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A neurology course through team-based learning

Curso de neurologia por aprendizagem baseada em equipes

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ABSTRACT: Neurology faces teaching difficulties in many medical schools. Among active methodologies, Team-Based Learning helps to develop competencies such as problem-solving and group communication. We proposed developing, applying and evaluating the first neurology course based on this method in Brazil by using the TBL active Software. Sixty-three first-year medical students participated in the course, and when answering a final course-evaluation questionnaire containing 29 items, they considered the experience valid for neurology teaching. The Team-Based Learning method was well received by students even in the face of low test (low-test) performance as revealed by their final grade averages. Team-Based Learning, applied in a medical course and using technological resources, such as the TBL active software, proved to be an additional tool in favor of neurology teaching.

Keywords: Learning; Cooperative behavior; Students, medical; Neurology/education; Technology/education.

RESUMO: A neurologia enfrenta dificuldades de ensino em muitas escolas médicas. Entre as metodologias ativas, a Aprendizagem Baseada em Equipes auxilia o desenvolvimento de competências como a solução de problemas e a comunicação em grupo. Propôs-se desenvolver, aplicar e avaliar o primeiro curso de neurologia com esse método no Brasil e a utilização do Software *TBL active*. Participaram do curso 63 estudantes de Medicina do primeiro ano, que, ao responderam questionário final com 29 itens de avaliação do curso, consideraram a experiência válida para o ensino de neurologia. O método Aprendizagem Baseada em Equipes foi bem recebido pelos estudantes, mesmo diante de baixo desempenho nos testes revelado por suas médias finais. A Aprendizagem Baseada em Equipes, aplicada no curso médico e com uso de recursos tecnológicos, como o software *TBL active,* se mostrou mais uma ferramenta em benefício do ensino neurológico.

Descritores: Aprendizagem; Comportamento cooperativo; Estudantes de medicina; Neurologia/educação; Tecnologia/educação.

INTRODUCTION

Learning concerns the permanent development of attitudes, psychomotor skills and knowledge. It also represents the result of neurological processes involved in the so-called neurofunctional networks, which, in the human brain, are substrates for cortical functions. Among such functions, memory, attention, language and motor perception are recognized[1,2].

Several theories have emerged over time, and they have endeavored to explain learning. These theories have emerged from different contexts, sometimes considering learning in an individual manner, sometimes considering it part of social models. An example of this was the theory proposed by Freire[3], which recovered the importance of creating possibilities for students to build their own

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knowledge.

In the last 50 years, methodologies deriving from such learning theories, such as problem-based learning, team-based learning (TBL) and inverted classroom, have arisen, which were introduced with an the expectation of benefitting the development of new skills[4-9]. Among such competencies, studies refer to problem solving and collaborative learning. These strategies, also called active strategies, have been widely applied in health education[4].

Active methodologies use problematization as a teaching-learning strategy with the objective of reaching and motivating students, who, in the face of a problem, are encouraged to examine, reflect and reframe their discoveries. Problematization can lead them to contact with information and to knowledge production, mainly with the purpose of solving impasses and promoting their own development.

Consequently, these methodologies produce better performance when compared to traditional teaching methodologies. Active methodologies are based on a significant theoretical principle, which is autonomy. Contemporary education must presuppose students are capable of managing their own training process, since learning that involves self-initiative becomes more solid and long-lasting[5,6].

TBL, which was applied in medical courses for the first time in the late 1990s, is characterized by student empowerment in the learning process. Through this method, students relate previously studied subjects with new learning objectives. Additionally, in a sequence of team meetings, they solve common situations of daily practice, in which the ability of interpersonal communication is also developed[7,8,9].

Currently, the teaching of contents such as neurological semiology and neuroanatomy is an object of study due to the difficulty in learning them pointed out by medical students. Some studies have referred to such difficulty or aversion as "neurophobia"[10,11]. Basically, neurology contents are seen as extensive, complex or unrelated to the practice environment[12]. Preventing "neurophobia" in medical students depends a lot (greatly) on facilitators, tutors or teachers as well as on the development of active strategies such as TBL[12–15].

Over time, students have been subjected to several active and mixed teaching strategies in order to obtain learning benefits. The aim of this study was to develop, apply and evaluate the first neurological semiology course through TBL in Brazil. In addition to tests, students' impressions of the course and the method were evaluated.

METHOD

An unprecedented exploratory and quantitative study was carried out on the validation of a neurology course through TBL, the description of students' performance and their perceptions of the experience with the learning methodology. Initially, in order to develop the neurology course through TBL, it was necessary to define specific content and learning objectives. As neurology is a broad field of knowledge, neurological semiology was chosen as the course content. The target audience comprised first-year medical students from a specialized health school.

The process of content design and validation involved textbook research in the field of clinical testing, development of a syllabus and learning objectives for two meetings (TBL sessions). Eight referees (neurologists, health professors and managers, linguists and educators) were invited, and through the Delphi[16] method, they expressed their opinions on the development of learning objectives until consensus was reached.

Subsequently, written tests with multiple answer choices were developed for application in the two meetings, in the form of a preparation phase and an application phase in TBL. The referees followed the same consensus strategy and contributed to the analysis, writing and structure of the questions. At the end of the process, the questions were also presented and modified according to the semantic evaluation by six medical students from the clinical testing laboratories at the same institution. The referees also analyzed the peer-evaluation questionnaires and the final-course evaluation questionnaire.

Example of Some of the Preparation and Application Tests

Meeting 1 – Dizziness

Preparation test

1) What neurological functions are integrated for equilibrium regulation?
a) vestibular and cognitive
b) motor and cerebellar
c) visual and motor
d) cerebellar and vestibular

2) A 16-year-old patient sought your care at the Emergency Care Unit (UPA). She reported that when she got up that morning, she felt malaise, vison darkening and dizziness. In order to confirm whether she had lipothymia, what question would you include in the anamnesis?
a) Did objects move in front of you?
b) When you lay down, does the room spin?
c) Did your body hang to one side?
d) When you lay down, do the symptoms go away?

3) João had to miss class yesterday. He reported that his head seemed to be spinning, and he vomited. How would you rate João's complaints?
a) Oscillopsia

b) Lipothymia
c) Objective vertigo
d) Subjective vertigo

4) What structures are integrated for the conscious proprioception function?
a) the red nucleus and Wernekink commissure
b) the medial prosencephalic bundle and oculomotor nuclei
c) the spinal cord posterior funiculus and the parietal lobe
d) Deiters' vestibular nucleus and vestibular fibers

5) Miguel had mild head trauma, showed a normal skull CT scan and was released from the emergency room. After a week, he returned complaining of dizziness and tinnitus. Why did Miguel report these complaints?
a) The trauma affected the pontomedullary vestibular nuclei and their fibers.
b) The posterior labyrinth and Gasser's ganglion were affected by the trauma.
c) The semicircular canals and Wrisberg's nerve were damaged inside the temporal bone.
d) Scarpa's ganglion and the cochlea were damaged inside the temporal bone.

Application Test

6) A young patient, with recurrent dizziness seeks care in your clinic and reports that he has consulted with several doctors before, but without a solution. During crises, he complains of nausea and body shifting to the right. In the anamnesis addressing the patient's main complaint, how would you proceed? Justify your answer.
a) I would ask how long he has been having the crises and how long they have lasted.
b) I would ask if dizziness occurs when he walks and if he has noticed any difficulty walking.
c) I would ask if he feels dizzy when getting out of bed and if he has ever fainted.
d) I would describe a typical vertigo crisis and ask if that is what he feels.
e) Are you on any drug treatments? If so, what medications do you use?

Pair Evaluation Questionnaire

Remembering the meeting in which you and your colleagues answered the questions on the tests, assign each member of the team a grade from **1 to 5**, taking into account the criteria on the side.

You should list the name of each one below and record your grade on the side, for each criterion.

1 = very bad, 2 = bad, 3 = fair, 4 = good, 5 = great.

Name	Grade	Criterion
		Showed focus in the meeting and on what needed to be done.
		Contributed with solutions and recalled the studied content.
		Listened and helped colleagues in the search for solutions.
		Monitored the teamwork, giving suggestions to make it more effective.
		Showed focus in the meeting and on what needed to be done
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		Contributed with solutions and recalled the studied content.
		Listened and helped colleagues in the search for solutions.
		Monitored the teamwork, giving suggestions to make it more effective.

Final Evaluation Questionnaire for the Neurology Course through TBL

In order to evaluate the course on coordination and equilibrium semiology using the Team-Based Learning method, you will be able to contribute (with) your opinion after having experienced it.

You should read each statement below, recording your level of agreement with it on a scale from 1 to 5.

1 = (I) strongly disagree, 2 = (I) disagree, 3 = (I) don't know, 4 = (I) agree, 5 = (I) strongly agree

1. The course made it easier to learn Neurological Semiology.	1	2	3	4	5
2. The study of Neurological Semiology in this course was related to clinical practice.	1	2	3	4	5
3. You are interested in continuing to study the subject.	1	2	3	4	5
4. The meetings, with tests being completed in a team and discussed at the end, favored your interest in Neurological Semiology.	1	2	3	4	5
5. This course addressed the understanding of dizziness and its differential diagnosis, while you learned the anamnesis.	1	2	3	4	5
6. The study of Neurological Semiology in this course has to do with everyday life in the community.	1	2	3	4	5
7. This course features extensive content.	1	2	3	4	5
8. After completing this course you became interested in researching its content on the Internet.	1	2	3	4	5
9. In this course, you understood vestibular syndromes and were able to recognize mixed conditions.	1	2	3	4	5
10. The preparation tests evaluated whether you had read the previously sent material.	1	2	3	4	5
11. The study of Neurological Semiology in this course has developed your ability to provide care at a hospital.	1	2	3	4	5
12. After completing this course, you would like to read more about Neurological Semiology.	1	2	3	4	5
13. You will use what you have learned when you are working at the health care unit.	1	2	3	4	5
14. You know how to differentiate the various forms of ataxia, using the appropriate maneuvers for each case.	1	2	3	4	5
15. The team search for solutions facilitated learning. It was better than taking the tests alone.	1	2	3	4	5
16. After studying Neurological Semiology in this course, the subject will be easily remembered when you are working at the emergency room.	1	2	3	4	5
17. After completing this course, you have developed the ability to learn on a team.	1	2	3	4	5
18. After this course, you will remember how to examine a patient's gait and perform the Romberg test.	1	2	3	4	5
19. The discussion with the teacher at the end of the tests facilitated learning.	1	2	3	4	5
20. At the outpatient clinic, you will know how to examine people with ataxia, remembering this course.	1	2	3	4	5
21. After completing the course, you feel able to care for the elderly with a history of falls.	1	2	3	4	5
22. You feel motivated to seek team solutions as a learning strategy.	1	2	3	4	5
23. The criteria for evaluating your colleagues on the team were adequate.	1	2	3	4	5
24. After studying Neurological Semiology in this course, you would participate in another similar activity on another subject.	1	2	3	4	5
25. The team study made it easier to answer the test questions.	1	2	3	4	5
26. You know how important nystagmus is for the Hallpike maneuver.	1	2	3	4	5
27. You learned the subject as you answered the questions on the tests by discussing them as a team	1	2	3	4	5
28. After each meeting is finished, it is important that you also evaluate your teammates.	1	2	3	4	5
29. The preparation and application tests were important for each meeting, even though they had different goals.	1	2	3	4	5

Based on the consensus achieved, the neurological semiology course on coordination and equilibrium through TBL was concluded[12]. The project was submitted to and authorized by the institution's Research Ethics Committee, under CAAE no. 55025516.0.0000.5569.

Later, medical students who were attending the clinical testing laboratory of a medical school in northeastern Brazil were invited to participate in the course. The course was held in two meetings at the institution, which lasted three hours each. In addition to the TBL sessions, in the last hour of each meeting, practice was carried out in a simulation laboratory, with participation by student monitors.

Course development

The TBL method, used in the course, followed the steps recommended for its development. At first moment, one week before each meeting, the students received instructional material (videos and texts) with the content related to the learning objectives to be worked on in the classroom.

For the TBL sessions, in the classroom, students were randomly divided into teams (with five to seven participants each) and instructed to do written tests containing multiple-choice questions. The tests were progressively more complex, consisting of a preparation phase and an application phase.

In the preparation phase, before forming teams, students were subjected to individual multiple-choice written tests to check prior knowledge acquired from the instructional materials sent to them. In addition, during the resolution of the team tests, students could compare their answers with those offered by the TBL active software, since they used cell phones or laptop computers in the classroom.

In the application phase, on the same day as the meeting, student teams were faced with problem cases and extended multiple-choice questions. At the end, the teams had the opportunity to discuss their choices with each other and with a facilitator, a teacher present at the meeting. Thus, several teams shared the same environment, discussed answers collaboratively, proposed solutions, compared opinions and discussed the content in further detail in subsequent meetings.

Data analysis

The SPSS 13.0 (Statistical Package for the Social Sciences) for Windows and Excel 2010 software programs were used to analyze students' performance on the course. All tests were applied with 95% confidence and the results are shown in a table with their respective absolute and relative frequencies. Numerical variables are represented by measures of central tendency and measures of dispersion. The Kolmogorov-Smirnov normality test was used for quantitative variables; comparison with two groups was performed using Student's t test (Normal Distribution) and the Mann-Whitney test (Non-Normal), and the test between paired groups used the Paired Student's t Test (Normal Distribution) and the Wilcoxon Test (Non-Normal).

RESULTS

Two meetings took place. In the first meeting, 63 participants worked on contents related to neuroanatomy, nervous system physiology, neurological semiology, central and peripheral vestibular syndromes. In the second meeting 15 days after, 30 participants, who were also at the previous meeting, worked on more complex content related to neurological semiology, ataxias or incoordination, postural imbalance and approach to falls in the elderly.

At the end of each meeting and on the same day, participants completed the anonymous peer evaluation and course evaluation questionnaires. To record the averages on the individual and team tests in the comparison between the two meetings, the TBL active software, which is available for free use on the internet and has already been applied in other contexts in Brazil, was used (.)

During meetings 1 and 2, the results obtained were recorded by the software program, through which the participant teams had access to the written tests and were able to check the preparation and application tests for the correct answers. TBL active was able to analyze the performance of each individual and team participant in the two meetings, with scores from 1 to 10, where the individual stage weighed 10% and the team stage(weighted 90% of the composition of the final score for the meeting.

Table 1 shows the comparison of the number of correct answers on the written tests by comparing individual and team averages in the preparation phases of the two meetings.

Table 1 – Comparison of the number (No.) of correct answers on the individual and team written tests between the preparation phases of the two meetings

Variables	Phases		*p*-value
	Individual	Teams	
	Mean ± SD	Mean ± SD	
No. of Correct Answers - Preparation 1	18.93 ± 4.98	37.45 ± 2.11	**< 0.001 ***
No. of Correct Answers - Preparation 2	21.23 ± 4.89	33.37 ± 2.51	**< 0.001 ****

(*) Mann-Whitney Test (**) Student's t Test

In Table 1, it is observed that there was a statistically significant difference in variables "No. of Correct Answers - Preparation 1" and "No. of Correct Answers - Preparation 2" in the comparison between Individuals and Teams. It is noteworthy that the number of correct answers by the Team in relation to Individuals found in the sample was larger. Table 2 compares results between the average scores obtained by the teams in the two meetings, considering the preparation and application phases.

Table 2 – Comparison between the average scores obtained by the teams in meeting 1 (team 1) and the teams in meeting 2 (team 2) in the preparation and application phases

Variables	Moments		*p*-value
	Preparation	Application	
	Mean ± SD	Mean ± SD	
Team 1 Score	8.39 ± 0.36	6.86 ± 3.00	**0.006 ***
Team 2 Score	7.50 ± 0.57	4.50 ± 1.64	**< 0.001 ***

(*) Wilcoxon Test (**) Paired Student's t Test

In Table 2, it is observed that there was a statistically significant difference in variables "Team 1 Score" and "Team 2 Score" in the comparison between the preparation and application phases. It is noteworthy that there was a significant decrease in the scores of teams 1 and 2 in the application phases.

Table 3 compares the teams' averages in the application phases of the two TBL meetings.

Table 3 – Comparison between the teams' averages in the application phases of the two meetings

Variables	Application		*p*-value
	1st Meeting	2nd Meeting	
	Mean ± SD	Mean ± SD	
Team's Score	6.86 ± 3.00	4.50 ± 1.64	**< 0.001 ***

(*) Wilcoxon Test

In Table 3, there was a statistically significant difference in variables "Team's Score" when comparing the meetings. It is noteworthy that there was a significant decrease in the teams ' scores in Meeting 2 in relation to Meeting 1, that is, the teams that dealt with more complex content in Meeting 2 obtained, in general, significantly lower averages than did the teams formed in Meeting 1.

The data in Table 4 shows the means of the students' general opinion. The questions, which were assertions about the course and the TBL method presented to the participants, could be grouped as referring to the course structure itself, to the relationship of the course with practice environments, to their impression of the course content and to their interest in the content after the course. Each question represented a statement with a Likert-type answer from 1 to 5, where 1 was for "strongly disagree" and 5 was for "strongly agree". The mean rank was calculated for each question. If it were greater than or equal to 4, it would be considered satisfactory and valid for the participants.

As 30 participants attended the two meetings, the analysis was based on 30 questionnaires for the final evaluation of the course.

According to the mean rank obtained by most of the questions in the course's final questionnaire (Table 4), the participants agreed that the course with a TBL method was satisfactory and valid for their training; it brought them benefits and aroused interest in the neurology content.

Table 4 – The participants' general opinion regarding the course, its educational benefits and the interest aroused by the content in Neurology

Question	Mean Rank ± SD	% of Agreement
Question 1	4.59 ± 0.57	26 (96.3)
Question 2	4.70 ± 0.54	26 (96.3)
Question 3	4.44 ± 0.58	26 (96.3)
Question 4	4.59 ± 0.69	24 (88.9)
Question 5	4.33 ± 0.55	26 (96.3)
Question 6	4.15 ± 0.82	20 (74.1)
Question 7	4.04 ± 1.06	21 (77.8)
Question 8	3.78 ± 1.15	18 (66.7)
Question 9	4.19 ± 0.74	24 (88.9)
Question 10	4.37 ± 0.79	24 (88.9)
Question 11	3.67 ± 0.83	18 (66.7)
Question 12	4.33 ± 0.73	23 (85.2)
Question 13	4.59 ± 0.57	26 (96.3)
Question 14	3.56 ± 0.80	18 (66.7)
Question 15	4.89 ± 0.32	27 (100.0)
Question 16	3.93 ± 0.68	20 (74.1)
Question 17	4.37 ± 0.74	23 (85.2)
Question 18	4.78 ± 0.42	27 (100.0)
Question 19	4.81 ± 0.40	27 (100.0)
Question 20	4.00 ± 0.73	20 (74.1)
Question 21	3.19 ± 1.04	10 (37.0)
Question 22	4.59 ± 0.50	27 (100.0)
Question 23	4.70 ± 0.54	26 (96.3)
Question 24	4.63 ± 0.63	25 (92.6)
Question 25	4.89 ± 0.32	27 (100.0)
Question 26	4.19 ± 0.68	23 (85.2)
Question 27	4.67 ± 0.55	26 (96.3)
Question 28	4.67 ± 0.48	27 (100.0)
Question 29	4.70 ± 0.61	25 (92.6)

The peer-evaluation questionnaire also applied at the end of the meetings showed means that were greater than 4 for each participant in the two meetings, with no significant differences between the meetings. Thirty questionnaires of the 93 applied in the two meetings were returned.

DISCUSSION

According to the results, it was noticed that the participants showed a significant decrease in the test averages when the application tests were compared with the preparation tests for each meeting. It is worth asking whether the fact that the tests were validated by the consensus of experts would have contributed to this finding, since the expectation was that the participants would deal with more complex content and, therefore, would naturally present poorer performance, which was shown in the comparative results.

On the other hand, it is worth evaluating whether, even with prior preparation for each of the meetings, the fact that the participants had just begun their medical programs influenced the decrease in the averages on the application tests. This finding was very significant in the results. It must be recognized that first-year medical students could have more difficulty solving tests related to the practical environment.

Therefore, it was expected, that the students' opinions about the course in this TBL format would not be favorable in terms of the level of satisfaction or the validity of the experience. However, this was not observed in the results of the final questionnaire with 29 items on a Likert scale. This finding was also significant.

If, on the one hand, either because of the increasing complexity of the tests that were applied or because of the participants' inexperience, there was a decrease in the test averages, on the other, it was found that the participants considered the course satisfactory and valid for teaching neurological semiology.

It remains to be seen whether new courses with other content related to neurological semiology would promote similar reactions, or whether performance in progressively more complex subsequent meetings would also decrease. Such score behavior could indicate the validity of the course, specially developed for progressive team tests.

Thus, the phenomenon of "neurophobia", which has already been justified by the lack of adequate educational planning and bedside teaching, should be prevented by active strategies such as TBL, in which the participants' impression does not seem to be affected by poor performance or by the level of difficulty in written tests. The need for qualitative studies is suggested in order to hear the extent of these benefits from the participants' perspective, considering the context in which they are.

CONCLUDING REMARKS

The experience of conducting such an exploratory and quantitative study, in order to design course using TBL, represented a reflection on the learning phenomenon. Active methodologies are decisive agents and, specifically in relation to the method adopted in this study, the available resources and the students' opinion were rather positive considering the experience itself and the content learned.

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REFERENCES

1. Fonseca V. Papel das funções cognitivas, conativas e executivas na aprendizagem: uma abordagem neuropsicopedagógica. Rev Psicopedag. 2014.31(96):236-53. http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S0103-84862014000300002&lng=pt&nrm=iso.
2. Cosenza RM, Guerra LB. Neurociência e educação: como o cérebro aprende. Porto Alegre: Artmed Editora; 2011.
3. Freire PRN. Pedagogia da autonomia: saberes necessários à prática educativa. 25a ed. São Paulo: Paz e Terra; 1996.
4. Michaelsen L, Davidson N, Major C. Team-based learning practices and principles in comparison with cooperative learning and problem-based learning. J Excellence Coll Teach. 2014;25(3-4):57-84. https://eric.ed.gov/?id=EJ1041362.
5. Mitre SM, Siqueira-Batista R, Girardi-de-Mendonça JM, Morais-Pinto NM, Meirelles CAB, Pinto-Porto C, et al . Metodologias ativas de ensino-aprendizagem na formação profissional em saúde: debates atuais. Ciênc Saúde Coletiva. 2008;13(Suppl 2):2133-44. https://doi.org/10.1590/S1413-81232008000900018.
6. Quintanilha LF, Costa GN, Coutinho MR. Medical student perceptions about active methodologies in the study of physiology in medical schools in Salvador, Brazil. Adv Physiol Educ. 2018;42(4):693-69. https://doi.org/10.1152/advan.00105.2018.

7. McIrney MJ, Fink LD. Team-based learning enhances long-term retention and critical thinking in an undergraduate microbial physiology course. Microbiol Educ. 2003;4:3-12. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3633123/.

8. Searle NS, Haidet P, Kelly PA, Schneider VF, Seidel CL, Richards BF. Team learning in medical education: initial experiences at ten institutions. Acad Med. 2003;78(10 Suppl):S55-S58. doi: https://doi.org/10.1097/00001888-200310001-00018.

9. Vasan NS, DeFouw DO, Compton S. Team-based learning in anatomy: an efficient, effective, and economical strategy. Anat Sci Educ. 2011;4(6):333-9. doi: https://doi.org/10.1002/ase.257.

10. Santos-Lobato BL, Magalhães AB, Moreira DG, Farias F P, Porto LK, Pereira RB, et al. Neurophobia in Brazil: Detecting and Preventing a Global Issue. Rev Bras Educ Med, 2018;42(1):121-8. https://doi.org/10.1590/1981-52712015v41n3rb20160105.

11. Tarolli CG, Józefowicz RF. Managing neurophobia: how can we meet the current and future needs of our students? Semin Neurol. 2018;38(4):407-12. doi: https://doi.org/10.1055/s-0038-1666987.

12. Andrade FCG. Validação de Curso de Semiologia Neurológica com Método Aprendizagem Baseada em Equipes [dissertação]. Recife: Faculdade Pernambucana de Saúde; 2017. doi: https://doi.org/10.1590/0004-282X20170094.

13. Burgess AW, McGregor DM, Mellis CM. Applying established guidelines to team-based learning programs in medical schools: a systematic review. Acad Med. 2014;89(4):678-88. doi: https://doi.org/10.1097/ACM.0000000000000162.

14. Cevik AA, ElZubeir M, Abu-Zidan FM, Shaban S. Team-based learning improves knowledge and retention in an emergency medicine clerkship. Int J Emerg Med. 2019;12(1):6. doi: https://doi.org/10.1186/s12245-019-0222-2

15. Pollack AE. The Neuroscience Classroom Remodeled with Team-Based Learning. J Undergrad Neurosci Educ. 2018;17(1):A34-A39. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6312146/.

16. Almeida M, Spínola A, Lancman S. Técnica Delphi: validação de um instrumento para uso do terapeuta ocupacional em gerontologia. Rev Ter Ocup Univ São Paulo. 2009;20(1):49-8. https://doi.org/10.11606/issn.2238-6149.v20i1p49-58.

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