Values and Knowledge Education combined with Team Based Learning for medical students.

Yuri Perlitz[1], Yakir Lidani[2], Izhar Ben- Shlomo[1], Moshe Ben Ami[1], and Nomy Dickman[2]

[1]The Baruch Padeh Medical Center, Poriya. Affiliated to the Faculty of Medicine in the Galilee. Bar-Ilan University Safed, Israel.
[2]Bar-Ilan University

May 12, 2020

Abstract

Background: Team-based learning (TBL) is a structured form of small-group learning for students which emphasizes out-of-class preparation towards guided application of knowledge in class. Values and knowledge education (VaKE) is a teaching method in which a "dilemma" is used as a motivation and trigger of knowledge acquisition. The goal of this study was to compare and evaluate medical students' knowledge and achievements in a combination of these two methods (TBL+VaKE) vs. TBL alone. Methods: Every academic year we teach 3-4 groups of 8-10 medical students in each group, at their 5th year of MD studies. We recruited all groups of students since we started the study and alternately used one of the educational approaches on them, TBL or TBL+VaKE. Our study's module was "diabetes in pregnancy". Results: On all issues, the TBL+VaKE received higher scores. The difference for "complexity of decision making" question reached statistical significance. Furthermore, when we compared the two groups questionnaire answers, we detected statistical significance of p=0.02 (T test) for the difference between the two sets of scores. Conclusions: "Diabetes and pregnancy" module for 5th year meducal school students had better knowledge acquisition when a moral dilemma was added to the module (TBL+VaKE vs TBL).

Introduction

Team-based learning (TBL) is a structured form of small-group learning for students which emphasizes out-of-class preparation towards guided application of knowledge in class. This teaching method (1) has been reported to improve student's knowledge and to increase their engagement and satisfaction out of learning. The methodology (2) consists of modules on various subjects that span three steps: self-reading preparation at home, in-class readiness assurance testing and application-focused exercise. TBL is based on four principles (3,4): students should be talented for this mission, accountable for their pre-learning, the assignment should promote team development and satisfaction and the students must receive immediate feedback on their work. Every meeting typically includes one module. The students get a clinical case and leading questions ahead, to prepare on this subject at home. Then, at the beginning of the class, the group has a knowledge quiz and afterwards split into 2 sub-groups. The partition is made randomly, equal number of students in each group. The students answer the quiz. Then, after brainstorming, the students in each group answer together the clinical case leading questions and write the acronyms on a board. Finally, all students from both groups gather and each group presents its answers and the entire group discusses the module together with the direction and emphasis of the tutor.

Values and knowledge education (VaKE) is a teaching method in which a "dilemma" (i.e. moral, ethical or medical) is used as a motivation and trigger of knowledge acquisition (5). The dilemma is presumed to further stimulate the students to engage, to take a further look for medical information in order to familiarize themselves not only with the clinical case, but also with the dilemma. Both teaching methods have been tested and have proven better than the classical exposure to "A Power Point lecture" (6).

The aim of this study was to evaluate the students' knowledge achieved after participating in TBL vs. TBL+VaKE session on "diabetes in pregnancy" module. Furthermore, we evaluated the students' positions in a series of opinion seeking questions in both educational approaches.

Methods

This was a prospective study in a single obstetrics and gynecology department in a teaching medical center, affiliated academically to the faculty of medicine of a large university. In our department we teach medical students over a decade and use TBL in over 50% of our lectures. Every academic year we teach 3-4 groups of 8-10 medical students in each group, at their 5^{th} year of MD studies. The clerkship includes rounds with the senior physicians, clinical meetings with the staff, participating in surgeries and deliveries and lectures on central subjects of obstetrics, infertility and gynecology. We recruited all groups of students since we started the study and alternately used one of the educational approaches on them, TBL or TBL+VaKE. Our study's module was "diabetes in pregnancy". The moral dilemma presented was whether or not to suggest a termination of a 6 weeks' first pregnancy achieved in a 42 years old diabetic woman suffering of uncontrolled type 2 diabetes and chronic hypertension, treated with oral hypoglycemic medications and Ramipril (a teratogenic antihypertensive drug) and having HbA1C of 12%.

The tutor of the "diabetes in pregnancy" module was a single senior physician (YP) trained in teaching these educational approaches. All students agreed and gave their consent to participate in the study after being reassured that they will not be harmed in any way by participating or not in the study. The study was approved by the ethics committee of the Faculty of Medicine, Bar Ilan University at 24/1/2017. The module length was a two 45 minutes split session. The module flow chart is presented in fig. 1. The students were instructed to read the relevant chapter in their reference Obstetrics and Gynecology book before class. A five multiple choice anonymous test of knowledge was given to the entire students group at the beginning of the module. The dilemma and values which were at stake were introduced to the class by the tutor, together with all necessary clinical information. Based on the information presented by the tutor and their preparations at home, the students made their first decision about how to solve the dilemma and split to two groups, representing their opinions, respectively. The test questions were discussed and answered again, together, by the students in each group. Then, the first dilemma discussion took place with arguments exchanged and challenged within the group (moral viability check). This discussion raised the information that should be required, identified or developed. Students worked in groups to search for this information. The new information was shared between groups (content related viability check) and the possibility to switch groups was given. Then, the students engaged in groups once again to discuss and arrange their solution to the dilemma and to answer the clinical medical issues related to the module. In the following day, a new second round of moral arguments presentation (second dilemma discussion – moral viability check) included the whole class with the tutor. Both groups described and summarized their solution to the dilemma and presented their answers related to the clinical aspects of the module. A summary discussion was performed by the tutor concerning the dilemma and the other related issues of the module. A second anonymous five multiple question test and a self, anonymous detailed questionnaire finalized the module. The questions presented in the questionnaire were as follows:

1) To what extent have the last two classes about diabetes in pregnancy contributed to your ability to work in a group?

2) To what extent did the class format contribute to your ability for high-level thinking about diabetes in pregnancy (*i.e.* knowledge and thinking beyond memory, applied thinking, general inference, judgment and assessment, etc.)

3) To what extent did the last two classes on diabetes in pregnancy illustrate the complexity of the decision-making process?

4) To what extent have you enjoyed the last two classes on diabetes and pregnancy?

5) To what extent has the teaching/learning method contributed to shaping your conception of work as a

future physician?

6) To what extent did the last two classes on diabetes in pregnancy cause you to look for knowledge in other sources of information, outside the class and textbook?

7) Have the last two classes on diabetes in pregnancy affected you in other areas beyond knowledge (beliefs, values, self-confidence, interpersonal abilities, etc.)?

8) How satisfied are you with the last two classes on diabetes in pregnancy?

The answers were rated from 1-5, 1- Absolutely unsatisfied and 5 – Absolutely satisfied.

In addition, for each question, an option was added to explain the answer in an open form and three more open questions were considered. These findings were evaluated by qualitative analysis that presented aspects that emerged from students' responses.

The statistical analysis was performed using the Mann-Whitney-Wilcoxon test. We chose this test as being a non-parametric test, most suitable to these small groups. $P< 0.05$ was considered as statistically significant. Furthermore, the results of the final test were compared between the two groups.

Results

This was a prospective study. Between November 2017 – January 2019 we guided 7 groups of students who passed the diabetes and pregnancy module, 23 in the TBL group and 30 in the TBL+VaKE, a total of 53 students. In table 1 we present the mean + standard deviation results for the student's answered questionnaire. On all issues, the TBL+VaKE received higher scores. The difference for "complexity of decision making" question reached statistical significance. Furthermore, when we compared the two groups questionnaire answers, we detected statistical significance of p=0.02 (T test) for the difference between the two sets of scores. We compared the two groups final test marks at the end of the module, and detected no change, 68% success rate in both. In the questionnaire, for each question, a line for free verbally answer was added, in addition to three more open questions. These findings were evaluated by a qualitative analysis showing aspects that emerged from students' responses. The results are presented in table 2. The students rated the TBL+VaKE learning method slightly more favorable in: group work, high-level thinking, the complexity of decision making, impact on other areas beyond knowledge and degree of satisfaction. Examples for both positive and negative statements for both learning methods are presented in table 3.

Discussion

Main findings

TBL is an established collaborative learning approach in medical education (1, 2). VaKE is a teaching approach which combines values education to knowledge acquisition. Adding a moral/ethical dilemma to the learning module stimulates the students to further seek for information by themselves in order to solve the dilemma without limiting the content of the curriculum (7). In this study we combined, for the first time, these two teaching approaches, compared and evaluated the students' views and opinions on the TBL Vs. VaKE combined with TBL. The students who experienced the TBL+VaKE teaching approach graded it higher, statistically significant when all parameters were combined.

Interpretation

Our results are in accordance with other studies which evaluated active Vs. traditional learning approaches. Kelly *et al* conducted a study to compare the in-class engagement of medical students learning preclinical medical curriculum. The three types of learning approaches included in their study were problem-based learning (PBL), TBL and regular, frontal lectures. Study results showed that in PBL and TBL students' engagement was similar but much higher than the regular lectures. The authors concluded that the observed engagement behaviors confirm the potential of team learning with greater faculty input (8). Freeman *et al* evaluated the results of active Vs. traditional lecturing course performance on 225 studies that reported data on examination scores or failure rates for science, technology, engineering, and mathematics (STEM).

Average examination scores improved by 6% in active learning, and that students in traditional classes were 1.5 times more likely to fail than those in traditional learning (9). Theobald *et al* tested the hypothesis that underrepresented students in active-learning experience narrower achievements gaps than underrepresented students in traditional lecturing in STEM courses. Data from 15 studies (9,238 students) revealed that active learning reduced achievement gaps in examination scores by 33% and narrowed gaps by 45% (10). The authors called to replace traditional lecturing with active-learning course designs across the STEM disciplines. Conducting a new teaching approach, we had concerns whether or not the new methodology would impair the students' achievements. We evaluated this issue by comparing the module's final test results of the two approaches. We detected no change in the knowledge results in both groups' final exams. One important and significant difference between the groups of students was that "the complexity of decision making" received higher marks in the TBL+VaKE group. This is an important observation. Indeed, obstetrics is a more complex domain then others in medicine because we have to consider two patients relating very closely to each other. These two patients have many times opposite interests and we have to work out the best solution for both. Therefore, we believe that obstetrics faculty should embrace this approach as soon as possible, since it appears to be perfectly suited for this unique domain in medicine.

Strength and limitations

This is the first study in the literature which combined TBL+VaKE in medical eduction approach of medical students. Another strength of our study is the match of our study with many other studies, comparing active Vs. passive learning approaches and concluded the same conclusions: active learning is better than passive learning. Further more, combinig the TBL to VaKE did not lower the final exam achievements, meaning - no harm done. The main limitation of our study is its small participants number.

Conclusions

"Diabetes and pregnancy" module for 5^{th} year med. School students had better Knowledge acquisition when a moral dilemma was added to the module (TBL+VaKE vs TBL). When we confront our medical students with complicated cases, and further challenging them with a moral/ethical dilemma, we prepare them better for the reality they will have to dill with when they will become physicians.

Disclosure of interest

All authors declare no relevant financial, personal, political, intellectual or religious conflict of interests.

Contribution to authorship

All authors contributed to the study design concept and

design, acquisition of data, analysis and interpretation of

data, drafting of the manuscript, and critical revision of the

manuscript for important intellectual content.

All authors contributed to the study design concept and design, acquisition of data, analysis and interpretation of data, drafting of the manuscript, and critical revision of the manuscript for important intellectual content.

Funding statement

This study received no funding.

Details of ethics approval

The study was approved by the ethics committee of the Faculty of Medicine, Bar Ilan University, at 24/1/2017.

References

1. Haque M, Majumder A. Team Based Learning in Medical Education – A Review. Int J Pharm Sci Rev Res. 2017;43(2):59-63.
2. Thomas D, Sabina R. Team based learning. In: Fornari A, Poznanski A, editors. How-To guide for active learning. IAMSE MANUALS. A publication of the International association of Medical Science Educators. 2015 P. 21-28.
3. Michaelsen LK, Richards B. Drawing conclusions from the team-learning literature in health-science education: a commentary. Teaching and learning in Medicine. 2005 17(1):85-88.
4. Michaelsen LK, Sweet M. The essential elements of team-based learning. New Directions for Teaching and Learning, no. 116, Winter 2008 © Wiley Periodicals, Inc. Published online in Wiley Inter-Science (www.interscience.wiley.com). Available at: http://www.albany.edu/teachingandlearning/library/michal sen.pdf [Available at: 23-August-2016]
5. Patry JL, Weyringer S, Weinberger A. Combining Values and Knowledge Education. In: Aspin DN, Chapman JD editors. Values Education and Lifelong Learning. Dordrech, The Netherlands. 2007 p. 160–179.
6. Schwartzstein RM, Roberts DH. Saying goodbye to lectures in medical school-paradigm shift or passing fad? NEJM. 2017 377(7):605-607.
7. Patry JL. VaKE-Introduction and Theoretical Background. In: Values and Foundations in Gifted Education. Tirri K editor. Peter Lang International Academic Publishers. 2018 p. 157–169.
8. Kelly PA, Haidet P, Schneider V, Searle N, Seidel CL, Richards BF. A comparison of in-class learner engagement across lecture, problem-based learning, and team learning using the STROBE classroom observation tool. Teach Learn Med. 2005 17(2):112-118.
9. Freeman S, Eddy SL, McDonough M, Smith MK, Okoroafor N, Jordt H, Wenderoth MP. Active learning increases student performance in science, engineering, and mathematics. Proc Natl Sci USA. 2014 111(23):8410-8415.
10. Theobald EJ, Hill MJ, Tran E, Agrawal S, Arroyo EN, Behling S, Chambwe N, Cintron DL, Cooper JD, Dunster G, et al. Active learning narrows achievements gaps for underrepresented students in undergraduate science, technology, engineering, and math. Proc Natl Sci USA. 2020 117(12):6476-6483.

Figure 1

Flowchart of The TBL+VaKE combination process

Table 1

Students evaluation of various aspects of learning.

SD- Standard deviation.

Comparison of all eight marks for each method found a significant difference (P = 0.02)

	TBL		TBL+ VaKE		
	Mean	SD	Mean	SD	P value
Team work	2.91	1.04	3.46	1.07	0.074
Advanced thinking	3.48	1.04	3.66	1.20	0.454
Complexity of decision making	3.30	1.22	4.24	.95	**0.005**
Pleasure	3.96	.71	3.97	.94	0.752
Designing a future concept	2.80	1.20	3.14	1.21	0.326
Information search	2.64	1.50	2.89	1.29	0.453
Impact on other areas	1.84	.83	2.14	.79	0.166
Satisfaction	3.95	.97	3.97	.98	0.933

Table 2

Qualitative analysis of the text obtained from verbal answers in the position questionnaire.

	TBL	TBL+VaKE
Group work: Discussion, interaction	6/11	7/11
High-level thinking	4/6	10/13
Complexity of decision-making process	5/7	8/10
Pleasure from learning	12/14	9/11
Designing of work concept as a future physician	4/4	9/12
Impact on other areas beyond knowledge	2/4	5/7
Satisfaction from learning	6/12	11/15

Number of *positive statements* responders as a fraction of all (positive and negative) analyzed answers.

Table 3

Examples for positive/negative students' statements quotes from questionnaire.

	TBL
	Positive
Group work: Discussion, interaction	I made sure to consult and hear the opinions of others, especially in ques
High-level thinking	By having applied thinking and deduction from the individual to the wh
Complexity of decision-making process	The case and its thorough discussion have allowed us to go deeper.
Pleasure from learning	Everything! It is much easier to remember and understand the material i
Designing of work concept as a future physician	Shows that reality is not black and white as written un the book. Shows
Impact on other areas beyond knowledge	*No student's remarks*
Satisfaction from learning	Interpersonal interaction and discussion between group members allows f