This study aimed to determine the effect of technical simulation using Goldfish Bowl (GFB) method on creative thinking of midwifery students in Tehran University of Medical Sciences.

Methods: During 2015-2016, 70 students in two groups (n = 35 midwifery students in each group) were enrolled in this study and educational intervention was conducted on one of the groups. The intervention was the new GFB method. The students' creative thinking was assessed using Dr. Abedi's standardized creative thinking questionnaire in both groups before and after the intervention and in one-month follow-up. The results were gathered and entered into the SPSS software version 16. For data analysis, descriptive and analytical statistical tests were used to compare the scores of three stages of creative thinking, and variance analysis in the intervention and control groups with the significant level of 0.05.

Results: There were no significant differences between the results of the two groups before the intervention. The statistical results showed changes at different levels after intervention, indicating an improvement in the students' creative thinking. The mean score of creative thinking was 70.71 ± 15.75 before the intervention, 80.40 ± 14.68 at the end of the eighth week of the intervention, and 72.09 ± 14.98 in the follow-up. The effect size of this technique on creative thinking was 0.91 in week 8.

Conclusion: The use of Goldfish Bowl technique in teaching medical students is recommended to promote their creative thinking.

Keywords: Creativity, Creative thinking, Medical, Teaching

Cite this article as: Shirazi M, Modarres M, Shariati M, Hosseini Dehshiri AS. Technical simulation using Goldfish Bowl method: a medical teaching method for increasing student's creativity. Arch Iran Med. 2020;23(1):37–43.

Received: June 14, 2019, Accepted: October 23, 2019, ePublished: January 1, 2020

Introduction

Education is facing serious challenges, and one way to reduce these challenges is to pay more attention to creative thinking. There are various creativity training methods such as brain storming and creative problem solving that can increase the ability of creative thinking.[1] Also, our educational designers must pay more attention to these methods and take them seriously.[2] Divergent thinking is an important feature of creativity.[3] The theoretical foundation of creative thinking is based on information processing.[4,5] Although the social dimension of learning is also significant,[6] creative thinking is important to learn and to move education forward.[7] Medical students face clinical challenges and to find answers and solve them, they need to combine cognitive processes and decision-making in the diagnosis[8]; creative thinking can help them with this issue.

Furthermore, one point which is often forgotten by teachers is to create the necessary atmosphere for growth and cultivation of creativity dimensions.[9-11] Basically, creativity is multi-dimensional and potential. This is why it cannot be measured easily with a tool and requires the use of different techniques and comprehensive tools.[12] Creativity has three components, including intrinsic motivation, skills associated with relevant expertise and cognitive processes. Intrinsic motivation is the most important component in maintaining stable performance. Divergent thinking is related to the cognitive process. Therefore, creativity demonstrates itself in a context, particularly a team, despite having other personal components.[11] Interactive teaching, and learning in small groups or teams allow creativity to flourish further and facilitate deeper learning.[13] Livingston suggested the use of methods that are based on teamwork, collaboration and interaction for the development of creative thinking.[14] It has been observed that the scores of fluency and flexibility improve in the creative thinking of students participating in 10 to 15 sessions of a creativity program.[15] Furthermore,

***Corresponding Author:** Maryam Modarres, PhD; Nursing and Midwifery Care Research Center membership & School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran. Tel: +98-21-66927171; Fax: +98-21-66904252; Email: modarres@tums.ac.ir

an 8-week creativity training program increases the creative thinking skills.[16] Karwowski refers to creative learners as impulsive learners who do not follow teachers in some cases. Therefore, in these cases, we can expect the negative attitude of teachers, and resistance and difficulty in the classroom.[17] Thus, the teaching methods of teachers play an important role in the development of creative thinking in learners.[10,18]

The role of simulation in learning has been addressed in many studies.[19,20] The Goldfish Bowl method (GFB) in teaching is a role-playing method in which a group of learners sit together in a circle and the rest sit around them. The two groups can be replaced, and the criticizing group can be moved to sit in the middle.[20,21] This method can be used in medical groups as it creates discussion, role-play, challenge and team critic.

It has been also observed that drinking tea and motivating people to describe a happy memory has had a positive impact on creative thinking.[22] Even meditation and changing of emotions have a positive effect on the score of creative thinking.[23] Also, the personality characteristics of people like having high SQ or high systemic intelligence and analytical thinking power are positively associated with higher creative thinking. Moreover, low EQ or emotional intelligence has a positive correlation with poorer creative thinking. According to the evidence, creativity can flourish with changes in mood and personality and social factors.[18,24] However, it has a positive correlation with two factors of general intelligence and creative character of people.[25] Creative thinking, as an integral part of cognitive learning, is greatly related to the environment.[26] Therefore, we can enhance creative thinking by creating a healthy environment and taking a rest between activities.[27] Thus, the GFB method is a suitable method because in this method, the individuals' personality plays an important role in their role-play and criticism. Also, to consider the role of environment in creativity, we should use techniques to make the teaching atmosphere more pleasant.[28] In educational studies compared with clinical research, it is more difficult to obtain results because there are more confounding variables.[29] Our medical teams should simultaneously use their own experiences, culture and personality structure and the variety of environmental and social facilities in order to come up with a solution for their problem.[30] Therefore, the need for establishing creativity with a new teaching method is essential for students in medical sciences. The aim of this study was to determine the effect of technical simulation (making educational atmosphere more pleasant) on creative thinking of midwifery students using the GFB method.

Materials and Methods

Design

This study has a quasi-experimental design[31] by convenience sampling (non-randomized allocation assignment).

Participants

In total, 70 individuals, 35 individuals in each group (intervention and control), were selected to participate in the study.[32,33] To compensate for the likelihood of the loss, 10% attrition was considered. The inclusion criteria were; the samples should be midwifery students of Tehran University of Medical Sciences in their 4th to 6th semester, and willing to participate in the study. The students did not have any knowledge of creativity and had not participated in any creativity training course. The exclusion criteria were; not giving consent to participate in the study, not completing the questionnaire, not participating in training sessions, and not participating in the pre- or post-test.

Intervention

A written ethical consent was obtained from the participations before entering the study, and then the midwifery students were divided into two groups of intervention and control during 2015-2016. There was no significant difference between the individuals' characteristics before the intervention. The sample size was calculated based on comparison of averages formula[31]. The samples were selected from a single school and discipline. For synchronization, the scores of creative thinking in both groups were compared before the study. The standard deviation of the two groups was 5 and the standard deviation of score of creative thinking was 5.2 in the first group and 4.9 in the second group. Therefore, by choosing $\alpha = 0.05$ and $\beta = 0.2$ and considering the results of relevant articles,[32,33] it was predicted that if the difference of average creative thinking in the intervention and control groups was 4 points or more, the difference would be statistically significant.

Written consent was obtained from the participants after obtaining permission from the Ethics Committee of the University and School. Full information about the study and its implementation was provided to the subjects in the first session. They were given the opportunity to ask any questions regarding the intervention and to ensure the confidentiality of information.

The educational intervention was implemented for one module: "mother and child health". Also, in the control group, the same section of the module was carried out in the form of the usual lecture and questioning for midwifery students. In both intervention and control groups, training consisted of eight sessions, each lasting for two hours. Intervention was carried out with the GFB method: in this technique, students who sit in the middle play a role in the scenario or the subject, or argue with each other. Those who are seated around them criticize or discuss their solutions or arguments.[20,21] Some techniques are performed to make the educational atmosphere more pleasant, through mini meditation with relaxing music played on the mobile phone of a student volunteer every 3-5 minutes. Mini meditation was in the form of

closing the eyes and imagining a pleasant memory. Fruit and drinks were served during the last half hour of the session. A group of students sat in the center voluntarily to have a discussion about the scenario or role-play, and the rest of students observed them. The observers wrote down all negative and positive points. Then, the entire group discussed the positive and negative comments and critically analyzed the opinions.

Instrument and Data Collection

The four components of fluency, flexibility, origination and expansion were measured at three stages (before, immediately after and one month after the intervention) using a standard creative thinking questionnaire. This tool was psychometric and localized by Dr. Abedi and colleagues in Iran. The internal reliabilities in the original questionnaire have been reported at 0.61 to 0.75 (average 0.66) for all subscales. This questionnaire was also standardized in Iran. Test-retest reliability is 0.023 for fluency, 0.444 for expansion, 0.614 for origination, and 0.595 for flexibility. The internal consistency coefficient ranged from 0.48 to 0.68 (mean 0.595).[34]

Each question in this tool has three options A, B and C, with scores of 0, 1 and 2, respectively. The range of creativity is between 0 and 120 in any test. The score range in the component of fluency is 22 to 66 points, expansion 11 to 33 points, origination 16 to 48 points, and flexibility 11 to 33 points. In each component, a higher score indicates a higher creativity.[35] The total score was calculated for all four components as the score of creative thinking. Also, a demographic questionnaire was completed by researchers through a structured interview. This questionnaire included some variables such as age, mother's occupation, father's occupation, father's literacy, mother's literacy, economic status, cultural status and place of residence.

Data Analysis

After data gathering, descriptive and analytical statistics were used to analyze the data. We used descriptive statistics to provide the information in the frequency distribution table, and the mean and standard deviation. Among inferential statistical methods, we used ANOVA, paired *t* test, chi-square, independent t-test, Kolmogorov-Smirnov and multivariate repeated measuring to compare the scores of three stages of creative thinking. Independent *t* test was used to compare the average of creative thinking between the two groups before and after the intervention. Paired *t* test was used to compare the average of creative thinking between the two groups before and immediately after the intervention. All analyses were performed using SPSS software version 16. The analyses were done with a confidence level of 95%, significance level of 0.05, and test power of 80%. After obtaining the results and performing the comparisons, the final results were observed between the two groups and the impact of the intervention was determined.

Results

The majority of midwifery students in both groups were aged 22-24 years, 51.4% were in the control group and 48.6% were in the intervention group. There was not a statistically significant difference between the two groups before the intervention. Both groups were similar in age,

Table 1. Absolute and Relative Frequency Distributions of Midwifery Students' Demographic Characteristics in the Intervention and Control Groups

Personal Characteristics (Qualitative)		Group				Total	Chi-square Test
		Control		Intervention			
		No.	%	No.	%		
Mother's occupation	Homemaker	27	38.6	29	41.4	(80%) 56	$\chi^2 = 0.358$ $P = 0.550$, df = 1
	Employed	8	11.4	6	8.6	(20%) 14	
Father's occupation	Retired	6	8.6	10	14.3	(22.9%) 16	$\chi^2 = 1.258$ $P = 0.546$, df = 2
	Self-employed	19	27.1	17	24.3	(51.4%) 36	
	Clerk	10	14.3	8	11.4	(25.7%) 18	
Father's literacy	Reading-writing	1	1.4	3	4.3	(5.7%) 4	$\chi^2 = 1.933$ $P = 0.586$, df = 3
	Below diploma	8	11.4	8	11.4	(22.9%) 16	
	Diploma	14	20	16	22.9	(42.8%) 30	
	University degree	12	17.1	8	11.4	(28.6%) 20	
Mother's literacy	Reading-writing	3	4.3	4	5.7	(10.0%) 7	$\chi^2 = 4.549$, $P = 0.208$, df = 3
	Below diploma	11	15.7	11	15.7	(31.4%) 22	
	Diploma	13	18.6	18	25.7	(44.3%) 31	
	University degree	8	11.4	2	2.9	(14.3%) 10	
Economic status	Average	14	20	19	27.1	(47.1%) 33	$\chi^2 = 5.581$ $P = 0.134$, df = 1
	Good	21	30	16	22.9	(52.9%) 37	
Cultural status	Average	6	8.6	5	7.1	(15.7%) 11	$\chi^2 = 1.620$ $P = 0.655$, df = 2
	Good	25	35.7	27	38.6	(74.3%) 52	
	Excellent	3	4.3	4	5.7	(10.0%) 7	
Place of residence	Dormitory	14	20	9	12.9	(32.9%) 23	$\chi^2 = 3.113$ $P = 0.21$, df = 2
	Family-rent	2	2.9	6	8.6	(11.4%) 8	
	Family/home owner	19	27.1	20	28.6	(55.7%) 39	

mother's occupation, father's occupation, mother's literacy, father's literacy, economic status, and cultural status variables (Table 1). The *P* value from the Kolmogorov-Smirnov test indicated a non-significant distribution in all of four dimensions of creativity (Fluency *P* = 0.231, Expansion *P* = 0.611, Flexibility *P* = 0.178, origination *P* = 0.703).

Based on the results of the independent *t* test, there was no significant difference between the dimensions of creativity in the intervention and control groups before the intervention. The total score of creativity was 64.40 in the control group, and 70.71 in the intervention group before the intervention. Also, among the components of creative thinking, fluency (26.29) had the highest score and expansion (10.11) had the lowest score. Finally, there was no significant difference between the two groups in the total score of creativity before the intervention (*P* = 0.706) (Table 2).

The difference between the average scores of creative thinking was statistically significant (*P*=0.001) according to the results of variance analysis with repeated measuring immediately after the intervention and on follow-up (Table 3).

Repeated measuring was used for comparison because the assumptions were considered. The amount of effect was 0.867 in pre- and post-test comparison (*P* = 0.001) by the repeated measure ANOVA (Table 3). This effect had been added by the interaction of group effect. In one-month follow-up, the amount of effect was reduced to 0.19, which was significant (*P* = 0.001) (Table 4).

Table 2. Comparing the Mean and Standard Deviations of Dimensions of Creativity in the Control and Intervention Groups Before the Intervention.

Components of Creativity	Group	Mean	SD	Independent t test
Fluency	Control	24.57	7.957	T = 0.572
	Intervention	26.29	7.35	*P* = 0.323
Expansion	Control	9.49	3.71	T = 0.523
	Intervention	10.11	3.07	*P* = 0.411
Flexibility	Control	14.57	3.70	T = 0.688
	Intervention	15.49	3.75	*P* = 0.163
Origination	Control	16.00	5.83	T = 0.204
	Intervention	18.66	4.41	*P* = 1.642
Total score	Control	64.40	17.52	T = 0.404
	Intervention	70.71	15.74	*P* = 0.706

SD, standard deviation.

The results in Table 5 show the creative thinking of the two groups at the stages of immediately after the intervention and on follow-up. Also, Cohen's correlation test showed that the effectiveness of training on creative thinking was 0.91 at the 8th week and 0.50 in one-month follow-up.

Discussion

Our study showed that the samples were homogenous in terms of demographic information before the intervention, as the majority of midwifery students who participated in the study in both groups were 22-24 years old. The intervention and control groups were homogenous in terms of age, economic status, culture, parents' education and place of residence. The score of creative thinking in the intervention and control groups was 50-75 before the intervention, indicating that they had a low creative thinking level. After the intervention, the students' creative thinking improved and the amount of effect was 0.91 by Cohen's test and 0.867 by the repeated measure ANOVA. The level of effect was also constant through the next month with a slight decline.

Mohebiamin et al studied the creativity of 246 students from four disciplines (nursing, anesthesia, operating room and midwifery) in the first semester of 2012. The results indicated a significant difference between the scores of educational program in the components of creativity (*P* < 0.001). They concluded that the midwifery tutors obtained the highest score in creative teaching compared to tutors of other disciplines.[36]

Also, Sadeghi et al found that the creativity of nursing students was higher than the general public, which is somewhat similar to the results of our study.[37] Furthermore, in the present study, the total score of creativity was 64.9 after the intervention in the control group, while it was 80.4 in the intervention group and there was a significant difference between the two groups. In a study by Pirkhaefi et al, the two groups were significantly different in the score of fluency, which was significantly increased in the intervention group. The scores of flexibility and originality were also increased.[33] These results are similar to the findings of this study with one difference which is, unlike their results, the score of originality dimension of creativity in our study was slightly increased after the

Table 3. Comparing the Changes in Creative Thinking in the 8th Week and One-Month Follow-up after the Intervention

Creative Thinking after the Intervention and follow-up	Group		Comparing the Intervention and Control	Comparing the Intervention and Control with the Past	Amount of Effect with Variance Analysis by Repeated Measuring in 3 Stages	Significant Level with Variance Analysis With Repeated Measuring
	Intervention	Control				
Creative thinking immediately after the intervention	80.4 (14.68)	64.91 (18.33)	F = 18.675	0.221	0.867	*P* = 0.001
Creative thinking on follow-up	72.09 (14.98)	63.54 (18.02)	F = 15.445	0.190		*P* = 0.001

F, variation between sample means/variation within the samples which calculated using the ANOVA, The F-statistic is a ratio of two quantities that are expected to be roughly equal under the null hypothesis.

Table 4. Results of Variance Analysis for Repeated Measuring to Compare the Mean Score of One-Month Follow-up and the Pre-test

Source of Changes	Sum of Squares	df	Mean of Squares	F-test	Significant Level	Multivariate Eta Square
Effect of intervention	1162.825	1	1162.825	15.445	$P < 0.0001$	0.190
Pre-test effect	5938.923	1	5938.923	78.882	$P < 0.0001$	0.544
Interaction of group effect with pre-test	75.708	1	75.708	1.006	$P = 0.320$	0.015
Error	4969.081	66	75.289			

F-test, Analyzes variance in repeated measure design.
Eta squared (η2) is the ratio of the total variance in an outcome variable that is reflects the strength or magnitude related to a main or interaction effect. It is a common measure of effect size and used in *t* test and ANOVA.

Table 5. Comparing the Mean and Standard Deviation of Creative Thinking and Effect Size with Cohen's Test at Two Post-test Times

Statistics Variables	Mean and Standard Deviation		Effect Size Cohen's d	Significant Level with Cohen's Test
	Intervention	Control	Comparing the intervention and Control	Comparing the Intervention and Control
Creative thinking immediately after the intervention	80.4 (14.68)	64.91 (18.33)	0.91	$P < 0.0001$
Creative thinking on follow-up	72.09 (18.02)	63.54 (18.02)	0.50	$P < 0.0001$

intervention although the difference was not significant compared to pre-intervention. On the other hand, in the study by Pirkhaefi et al, the intervention was implemented through a workshop that lasted for 40 hours. The practical training part of the workshop was 15 hours and theoretical training lasted for 25 hours.[33] The difference in the tools used, method and duration of training and the study population would be likely the reasons for this difference.

In a study by Ness et al, the scores of creativity dimensions increased after the intervention. However, the score of originality in their study showed a higher increase compared to our findings.[15] This result is similar with the results of our study, as the overall score of creativity was increased after the intervention. However, since the trend of increase in originality in our study was not sharp, our result is different with the findings of Ness et al in this respect. The probable reason for this difference is that they used the Visual Torrance' creativity test (Form B) to assess the level of creative thinking (15), which is different from our tools. Many studies have also been conducted in this context that found results similar to ours.[38-41]

It should be added that very few educational studies on creativity have included a follow-up, so the follow-up in the present study is one of its strengths. However, educational interventions on other variables have been associated with long-term follow-up. For example, Luiz Adrian et al conducted a study to evaluate the effect of the professional communication educational method on academic achievement and repairing the relationships among pharmacy students. They concluded that the effectiveness of education lasted until the end of the students' study. They managed to maintain the changes in the students until the end of the academic year at the University of Hawaii through role-play and designing a scenario.[42]

Based on our results, the effectiveness of the implementation of the technical simulation using GFB Method was 0.91 in improving creative thinking at the eighth week and lasted for at least one month after the intervention, especially in terms of components of fluency and flexibility. Despite its effect on two dimensions, it could not make a statistically significant difference in all four dimensions of creativity when comparing pre-intervention to one month after the intervention. It seems that the number and duration of sessions were not enough for the effectiveness of intervention on these two components. Perhaps with more training sessions, a better effect may be achieved for these two components. It must be noted that our study examined the impact of this intervention only on midwifery students; it is recommended that further studies should be conducted to examine the impact of this intervention on the students of other disciplines of medical sciences.

Our study limitation was the sampling method (convenience sampling); in order to reduce the effect of this limitation (to reduce the risk of selection bias), we tried to use two homogeneous groups of students with the same pre-intervention characteristics (such as discipline, age, sex, university, session of classroom and content) and conducted the sampling in two separate periods of time to prevent the exchange of information between the two groups.

Authors' Contribution

Authors' Contributions: MaS and MoS confirmed of the presented idea. MM developed the theory and performed the intervention and wrote the manuscript. MY verified the analytical methods and helped shape the research. ASHD contributed to the design and supervised the findings of this work. All authors contributed to the final manuscript.

Conflict of Interest Disclosures

None.

Ethical Statement
This research was reviewed and approved by the ethics committee of the Tehran University of Medical Sciences with Approval ID IR.TUMS.MED.REC 29895-30-063-94, 17042.

Acknowledgments
The authors would like to thank the School of Nursing and Midwifery, Tehran University of Medical Sciences that helped us to conduct this study. This study was part of Maryam Moddares' research that was registered in Pajoheshyar with the Number: 29895 dated 25.04.2015 and on 22.07.2015 obtained the code from Ethical Committee of Tehran University of Medical Sciences.

References

1. DeHaan RL. Teaching creativity and inventive problem solving in science. CBE Life Sci Educ. 2009;8(3):172-81. doi: 10.1187/cbe.08-12-0081.
2. Kyoung Hwa L. The relationship between creative thinking ability and creative personality of preschoolers. Int Educ J. 2005;6(2):194-9.
3. Saif AA. Modern Educational Psychology: Learning and Teaching Psychology. 6th ed. Tehran: Doran Publications; 2011.
4. Mumford MD, Mobley MI, Reiter-Palmon R, Uhlman CE, Doares LM. Process analytic models of creative capacities. Creat Res J. 1991;4(2):91-122. doi: 10.1080/10400419109534380.
5. Cheng VM. Infusing creativity into Eastern classrooms: Evaluations from student perspectives. Think Skills Creativity. 2011;6(1):67-87. doi: 10.1016/j.tsc.2010.05.001.
6. Gunderman RB. Achieving Excellence in Medical Education: 2nd ed. Springer: London; 2011.
7. Hossieni A, Khalili S. Explanation of creativity in postmodern educational idea. Procedia Soc Behav Sci. 2011;15:1307-13. doi: 10.1016/j.sbspro.2011.03.283.
8. Scott JN, Markert RJ, Dunn MM. Critical thinking: change during medical school and relationship to performance in clinical clerkships. Med Educ. 1998;32(1):14-8. doi: 10.1046/j.1365-2923.1998. 00701.x.
9. Hosseiny AS, Godarzi MA, Poorkhalil M. The Role of Psychological Empowerment Factors in Enhancing the Creativity of Staff of Baqiatallah Medical Sciences University, Iran. J Educ Manage Stud. 2015;5(1):10-4.
10. Hoseini AS. Survey the influence of the creativity teaching model on teachers' knowledge, attitude, and teaching skills. IJSSP. 2014;3(2):106-17. doi: 10.4471/rise.2014.08.
11. Amabile TM. Componential Theory of Creativity. In: Kessler EH, ed. Encyclopedia of Management Theory. Sage Publications: London; 2013:134-9. doi: 10.4135/9781452276090.n42.
12. Piffer D. Can creativity be measured? An attempt to clarify the notion of creativity and general directions for future research. Think Skills Creativity. 2012;7(3):258-64. doi: 10.1016/i.tsc.2012.04.009.
13. Dornan T, Mann K, Schepbier A, Spencer J. Medical education theory and practice. Integrates, practice, theory, innovation and research, 1st ed. Churchill Livingstone/Elsevier; 2011.
14. Livingston L. Teaching creativity in higher education. Arts Educ Policy Rev. 2010;111(2):59-62. doi: 10.1080/10632910903455884.
15. Ness RB. Commentary: Teaching creativity and innovative thinking in medicine and the health sciences. Acad Med. 2011;86(10):1201-3. doi: 10.1097/ACM.0b013e31822bbb9f.
16. Onarheim B, Friis-Olivarius M. Applying the neuroscience of creativity to creativity training. Front Hum Neurosci. 2013;7:656. doi: 10.3389/fnhum.2013.00656.
17. Karwowski M. Are creative students really welcome in the classrooms? Implicit theories of "good" and "creative" student'personality among polish teachers. Procedia Soc Behav Sci. 2010;2(2):1233-7. doi: 10.1016/j.sbspro.2010.03.179.
18. Shirazi M, Shariati M, Modarres M, Hosseini Dehshiri AS, Yunesian M. The Impact of creative group teaching and educational booklet methods on interpersonal communications among midwives in clinical setting. Int J Clin Med. 2016;7(10):698-711. doi:10.4236/ijcm.2016.710076.
19. Issenberg SB, McGaghie WC, Petrusa ER, Lee Gordon D, Scalese RJ. Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. Med Teach. 2005;27(1):10-28. doi:10.1080/01421590500046924.
20. Sutherland R, Reid K, Kok D, Collins M. Teaching a fishbowl tutorial: sink or swim? Clin Teach. 2012;9(2):80-4. doi:10.1111/j.1743-498X.2011.00519.x.
21. Cohen J, Lesnick A, Himeles D. Temporary anchors, impermanent shelter: Can the field of education model a new approach to academic work? J Res Pract. 2007;3(2):13.
22. Einöther SJ, Baas M, Rowson M, Giesbrecht T. Investigating the effects of tea, water and a positive affect induction on mood and creativity. Food Qual Prefer. 2015;39:56-61. doi: 10.1016/j.foodqual.2014.06.016.
23. Ding X, Tang YY, Tang R, Posner MI. Improving creativity performance by short-term meditation. Behav Brain Funct. 2014;10(1):9. doi: 10.1186/1744-9081-10-9.
24. Takeuchi H, Taki Y, Sekiguchi A, Nouchi R, Kotozaki Y, Nakagawa S, et al. Creativity measured by divergent thinking is associated with two axes of autistic characteristics. Front Psychol. 2014;5:921. doi: 10.3389/fpsyg.2014.00921.
25. An D, Song Y, Carr M. A comparison of two models of creativity: Divergent thinking and creative expert performance. Pers Individ Dif. 2016;90:78-84. doi: 10.1016/j.paid.2015.10.040.
26. Dishke Hondzel C, Sørebø Gulliksen M. Culture and creativity: Examining variations in divergent thinking within Norwegian and Canadian communities. SAGE Open. 2015;5(4):1-13. doi: 10.1177/2158244015611448.
27. Murray G, Johnson SL. The clinical significance of creativity in bipolar disorder. Clin Psychol Rev. 2010;30(6):721-32. doi: 10.1016/j.cpr.2010.05.006.
28. Dauphinee WD, Wood-Dauphinee S. The need for evidence in medical education: the development of best evidence medical education as an opportunity to inform, guide, and sustain medical education research. Acad Med. 2004;79(10):925-30. doi: 10.1097/00001888-200410000-00005.
29. Norman GR. Reflections on BEME. Med Teach. 2000;22(2):141-4.doi:10.1080/01421590078553.
30. Davis DA, Barnes BE, Fox RD. The Continuing Professional Development of Physicians: From Research to Practice. 1st ed. American Medical Association; 2003. doi: 10.1016/j.jacr.2003.12.038.
31. Creswell JW. Educational research planning, conducting and evaluating quantitative and qualitative research. 4th ed. Pearson Education Inc; 2012. Available from: http://basu.nahad.ir/uploads/creswell.pdf.
32. Amiri A. Noroozi D. Comparing the effectiveness of two method (TRIZ and brainstorming) on the creativity of the E-learning training students of Khaje Nasir University (Persian). Initiative and Creativity in Human Sciences. 2012;1(4):85-120.
33. Pirkhaefi A, borjali A, Delavare A, Eskandari H. The effect of creativity training on metacognitive components of students' creative thinking (Persian). Quarterly Journal of Educational Leadership & Administration. 2009;3(2):51-61.
34. Daemi H, Moghimi Barforoosh F. Normalization of the creativity test. Adv Cogn Sci. 2004;6(3-4):1-8.
35. O'Neil HF, Abedi J, Spielberger CD. The measurement and teaching of creativity. In: O'Neil HF, Drillings M, eds. Motivation: Theory and research. Routledge; 1994:245-63.
36. Mohebiamin S, Jafari Suni H, Saeedy Rezvani M, Amin Yazdi A. Creative teaching in Mashhad University of Medical Sciences: students' viewpoints in school of nursing and midwifery. Iran J

Med Educ. 2013;13(6):509-18.
37. Sadeghi Gandomani HR, Delaram M, Naseri-Ziba F, Naseri-Boroujeni N. Assessment the Creative Skills of Nursing Students and Nurses in the Intensive Care Units of Hospitals Covered by Tehran University of Medical Sciences. Res Med Educ. 2015;7(3):11-9. doi:10.18869/acadpub.rme.7.3.11.
38. Alzoubi AM, Al Qudah MF, Albursan IS, Bakhiet SF, Abduljabbar AS. The effect of creative thinking education in enhancing creative self-efficacy and cognitive motivation. J Educ Develop Psychol. 2016;6(1):117-30. doi: 10.5539/jedp.v6n1p117.
39. Çetinkaya Ç. The effect of gifted students' creative problem solving program on creative thinking. Procedia Soc Behav Sci. 2014;116:3722-6. doi: 10.1016/j.sbspro.2014.01.830.
40. Bahrami B, Hoseinia A. Evaluation of in-Service Training Programs and Creativity in Teaching. Int J Rev Life Sci. 2015;5(1):1015-9.
41. Paek SH, Sumners SE. The indirect effect of teachers' creative mindsets on teaching creativity. J Creat Behav. 2019;53(3):298-311. doi: 10,1002/jocb.180.
42. Luiz Adrian JA, Zeszotarski P, Ma C. Developing pharmacy student communication skills through role-playing and active learning. Am J Pharm Educ. 2015;79(3):44. doi: 10.5688/ajpe79344