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Importance of Team Based Learning on the Academic Performance of Medical Students: A Systematic Review

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Abstract

The quest for an excellent learning tool to enhance productivity and ultimate success in academia is not farfetched, as both students and faculty would be able to benefit from such discovery. However, one would quickly realize that learning is individualized and what works for one person might not necessarily work for another, as is the case most of the time. This is why learning methods that have proven to work at various settings and scenario need constant publishing and subsequent implementation at institutions especially when they are affordable. The aim of this study therefore, is to detail the benefits realized from the use of Team-based learning as a primary mode of instruction/learning for students at higher institutions. Team based learning (TBL) is an active form of learning that encourages individual and team involvement in learning in an academic setting. Unlike traditional pedagogy aimed at lecture delivery with application of concepts later tested, team based learning fosters immediate involvement in applying concepts being learned long before exams are taken. The aim of this study is to explore the details of the process involved in facilitating TBL while elucidating the benefits realized there in. To do this, we elected to review journal articles of previously done studies on the same topic published on databases such as Google scholar and MEDLINE. 11 articles were summarized, emphasizing on the various methods used by the researchers; most of them being experimental studies that were carried out at various academic institutions.

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The results showed positive feedback as students were not only able to improve their performances significantly on exams but also retain learned information longer with TBL. Students also exhibited positive attitudes toward learning the material when TBL was used. It was concluded therefore that students should adopt this method and indeed recommend it in all learning levels.

Keywords: Team Based Learning; Academia; pedagogy; Systematic Review; All Saints University School of Medicine; Dominica.

1. Introduction

The Learning process can be defined as one which involves acquiring knowledge or skill by studying, practicing, being taught, or an experience. There are different methods of learning such as the lecture based learning, online learning, virtual learning, Team based learning (TBL), Problem based learning etc. Medical schools today are adopting various learning techniques that will help students to understand and also get the best out of the variability of subjects that student will encounter during the cumbersome period of their MD/MBBS programme. TBL is one of the learning techniques/methods that is being adopted by a lot of medical schools recently especially for very important courses that focus on the application of knowledge in clinical practice than the mere acquisition of this knowledge [1]. Team Based learning can be defined as an active form of learning that encourages individual and team involvement in learning in an academic setting. Team based learning can also be defined as "an active learning and small group instructional strategy that provides students with the opportunity of applying conceptual knowledge through a sequence of activities that includes individual work, team work, and effective feedback" [1]. Team based learning was discovered by Dr Larry Michaelsen at the university of Oklahoma in1979 for the its sole use in business schools [1]. Baylor College of medicine and University of McMaster to mention a few are examples of institutions that already use TBL as the primary form of learning for students in various courses [2]. TBL as a primary mode of learning among college students will be considered in this study.

TBL involves a small permanent group of at least 5-7 students depending on the class size [3]. TBL has also been found to motivate student's attendance, preparation and participation in various courses [4].

TBL generally involves three different phases in order to ensure its success. Phase 1: Preparation before class, Phase 2: In class readiness assurance testing, Phase 3: In- class application focused exercise [4].

Phase 1(PREPERATION BEFORE CLASS): This involves student making preparations as well as studying a particular lecture before the TBL session via the use of handouts, lecture slides and textbooks etc [3, 4].

Phase 2(IN CLASS READINESS): Phase 2 is meant to make students accountable to phase 1.Students are to take an individual readiness assurance test (IRAT) which can consist of 5 to 20 multiple choice questions depending on the faculty [3,4]. After the IRAT has been completed, the same questions are now tested as a team hence the name Group Readiness Assurance Test (GRAT). All members of each team share the same GRAT score, and both IRAT and GRAT scores add up to the student's grade as a form of continuous assessment [3]. Rather than compete, as is usually the norm, students are encouraged to discuss their individual

answers in their groups, compare them with others and reach a consensus as to what is correct or wrong. What this does is get the student thinking about the material rather the habitual passive way of learning the material for the purpose of passing exams [4].

Appeals: The instructor allows for teams to write an appeal for any question they got wrong, they feel correct about and also any MCQ they feel was poorly constructed or ambiguous [3].

Instructor Feedback: This involves the instructor reviewing the concluded test to clear doubts and also to address those areas that students find problematic [3]. This helps bring about improved understanding of concepts [3].

PHASE 3 (IN CLASS-APPLICATION FOCUSED EXERCISE): This phase involves students engaging themselves with exercises in order to learn how to apply the knowledge acquired [3, 4]. Teams are given problems based on what the instructor has previously taught in class, and are expected to arrive at a consensus to choose the most "correct" answer out of options provided. Teams then display their answer choice, and then discuss why they chose a particular answer when confronted by other teams that chose a different answer [3].These activities work best when four elements are incorporated in TBL. These elements include significant problem, specific choice, same problem, simultaneous reporting of answers by various teams (4's) [1].

PEER REVIEW: It is a vital element of TBL done at the end of the semester in order to make sure that students are indebted to each other and also bring about teams that are effective with hardworking members [1, 3, 8].

PRINCIPLES UNDERLYING TEAM BASED LEARNING

- Team assignments must bring about increased learning and also team development. (Michaelsen *et al.*,2005)
- Students are held responsible for working in groups and pre-studying of materials.(Michaelsen *et al.*,2005)
- Groups should be set up adequately formed and not by random sorting (e.g. higher scoring students in the class should be equally distributed to each group) (Michaelsen *et al*., 2005)
- Students must also receive immediate feedback from their instructors. (Michaelsen *et al.*,2005)

The study aims to examine the use of TBL and how it affects the academic performance of medical students by reviewing previous journals written on this subject. This research will also examine other positive benefits that are associated with the use of TBL in medical schools apart from the academic performance based on previous researches conducted.

2. Materials and methods

We used eleven relevant online literature (journals) related to the topic that were published between 2003 and 2014 and carefully reviewed them. The journals used for this study were gotten from databases including, MEDLINE and EBSCO, Google scholar, Association of American college (AMMC) journals. We searched for

journals using phrases including “Team based learning”, “Effects of Team Based learning” and ”Team based learning for medical students” which yielded over 50 articles in which they were narrowed down to the eleven most corresponding ones. We reviewed the aims, methods and results observed by all researchers involved. We painstakingly analyzed each result from which we were able to extrapolate our final conclusion.

3. Results

The articles reviewed showed several measures explored by researchers to study the effects of incorporating TBL into learning methods at various institutions. Several studies carried out aimed to show improvement in academic performances while others targeted positive attitudes toward learning. Experimental studies carried out involved division of students into case and control groups whose performances were analyzed at the end of the semester or the academic session.

Research articles [2-7, 10, 11] showed studies conducted on the effects of TBL on academic performance as seen in Table 1 below. Parmalee et al. studied student attitudes toward the use of TBL along with performance, showing that students actually appreciated TBL as more engaging and helpful. Systematic reviews [1, 9] also extrapolated the use of TBL from several previously conducted studies. It is of note however, that some studies realized the differing statistics in the performance of academically weak students compared with students already excelling [3, 6].

Table 1: Materials and methods used by each study, results and conclusion.

Source	**Method used**	**Results**	**Conclusion**
Reference [1]	The author reviewed articles published on TBL in undergraduate Medical education from MEDLINE, PubMed, and Web of knowledge and ERIC.	Majority of the articles reported that TBL brought about positive impact on students as regards learning.	In the future faculty should keep to an orderly team based learning pattern to better understand the benefits of each characteristic feature of their program.
Reference [2]	The authors, at Boonshoft school of medicine evaluated the performance of second year medical students between 2003 and 2004, 2004 and 2005 academic years.	With the use of TBL, 178 students studied showed significant improvement (5.9%) in their pathology exam. It is also of note that students who performed at the lowest quartile	Medical students’ performed higher on examination questions tested that related to course content learned through TBL this helped to show that TBL enhances

		benefitted more significantly.	understanding of course content.
Reference [3]	This study carried out involved implementation of TBL for Anatomy and embryology course, for first year medical students (n=97) at wrights state university school of medicine.	There was advancement in the problem solving skills of groups but there was no convincing difference in students mean scores as compared to previous year students.	The faculty became more involved with the students as compared to the previous times when small group instruction was used. The students found out that working in groups with their fellow students helped in understanding course content. It was also found to bring about increased performance in academically weaker students.
Reference [4]	A 16-item questionnaire consisting of open ended and closed ended question was used for the purpose of the research. The results of the research were based on the 3 open ended questions.	It was found out that buy-in, expertise, time, course characteristics, resources are five key elements needed to adopting TBL.	The authors concluded by saying that the implementation of TBL must include imputing buy-in and adequate expertise, course characteristics and resources.
Reference [5]	Team-based learning was used to improve the performance of students in a physiology course by increasing their retention and positive attitude towards the material.	The authors used TBL to improve critical thinking among the students hence increasing their retention of what is being taught.	It was concluded TBL with included challenging projects worked in realizing critical thinking, increased retention of the material which in turn led to improved performance on exams

Reference [6]	Team based learning was introduced into medical ethics course as students often did not understand the relevance of the course. The impact of TBL on their satisfaction and academic performance was evaluated.	The impact of TBL was measured by analyzing the IRAT and GRAT scores and academic performances at the end of the semester.	It was discovered that TBL got the students more engaged and increased their satisfaction. It was also discovered that students that were weaker academically benefitted more from the program.
Reference [7]	First year students at the university of Vienna were introduced to TBL via an intensive course to study students' reactions and subsequent performance on block exams.	Student's reaction to TBL was very positive. 220 students that did the vigorous course had 25.3% higher scores in the TBL block.	Already successful students appreciated the program more and did remarkably well. Students generally appreciated the teamwork as it helped hone their skills of working together to accomplish tasks.

4. Discussion

The review of journals helped to describe how the use of TBL as a supplement to the traditional lecture based teaching has brought about improved performance in academics and also in other areas.

TBL was found to improve student's zeal to study and also help in understanding concepts taught in class better [5]. TBL has also been found to ensure that students start getting engaged with course material at the beginning of the semester so as to prevent cramming of course content towards the exam time, which was done in the past by some medical students [3]. TBL was found to be a solution to courses students found very tedious and difficult to understand [5,3].Students found it easier to ask their fellow team mates questions regarding topics learnt in class that they felt shy about to ask in the class room [3,2].

TBL also brought about improved performance of students in examination question that tested on some topics learnt during TBL sessions. Some studies showed that TBL was found to benefit the lower performing students in class more as compared to the students who perform well in class prior to TBL implementation hence it can serve as a helping hand to the academically weak students [10, 2].TBL has been seen to be a good reinforcer of knowledge and hence enhances long term memory [10, 5]

TBL was equally found to help in the improvement of student's communication skills through intra and inter group discussion during TBL sessions [2]. This will further help students to be able to communicate with patients in the hospital when carrying out clinical work as medical doctors. TBL has also been found to be very interesting to students [10]. For TBL to be implemented successfully there should be efficient buy-in, useful

time, competent faculty, suitable course content and also expertise [1].

TBL has been proven to be a good method for lecturing large amounts of students at a time because it helps to make sure students are actively involved in learning process as compared to use of the traditional lecture based learning where some students may be involved passively [5].

Through the use of TBL faculties are able to identify areas students are unsatisfactory in areas of topics learnt in class [2]. This is carried out through the use of analyzing GRAT scores of each group and sourcing for questions most groups seemed to have gotten wrong. The lecturer goes through these questions and also explains them to students so as to enhance a better understanding of concepts. TBL also made the lecturer to ensure that students are involved in critical thinking [2].

TBL can be easily implemented by various schools because it is not financially burdensome as compared to other teaching techniques since TBL is mostly dependent on student's[2,3] .It also helps medical students to get more used to working with others which will be an essential tool they will need in clinical practice[2]. Studies on TBL showed that those students who did not prepare well for TBL sessions were propelled to work harder for subsequent TBL sessions because they would have a very poor IRAT score and also they would want to be able to contribute to group discussions in next TBL sessions [2]. The scores on the IRAT has been a good predictor of how students will perform in examinations. Students who work alone but would also want to work in groups but are given this opportunity via the use of TBL in various medical schools. It was found at that GRAT scores of groups were usually higher than the student with the highest IRAT score in the group this further helps to show that the benefit of teamwork cannot be over emphasized [7].TBL has also been thought to be more beneficial to the students as compared to lectures, small group teaching and also personal studying [10].

Some studies showed that initially when TBL was implemented in schools students found it hard to be convinced that TBL can bring about improved outcome in their learning [7].TBL can only be effective and beneficial only when student's work together over time[7]. TBL was found to improve lecturer to student interaction because it is an active form of learning and it also helped to improve attendance among students.

It is however important to note that constraints of TBL include the fact that team performance is placed over individual performance, hence, there can be loss of focus and it can be challenging to motivate individuals who are not recognized because of their personal input. Again because assessment is made on a team based basis, certain individuals who are not performing well are not easily identified. In addition, because it is a team, there is lack of centralization and hierarchy which in turn creates a problem in coordination and control of members.

5. Conclusion and Recommendations

This research work has therefore highlighted the benefits of TBL and does recommend to this end that the method be adopted in every aspect of learning irrespective of the level of education. In conclusion Team based learning has been found to be very useful to medical students not only in the academic aspect but also in other essential areas. Academicians and faculties who aspire that their students perform well in examinations can resort to Team Based learning as a means to achieve this goal.

This study therefore recommends that TBL as a mode of learning can be implemented for courses various medical students find very difficult or cumbersome this will go a long way to bring about improved understanding. Again, it recommends that research be conducted on TBL to determine its advantages and disadvantages as a mode of learning so that faculties will have more confidence to implement it in the school curriculum.

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