Team-based learning

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ABSTRACT

Team-Based Learning (TBL) is collaborative learning approach. The objective of this review is to share application of TBL in medical education. It is an expert lead strategy of active learning in small-groups where every student/learner is responsible for own and group's learning. Literature review shows four principles of TBL i.e. conceptual framework of seven core design elements for TBL implementation, and three stages for TBL implementation. There is variation and modification in implementation. Despite challenges, TBL approach is poised for success aligning individual and team performance metrics. Its application in health professions education has a positive impact on students' learning as it improves student performance, enhances students' engagement and boosts their satisfaction. Articles titled team-based learning searched on Google in October, 2019 reviewed and information organized.

Keywords: Medical Education, Student learning, Collaborative learning, Instructor lead learning, Small group learning, Student centered learning, Team-based learning

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INTRODUCTION

Yoram Harpaz figures out four pictures that was in teachers' mind symbolizes a traditional conceptualization of teaching which comprises of "learning is listening", secondly "teaching is telling" thirdly the "knowledge is an object"; and finally "to be educated is to know valuable content" [1]. The 20th century has witnessed a revolution in medical education and transformation in curriculum from traditional apprenticeship to those based on disciplines, than on organ-systems, clinical problems to most recently on clinical presentations[2,3]. Majority of the medical schools all over the world have redesigned their curricula to boost the development of active, learner oriented, self-directed and life-long learning strategies for their students[4]. Also, the approaches for teaching learning in medical education have been changing, and a range of new approaches including collaborative learning are being used in several schools to promote active learning. The collaborative learning approach in medical education has many forms like Problem-Based Learning (PBL) and Team-Based Learning (TBL). PBL technique has been in use for last five decades but TBL technique is adopted in medical education in 21st century[5-8]. The objective of this review is to share the application of TBL. Literature with key words of team-based learning were searched on Google, PubMed, Medline and Medscape between years 2000 to year 2018, information were sorted out and organized.

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DISCUSSION

The idea of TBL was formulated originally by Larry Michaelsen, a professor of business at the University of Oklahoma, Japan in 1970, when his business classes became so large for existing faculty to teach students[9,10]. TBL, an instructional strategy is being increasingly implemented in several medical schools designed to combine the principle of PBL, students/learners centered instruction, and constructivism. It is comparatively newest educational strategy in medical education and its application to various courses in medical school and health professions education has been documented[11-14].

TBL is a method of active student learning in small-groups in which every student or learner is responsible for his or her own learning and his group's learning too; in fact, students apply conceptual knowledge in sequences activities i.e. individual work, team work and feedback. It is an expert-led (instructor-led), interactive and analytical teaching approach. One instructor can manage several students' small groups concurrently in one classroom in this strategy; even bigger classes of students in the tiered class theatres now can be

managed by one facilitator[14-16].

TBL is structured form of small group learning in which students' preparation used to occur outside of class and application of knowledge and understanding within class[10]. The basic principle behind TBL is that students working collectively as a team become more competent of reaching a higher level of learning than individual student/learner alone achieves[17]. Haidet et al. have defined "TBL, a teacher-directed method of teaching/learning including multiple small groups/teams (usually 5-7 seven students/learners per group/team) into a solo classroom setting, generally with a single instructor/teacher/facilitator/faculty (for example, undergraduate teaching sessions, postgraduate conferences, continuing health professions education activities)[18].

Principles of TBL

There are four principles of TBL stated by McMahon[17,19].

Principle 1 (Team formation and maintenance): Teams must be formed in the beginning consisting of members from different knowledge base and background and members must work together throughout the course in identified teams. This is the task of instructor. The process of teamwork must be focused on objectives and worked out by team members as to learn from each other.

Principle 2 (Accountability of students for contribution to team): Individual member is accountable for his/her own score but also their contribution to team score. Peer evaluation with honest and constructive criticism may increase accountability. The instructor must ensure that students recognize the significance of honest peer evaluation.

Principle 3 (Provision of real-time feedback to the students): Real-time feedback is critical for the strengthening of knowledge learnt by students/learners and its reinforcement with focus on learning objectives. This is implemented with use of scratch-off cards during team readiness assurance test (TRAT). Immediate feedback of instructor and peers may address misconception of members if any, thereby consolidate knowledge learnt.

Principle 4 (Team assignments in application phase): Assignments and application exercises must be constructed in such a way to generate interaction, improve peer teaching and learning and promote team learning and development. The assignment must be for team and not broken into part for individual members.

Stages, Phases or Steps of TBL Implementation: There are three steps or stages or phases for TBL: a. Student Preparation. b. Readiness Assurance. c. Application[19-22].

Step one (Student Preparation): Students must pass through study, an advance assignment (task) defined by the faculty; learners read and study the learning material individually out of class. In the preparation stage, the student/learner accomplishes an assignment (task) for example reading learning material, attending a lecture/session, viewing a video or performing an interview etc.

Step two (Readiness Assurance): Faculty must be sure students are ready, study and understand the assignment (task) by making learners demonstrate knowledge through individual readiness assurance tests (IRATs). These are relatively short set of questions (for example, quiz, exam, or test) that assess understanding of fundamental concepts found in the preparatory materials. Then pre-assigned teams/groups of 5–7 learners re-take the same test, developing a consensus on each answer in group readiness assurance tests (GRATs). These answers are scored for immediate feedback.

In TBL this step is known as the Readiness Assurance Test (RAT). Students work individually into certain steps (iRAT, gRAT, Appeals and Feedback). The students individually take the test (iRAT), then his/her entire group take the same test as groups (gRAT).

The importance of the Readiness Assurance (RA) step is to convince both the student/learner and instructor that the student understands the content to the level needed for problem solving, analysis, evaluation and/or synthesis.

Step three (Application): Students start application of knowledge when learners apply course concepts to solve realistic, authentic problem designed by the faculty and analyzed by the teams. Teams also work on group application exercises (GAE), solving the problems before engaging in inter-team discussion and debate over finding solutions.

Variation in implementation in TBL

There is variation and flexibility in implementing TBL in health professions education. It is implemented in a variety of combinations, versions and dimension ranging from single sessions to entire courses. Instructors are allowed to choose and practice selectively one or more of the phases, based on the contextual demands of the course or session. The dimensions may vary, i.e. in the number and experience of faculty engaged in a course, or in duration of course, or course is graded or not, or multiple level of students/learners, or multiple level of available expertise relative to content of course, or multiple competing responsibilities of the students at same time, incorporation of other units in course contents[18,23-25].

Reidell et el stated that variation in implementation of PBL may influence outcome and effective replication in other programs[26]. For example, Hall J et all implemented TBL in pharmacy and deliberately changed the groups each session to permit the students to meet more peers[27].

Conceptual framework for implementation of TBL

Haidet et all have identified conceptual framework of seven core design elements for implementation of TBL and correlated these to educational principles that enhances students' engagement and team learning[18].

Team formation- This is a core component of TBL. The comprehensive account of the team formation process is very critical for contextualizing observed outcomes related to intra-team communication, decision-making processes and inter-team engagement.

Readiness assurance- This is an important component of TBL. An appropriate and sufficient description of readiness assurance processes and materials assist the instructor assess observed

changes in learners' acquisition knowledge, skills and attitude.

Immediate feedback- It nurtures good standards of team communication by allowing teams to continuously evaluate the effectiveness of their problem-solving approaches and communication strategies. It also strengthens the worth of team members the value of working together.

Sequencing of in-class problem solving- A problem solving or application of activities is the main focus of TBL. The sequencing is very vital as it can affect students/learners' engagement with the course content and their peers in team.

Four S structure (significant problem, same problem, specific choice, simultaneous reporting)- These are critically related to students/learners' understanding, knowledge retention, and engagement. Faculty need to know how 4S is implemented.

Incentive structure- This is one of the essential components of the learning process in TBL. Students/learners need incentive to develop normative behaviors which include individual preparation, open team communication, humble disagreement, and better problem solving.

Peer review- This may further motivate students/learners to develop and transform behaviors that contribute positively to individual learning, team communication and problem-solving ability.

Table-I: Template for TBL process[28]

Session		**Activity**
Pre- TBL Session (Students Preparation)		Provision of relevant resource material (May be used online facility) Completion of given assignment by the students
TBL Session (Readiness Assurance Test & Group Application Exercise GAE)	Day One	Administration of IRAT/GRAT Facilitation of discussion of the questions by faculty
		Collection of IRAT/GRAT with feedback
	Day Two	Distribution of scenario/vignette with learning objectives Students may also choose some learning objectives Facilitation of discussion by faculty with feedback
	Day Three	Reporting on all learning objectives Feedback by the faculty
Post-TBL Session		Completion of peer evaluation Distribution of peer evaluation to respective students

IRAT= Individual Readiness Assurance Test, GRAT= Group Readiness Assurance Test, GAE= Group Application Exercise

Source: Adapted from Balwan S, Fornari A, DiMarzio P, Verbsky J, Pekmezaris R, Stein J, Chaudhry S. Use of Team-Based Learning Pedagogy for Internal Medicine Ambulatory Resident Teaching 2015 Jan; 01; 7(4): 643-648

Template for TBL process

Faculty/Instructor/facilitator must form the teams in the beginning consisting of members from different knowledge base and background and members must work together throughout the course in identified teams. Template for TBL process is given in Table – I.[28]

Difference between LBL and TBL

Table-II: Difference between Lecture Based Learning (LBL) and Team Based learning (TBL)[9, 29]

	Lecture Based Learning (LBL)	**Team Based learning (TBL)**
Motivation of students	Low	High
Mode of instruction	Teacher centered	Students centered
Relevance to real life problems	Lack of relevance	Authentic relevance
Session time for application	No or little time	Sufficient time for application
Feedback	Limited opportunity	Critical component
Retention of knowledge	Comparably less	Comparably more
Development of creative & critical thinking	Not at all or little bit	Develop & improve
Students satisfaction	Comparably less	Comparably more
Students engagement	Comparably less	Comparably more
Education achievement	Comparably less	Comparably more
Enjoyable teaching method	Comparably less	Comparably more
Lower achiever score	No effect	Improve

Difference between PBL and TBL

Table-III: Difference between Problem Based Learning (PBL) & Team Based learning (TBL)[13,28]

	Problem Based Learning (PBL)	Team Based learning (TBL)
Motivation of students	High	High
Mode of instruction	Students centered	Students centered
Relevance to real life problems	Authentic relevance	Authentic relevance
Session time for application	Sufficient time for application	Sufficient time for application
Faculty members required to conduct session	More	Even single
Classrooms required	More	Less
Pre-reading assignments.	No	Compulsory

Modified TBL

People have been modified classic TBL and implemented it[30]. Barbara et el used concept maps instead of multiple choice questions and concluded that concept maps stimulate group discussion and help integration of topics across basic and clinical sciences and across multiple discipline in medical education[13]. Smyrnakis et el combined TBL with eLearning and concluded that eLearning could solve many issues of TBL such as timely posting of learning resources, sending reminder, online completion of individual and team RAT[31].

Tahira, QA et al have implemented modified TBL and compared with LBL. They didn't provide reading material for preparation to students, didn't conduct the TRAT and didn't take final test (FT) from individual students[25].

Faculty Development for TBL

Unlike the role of tutor in PBL, instructor in TBL works both as a facilitator and as a subject area expert. Instructor helps students to apply the knowledge learned to solve the problem[18,32]. So, faculty must be oriented about principles of TBL, its use in medical education, its implementation process, role played by faculty and their responsibility as faculty development is critical for implementation of TBL[28].

Orientation of students

TBL demands continuous students' preparation, adequate attendance, and full participation. It provides students the opportunity to learn from peers, how to work in team and negotiate within a team using self-evaluation and peer evaluation exercise. So, the students must be oriented about entire process of TBL[13,33].

Students and Faculty Perception

Majority of the students agreed that TBL is more engaging, effective, enjoyable teaching strategy[11,34,35]. There is mixed response regarding peer evaluation as peer evaluation remains most controversial aspects in TBL. Overall high degree of satisfaction with TBL is reported by majority of the faculty members[11,36].

CONCLUSION

TBL is an educational instructional strategy builds upon the strengths of individual students by letting them work together to accomplish a common aim and objective. The mainstay of TBL is use of individual and team assessments throughout the course. TBL provides many benefits to students including high level of learning, communication, and consistency. The application of TBL in health professions education has a positive impact on students' learning; it improves student performance (especially of academically lower achievers), enhances students' engagement and boosts their satisfaction. There is variation and modification in implementation of TBL. Despite some challenges TBL approach is poised for success aligning individual and team performance metrics.

CONTRIBUTION OF AUTHORS

Mal PR: Conceived idea, Literature search, Manuscript writing
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