Original Article

Impact of team-based learning on nursing students' knowledge of cardiovascular system examination

Farzad Zareie [1], Mohammad Reza Karimirad [2], Hossein Sharafi [3], Farhad Azadmeher [1], Keyvan Mollarahimi [1*]

[1]Department of Nursing, Boukan School of Nursing, Urmia University of Medical Sciences, Urmia, Iran.
[2]Department of Psychiatric Nursing, School of Nursing and Midwifery, Tehran University of Medical Sciences, Tehran, Iran.
[3]Department of Operation Room, School of Para Medicine, Qom University of Medical Sciences, Qom, Iran.

Article Info

Article history:
Received 15 Oct. 2022
Accepted 23 May. 2023
Published 16 Mar. 2024

***Corresponding author:**
Keyvan Mollarahimi, Department of Nursing. Boukan School of Nursing, Urmia University of Medical Sciences, Urmia, Iran.
Email: keyvanmollarahimi@gmail.com

How to cite this article:
Zareie F, Karimirad MR, Sharafi H, Azadmeher F, Mollarahimi K. Impact of team-based learning on nursing students' knowledge of cardiovascular system examination. J Med Edu Dev. 2024; 16(52): 10-16

Abstract

Background & Objective: The use of team-based learning (TBL) as one of the active learning strategies in the education of nursing students is expanding. The purpose of this study was to investigate the effect of employing the TBL method on improving the knowledge of the cardiovascular system in nursing students.

Materials & Methods: This semi-experimental study was conducted on nursing students of Hormozgan University of Medical Sciences, Hormozgan, Iran, in 2017. The students were divided into intervention (TBL method) and comparison (traditional lecture method) groups. The intervention group was taught by the TBL method, while the control group received teaching by the lecture method during three 2-hour sessions. Pre-test and post-test were administered to all students. The data were analyzed using SPSS23 software and the significance level was considered ≤ 0.05.

Results: The results showed a significant difference among the students in the intervention group, whose mean score of knowledge increased from 12.45±5.22 before the test to 32.26±4.25 after the test ($P<0.001$). Moreover, the comparison of the post-test mean scores in the intervention (32.26±4.25) and control (17.33±4.05) indicated a significant difference between the two groups ($P<0.03$).

Conclusion: The adoption of novel educational methods, such as TBL, in the education of nursing students can improve their knowledge.

Keywords: Active Learning, Education, Lecture, Knowledge, Nursing Students, Team-based Learning

Introduction

Nursing education is the foundation of providing efficient human resources to meet the needs of society and includes theoretical and practical processes (1, 2). The main mission of nursing education is to train quality, capable, and competent nurses who have the necessary knowledge, attitude, and skills to maintain and improve the health of society (3, 4). The development of education and making changes in it require understanding the educational process and being aware of new ways to execute it, which is highlighted in nursing education more than in other fields (5).

Nowadays, the traditional lecture method, as the most common method in teaching medical sciences and nursing, has faced numerous challenges. Among these challenges, one can mention inefficiency in motivating students to participate in class and engaging them (6), the existence of one-way communication between teacher and student (7), and the inability to advance critical thinking and teach behavioral skills (8). In the education of medical and nursing sciences, to eliminate these deficiencies, the tendency to replace passive learning methods, such as lectures, with active ones has widely grabbed attention since it is believed that active learning methods have the ability to eliminate the deficiencies of lectures, cause a better understanding of educational content, and develop new skills (9).

Team-based learning (TBL) is an interesting and novel educational strategy (10) that is used to create active

[DOI: 10.32592/jmed.2023.16.52.10]

learning in large group lectures (11). This strategy is based on social learning theory (12) and is increasingly employed in medical education and other health-based professional education programs (13). Team-based learning is designed in four stages, namely individual work, group work, immediate feedback, and application of exercises, to increase students' understanding and evaluate knowledge concepts (14). In various previous studies conducted in different fields, TBL has been reported to benefit in numerous ways, including increasing student satisfaction compared to traditional methods(15), improving grades and raising students' Grade Point Average (16), increasing participation and learning enjoyment (17), deepening understanding of delivered education (18), improving intra-group cooperation skills and problem-solving skills (19).

Considering this, specialized courses are of specific importance in the chapters of nursing courses, and if these courses are taught in a scientific and up-to-date manner, they can improve the knowledge of students more and more. It seems that the importance of using TBL has not been investigated in specific nursing courses, and its benefits should be well demonstrated in the education of nursing students (20, 21).

However, it is recommended that TBL be used more in the learning stages of basic science education in medical education (22). Based on the monitoring of students' previous years' scores in learning the knowledge of cardiovascular system examination, and subsequently identifying the shortcomings and weaknesses of students' learning in this field, it was decided to conduct research in the form of an active learning course of TBL for medical students (nursing). Therefore, this study was performed to investigate the effect of using the TBL method on improving the knowledge of the cardiovascular system in nursing students.

Materials & Methods

Design and setting(s)

This semi-experimental study was conducted based on a pre-test and post-test nonrandomized control group design (23) on third-semester nursing students in 2017.

Participants and sampling

After describing the objectives of the research, informed consent was obtained from all participants. The statistical population included all undergraduate nursing students in the third semester studying at the School of Nursing and Midwifery in Bandar Abbas (n=35) and the School of Nursing and Midwifery in Bandar Lengeh (n=35), affiliated with the Hormozgan University of Medical Sciences, Hormozgan, Iran. The samples were entered into the study using a census sampling method. The inclusion criteria were being a third-semester nursing student and willing to participate in the study. On the other hand, students in semesters other than the third one, reluctant to take part in the study, and absent in educational sessions were excluded from the study. Because of the availability of students and the presence of all students in the classrooms, there was no missing sample in this study. The reason for the equal selection of participants from the two schools was the equal number of student entries in these two schools.

Tools/Instruments

The required data were collected using questionnaires, namely a demographic information form, individual readiness assurance test (I-RAT), and group readiness assurance test (G-RAT), as well as educational tools. All the designed tests were first reviewed by other professors in the two faculties in terms of the validity of the content and were used after undergoing modifications. The reliability scores of the I-RAT and G-RAT using Cronbach's alpha analysis were obtained at 0.87 and 0.86, respectively.

The demographic questionnaire included information on age, gender, marital status, residence status, and educational status of parents. The I-RAT contained four-choice questions that measured the main concepts of the course content. At this stage, students could not use the sourcebook. To complete the G-RAT, the group members needed to agree on each question, and this discussion and negotiation in the group provided an opportunity for students to learn. At this stage, students could not use the sourcebook either. Due to the fact that in this study there was no drop in the participants and all students were present to the end of the study, the Prism Diagram was not drawn.

Data collection methods

The purpose of selecting the third-semester students was that these students had not yet completed the cardiovascular course, and since the topic of the research was knowledge of the cardiovascular system, the impact of confounding variables was minimized. In this way, the groups were matched in terms of placement in the same semester and also the lack of a history of learning the subject of heart examination knowledge.

The intervention group received training based on the TBL method, while the comparison group underwent teaching by the lecture method. The course material was

[DOI: 10.32592/jmed.2023.16.52.10]

taught from the translated book of Bruner and Sodarth, which is one of the main sources of the internal surgery course. Before starting the research and to find out the students' level of knowledge in cardiovascular system examination, a pre-test was taken from all the students participating in the study. After the pre-test, the educational content was provided to all students in the form of pamphlets and slides during a module. Afterward, the students were divided into two groups, namely the comparison group (undergoing the traditional lecture method) and the intervention method (being taught by the TBL method). The training in the comparison group was conducted using the usual lecture method in the form of three two-hour sessions, while in the intervention group, TBL was conducted based on a study by Maslakpak et al. (24) in a five-hour workshop. This workshop included the following steps:

First stage: A few days before the course, the educational module was provided to the students and they were asked to study for the second stage. Students studied the material independently and outside the class.

Second stage: As soon as the workshop started, the students filled out the I-RAT to evaluate their understanding of the knowledge and concepts acquired in the first stage. Each I-RAT included 40 questions in various formats about the course's educational materials. Answering these questions correctly required the use of materials that the student should have studied in the first stage. After completing the I-RAT, the students were randomly divided into 5 groups of 7 people, and the same test was given to the groups. Each group had to reach a consensus in their group to choose the answers to all the questions in this phase of the test, which was called the G-RAT.

Third stage: After collecting the individual and group test papers, the groups discussed their answers with other groups and justified their answers. To provide immediate feedback, the instructor, as a facilitator, discussed with the students about their questions and answers and clarified any concept for which the students had difficulty in understanding. In the end, a post-test was administered to the two groups.

Data analysis

Two months after the end of the course, the members of both groups participated individually in a post-test, which was different from the previous post-test in the writing of questions. Data analysis was reported with the assumption of normality using central indicators of the mean (standard deviation) as well as frequency (percentage) for qualitative variables. The chi-square test was used to check the statistically significant relationships between qualitative variables. The effect of training in two groups was evaluated using a t-test and paired t-test. Data were analyzed using SPSS23 software. The significance level was considered at ≤ 0.05.

Results

This study was conducted on the third-semester undergraduate nursing students at schools of nursing and midwifery in Bandar Abbas and Bandar Langeh in Hormozgan province. Examining the data in the demographic section of the questionnaire, including age, gender, marital status, place of residence, and educational status of parents, showed that the students of the two groups had statistically significant differences in terms of age and paternal educational level ($P \leq 0.05$). (Table 1).

Table 1. Demographic information of participants in the study

Variable		Intervention group	Control group	P-value
Age (mean±SD)		21.06±2.64[#]	22.12±1.31[#]	0.002[*]
Gender	Male	19	18	0.9[**]
	Female	16	17	
Marital status	Married	1	2	0.7[**]
	Single	34	33	
Residential place	Dormitory	18	16	0.4[**]
	Non-dormitory	17	19	
Father's educational status	Diploma and lower	10	13	0.03[**]
	Bachelor's degree	18	18	
	Above bachelor's degree	7	4	
Mother's educational status	Diploma and lower	12	10	0.08[**]
	Bachelor's degree	17	18	
	Above bachelor's degree	6	7	

[*]T-test, [**]Chi-square, [#]Mean±(SD)

According to the pre-test, the mean of the knowledge scores showed no significant difference between the intervention (12.45±5.22) and control (14.86±5.92) groups. However, a significant difference was observed in the mean of the post-test knowledge score between the

[DOI: 10.32592/jmed.2023.16.52.10]

intervention (32.26±4.25) and control (17.33±4.05) groups (P≤0.03) (Table 2).

The results of the intra-group comparison of students' mean scores showed that the mean of the knowledge score in the pre-test (12.45±5.22) was significantly different from that in the post-test (32.26±4.25) among the students in the intervention group (P≤0.001). However, this difference was not significant in the control group (Table 3).

Table 2. Between-group comparison of before and after mean scores of knowledge of the cardiovascular system in the intervention and control groups

Knowledge	Intervention group mean±SD	Control group mean±SD	Statistics(t)	P-value*
Pre-test	12.45±5.22	14.86±5.92	-1.85	0.176
Post-test	32.26±4.25	17.33±4.05	4.11	0.03

*Paired t-test

Table 3. Intra-group comparison of before and after mean scores of knowledge of the cardiovascular system in the intervention and control groups

Group	Number	Pre-test mean±SD	Post-test mean±SD	Mean difference	Statistics(t)	P-value *
Intervention group	35	12.45±5.22	32.26±4.25	19.81 (3.16)	-25.18	0.001
Control group	35	14.86±5.92	14.86±5.92	2.47 (2.26)	-1.25	0.156

*Paired t-test

Discussion

Considering the limited adoption of new educational methods in the education of nursing students, this study was conducted to examine how TBL affected students' knowledge of the cardiovascular system. The findings of the current study revealed that the implementation of the TBL method, as opposed to the traditional lecture method, resulted in a notable improvement in students' knowledge of the cardiovascular system examination. Additionally, it was found that the TBL method not only enhanced students' knowledge but also boosted their desire to learn.

Nowadays, growing attention is given to modern educational methods employed to teach the students of medical sciences, as well as to influencing and inhibiting factors in education (25). It is necessary to pay attention to new educational methods to improve students' awareness to prepare them for their professional duties (26).

In a meta-analysis conducted by Chen et al. (2018) (27), which was conducted with the aim of investigating the effectiveness of teaching medical students by TBL method, it was found that TBL improved the knowledge, attitude, and skills of these students, compared to other educational methods; therefore, they recommended the higher employment of this method. These results were in line with those of our study. The results of a study conducted by Sannathimmappa et al. (2022) (28), in Oman with the aim of examining medical students' understanding of the TBL method showed that this method was a suitable model and strategy for teaching medical students, which could be used with confidence if the training conditions were favorable.

Today, students are living in an era of technological advancement and new communication methods, which have made education face new challenges. It is vital to identify and implement novel educational methods that reduce existing challenges and are applicable to various sciences. TBL is one of these methods and has been investigated in students of other sciences. The results of the study by Ghaneib and Cagliesi (2022) (29), who examined the TBL method in economics students, demonstrated that this method, in addition to improving students' academic performance, made education more enjoyable, and perhaps because of this students' grades had raised.

Active learning strategies, especially the TBL method, have a great effect on improving student learning H Xue et al. (2021) (9), in their study, compared the lecture teaching method with the TBL method in nursing students, and concluded that TBL raised awareness, increased efficiency, and improved the teaching process among the students of the intervention group, compared to the lecture-given group. It was also revealed that TBL, through effective feedback between professors and students, as well as proving conditions for more discussion and communication, had a positive result and a significant impact on the education process (30). In two studies conducted in Iran, in which the effects of the TBL method were examined on students, it was found that this method was associated with high satisfaction and had a positive effect on improving students' learning (31, 32).

[DOI: 10.32592/jmed.2023.16.52.10]

These important and significant effects are supported by other studies (33, 34).

However, based on the results of some studies, the TBL method has not been associated with significant positive effects. In a study by Dehghani and Sabour (2017) (35), which was conducted to compare the effect of two teaching methods (i.e., lecture and TBL) on pharmacy students, no significant difference was observed in the average scores of the two groups, which was not consistent with the results of the present study. The reason for this problem can be attributed to the small number of samples in the mentioned study, in which only 30 students were included.

In the TBL method, the active role of the student in learning leads to more and better learning of educational materials, which results in an increase in students' level of knowledge and average scores, while the traditional teaching method (i.e., giving lectures) is incomplete and incomprehensive due to the fact that students cannot be active, and therefore, forget the learning material. It can be concluded that TBL, compared to the lecture method, increases the depth of students' learning and perception, which in turn makes learning more stable and practical (36).

The improvement of teaching strategies, such as TBL, would lead to the enhancement of the learning process through more enthusiasm for learning, more cooperation, teamwork, and creating competition. Since one of the main pillars of TBL is group work and interaction between group members, opportunities are provided to enhance social communication and develop skills and abilities for professional work and activity. All these components can play a positive role in students' learning, which will finally show their effect in raising students' grades as a manifestation of improved learning.

One of the limitations of the study was that it was conducted only on a small topic of a bigger topic and that it was done in two separate settings.

Conclusion

The results of this research were indicative of the greater impact of the TBL method compared to the lecture method on the promotion and improvement of knowledge and learning in students. Based on this result, it is possible to act with more confidence regarding the application of active learning strategies, especially group-based learning, in educational processes at the university level. According to the findings obtained from this study, it is suggested that TBL be used as an effective and dynamic training method to extend students' knowledge in various fields of medical sciences. It is also recommended that this educational method be considered in learning highly important topics in the clinical and internship fields of students.

Ethical considerations

The present study was registered with the ethical code IR.HUMS.REC.1395.126 at Hormozgan University of Medical Sciences. The principles of ethics in the research were respected, which included voluntary participation in the research, the statement of the study objectives, the consent of the faculties to conduct the study, and the confidentiality of the information.

Acknowledgment

The authors would like to express their appreciation and gratitude to Hormozgan University of Medical Sciences for their cooperation in the implementation of the research.

Conflict of interest

The authors have no conflicts of interest, either financial or non-financial, to declare.

Author contributions

Farzad Zareie: Idea production and design of the study, preparation of the article

Mohammad Reza KarimiRad: Study design, data collection

Hossein Sharafi: Implementation, data collection

Farhad Azadmehr: Preparation of the article, critical review before submission

Keyvan Mollarahimi: Analysis and interpretation of data, preparation of the article, editing after refereeing.

Data availability statement

Data will be available upon request.

References

1. Boselie P, J Van Harten, M. Veld. A human resource management review on public managementand public administration research: stop right there before we go any further. Public Management Review. 2021; 23(4): 483-500. [https://doi.org/10.1080/14719037.2019.1695880]

2. Johansen M.S, J.E Sowa. Human resource management, employee engagement, and nonprofit hospital performance. Nonprofit Management and Leadership. 2019; 29(4): 549-567. [https://doi.org/10.1002/nml.21352]

3. Nes AAG, Simen AS, MH Larsen, et al. Technological literacy in nursing education: A scoping review. Journal of Professional Nursing. 2021; 37(2): 320-334. [https://doi.org/10.1016/j.profnurs.2021.01.008]

4. Argyriadis A, Patelarou E, Paoullis P, et al. Self-Assessment of Health Professionals' Cultural Competence: Knowledge, Skills, and Mental Health Concepts for Optimal Health Care. International Journal of Environmental Research and

[DOI: 10.32592/jmed.2023.16.52.10]

PublicHealth. 2022; 19(18): 11282. [https://doi.org/10.3390/ijerph191811282]
5. Engelbrecht J, S Llinares, MC Borba. Transformation of the mathematics classroom with the internet. ZDM – Mathematics Education. 2020; 52(5): 825-841. [https://doi.org/10.1007/s11858-020-01176-4]
6. Jabbar, H.A, Jarrahi AH, Vamegh MH, et al., Effectiveness of the team-based learning (TBL) strategy on medical students' performance. Journal of Taibah Univ Medical Sciences. 2018; 13(1): 70-76 . [https://doi.org/10.1016/j.jtumed.2017.09.003]
7. Nawabi S, D Bilal, M Javed. Team-based learning versus Traditional lecture-based learning: An investigation of students' perceptions and academic achievements. Pakistan Journal of Medical Sciences. 2021; 37. [https://doi.org/10.12669/pjms.37.4.4000]
8. Yeh TP, Chang SM, Ho YF, et al. Online Team-Based Learning Teaching Strategy for Developing Caring Competencies in Nursing Students under COVID-19 Pandemic Restrictions. Healthcare (Basel). 2021; 9(11). [https://doi.org/10.3390/healthcare9111510]
9. Xue H, Yuan H, Liu G, et al. Comparison of team-based learning vs. lecture-based teaching with small group discussion in a master's degree in nursing education course. Nurse Education Today. 2021; 105: 105043. [https://doi.org/10.1016/j.nedt.2021.105043]
10. Vinall R, A Malhotra, J Puglisi. Use of Team-Based Learning Pedagogy to Prepare for a Pharmacy School Accreditation Self-Study. Pharmacy (Basel). 2021; 9 (3). [https://doi.org/10.3390/pharmacy9030148]
11. Burton R, T van de Mortel, V Kain. Applying team-based learning in a transnational post registration bachelor of nursing program in Singapore. BMC Nursing. 2021; 20(1): 82. [https://doi.org/10.1186/s12912-021-00593-4]
12. Remington, TL, Bleske BE, Bartholomew T, et al. Qualitative Analysis of Student Perceptions Comparing Team-based Learning and Traditional Lecture in a Pharmacotherapeutics Course. American Journal Pharmaceutical Education. 2017; 81(3): 55. [https://doi.org/10.5688/ajpe81355]
13. Yoon MH, CM Burns, VE Michaelsen. Team-Based Learning in Different Classroom Settings. Medical Science Educator. 2014; 24(2): 157-160. [http://dx.doi.org/10.1007/s40670-014-0024-3]
14. Koh YYJ, Schmidt HG, Low-Beer N, et al. Team-Based Learning Analytics: An Empirical Case Study. Academic Medicine. 2020; 95(6): 872-878. [https://doi.org/10.1097/acm.0000000000003157]
15. Ibrahim ME.Team-based learning student assessment instrument (TBL-SAI) for assessing students acceptance of TBL in a Saudi medical school. Psychometric analysis and differences by academic year. Saudi Medical Journal. 2020; 41(5): 542-547. [https://doi.org/10.15537/smj.2020.5.25054]
16. Liu SNC, AA Beaujean. The Effectiveness of Team-Based Learning on Academic Outcomes: A Meta-Analysis. Scholarship of Teaching and Learning in Psychology. 2017; 3: 1–14. [https://psycnet.apa.org/doi/10.1037/stl0000075]
17. Dearnley C, Rhodes C, Peter Roberts P, et al. Team based learning in nursing and midwifery higher education; a systematic review of the evidence for change. Nurse Education Today. 2018; 60: 75-83. [https://doi.org/10.1016/j.nedt.2017.09.012]
18. Thompson BM, Schneider VF, Haidet P, et al. Team-based learning at ten medical schools: two years later. Medical Education. 2007; 41(3): 250-7. [https://doi.org/10.1111/j.1365-2929.2006.02684.x]
19. Abdelkhalek N, Hussein A, Gibbs T, et al. Using team-based learning to prepare medical students for future problem-based learning. Medical Teachear. 2010; 32(2): 123-9. [https://doi.org/10.3109/01421590903548539]
20. Mlambo M, C Silén, C McGrath. Lifelong learning and nurses' continuing professional development, a metasynthesis of the literature. BMC Nursing. 2021; 20(1): 62. [https://doi.org/10.1186/s12912-021-00579-2]
21. Fukada M. Nursing Competency: Definition, Structure and Development. Yonago Acta Medica. 2018; 61(1): 1-7. [https://doi.org/10.33160/yam.2018.03.001]
22. Burgess A, Matar E, Robert C, et al., Scaffolding medical student knowledge and skills: team-based learning (TBL) and case-based learning (CBL). BMC Medical Education. 2021; 21(1): 238. [https://doi.org/10.1186/s12909-021-02638-3]
23. Ary D, Jacobs LC, Irvine CK, Walker D. Introduction to research in education. Cengage Learning; 2018. [https://books.google.com.tj/books?id=WSQLAAAAQBAJ&printsec=copyright]
24. Hemmati Maslakpak M, N Parizad, F Zareie. The Impact of Team-Based Learning on Nervous System Examination Knowledge of Nursing Students. Jornal of Caring Sciences. 2015; 4(4): 331-9. [https://doi.org/10.15171/jcs.2015.033]
25. Koohestani H.R, N Baghcheghi. The effects of team-based learning techniques on nursing students' perception of the psycho-social climate of the classroom. Medical Journal Islam Republic of Iran. 2016; 30: 437.
26. Mansoorian MR, Hosseiny MS, Khosravanet S, et al. Comparing the Effects of Objective Structured Assessment of Technical Skills (OSATS) and Traditional Method on Learning of Students. Nurs and Midwifery Studies. 2015; 4(2): 27714. [https://doi.org/10.17795/nmsjournal27714]
27. Chen M, Ni C, Hu Y, et al. Meta-analysis on the effectiveness of team-based learning on medical education in China. BMC Medical Education. 2018; 18(1): 77. [https://doi.org/10.1186/s12909-018-1179-1]
28. Sannathimmappa MB, Nambiar V, Aravindakshan R, et al. Are Online Synchronous Team-Based-Learning (TBL) pedagogy effective?: Perspectives from a study on medical students in Oman. Journal of Advances in Medical Education & Professionalism. 2022: 10(1): 12-21. [https://doi.org/10.30476/jamp.2021.92361.1481]
29. Cagliesi G, M Ghanei. Team-based learning in economics: Promoting group collaboration, diversity and inclusion. The Journal of Economic Education. 2022; 53(1): 11-30. [https://doi.org/10.1080/00220485.2021.2004276]
30. Swanson E, McCulley LV, Osman DJ, et al. The effect of team-based learning on content knowledge: A meta-analysis. Active Learning in Higher Education, 2019; 20(1): 39-50. [https://doi.org/10.1177/1469787417731201]
31. Mollashaei Share S, HR Baradaran, T Boryri, et al. The effect of Team Based Learning and Classical Lecture on the Knowledge and Attitudes of Midwifery Students in the Course of Midwifery Emergency. Research in Medical Education. 2019; 11(3): 22-29. [http://dx.doi.org/10.29252/rme.11.3.22]
32. Ghiyasvandian S, Haji mohammad hosein M, Asayesh H, et al. The effect of team-based learning on students' learning and motivation of Students of medical emergency in the triage lesson. Horizons of Medical Education Development. 2021; 12(1): 43-34. [https://doi.org/10.22038/hmed.2020.50081.1053]

[DOI: 10.32592/jmed.2023.16.52.10]

33. Adib-Hajbaghery M, MirBagher N, Heidari S. Clinical Nursing Education Based on Nursing Process and Group Discussion. Iranian Journal of Medical Education 2012; 11 (7): 728-734. [http://ijme.mui.ac.ir/article-1-1535-en.html]
34. Momeni H, A Salehi, H Sadeghi. Comparing the Effect of Problem Based Learning and Concept Mapping on Critical Thinking Disposition of Nursing Student. Bimonthly of Education Strategies in Medical Sciences. 2017; 10(4): 234-244. [http://edcbmj.ir/article-1-961-en.html]
35. Sabouri Shahrbabak S, MR Dehghani. Comparison of Team-Based Learning and Lecturing Methods in Pharmacological Biotechnology for Pharmacology Students. Strides in Development of Medical Education. 2017; 14(2). [https://doi.org/10.5812/sdme.64093]
36. Burgess, A, Diggele CV, Roberts C, et al. Team-based learning: design, facilitation and participation. BMC Medical Education. 2020; 20(2): 461. [https://doi.org/10.1186/s12909-020-02287-y]

[DOI: 10.32592/jmed.2023.16.52.10]