



Dysfunctional Team-Based Learning

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Team-based learning (TBL) is an innovative teacher-driven teaching method that uses a specific sequence of activities to foster individual and group responsibility in small groups of students that have been formed in order to answer questions and solve problems. TBL appears to have a number of benefits compared to conventional lecture-based teaching and traditional small group learning models. However, TBL has been modified in several ways for use in teaching within the curricula of medical schools. Research on the effects of TBL on the learning of students is still limited, and studies aimed at investigating whether the goals of TBL are achieved are rare. Medical schools that want to implement TBL in their curriculum and gain the benefits of TBL should ensure that those involved in the curricular process understand the essence of TBL. This review is primarily aimed at describing how dysfunctional TBL develops, and providing some suggestions regarding how to avoid it.

Keywords: Team-based learning, Active learning, Small group learning, Medical education

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Overview of Team-based Learning

Team-based learning (TBL) is defined as an active learning strategy that encourages individual and group responsibility by having small groups of students work together for the purpose of responding to questions and solving problems.¹ TBL was originally designed in the early 1990s by Larry Michaelsen for in-class activities within large classes in order to engage business students with the content and allow them to understand how to apply their learning.² Dr Michaelsen devised the “4 S” framework for classroom activities in which students work on a significant problem, the same problem, where they are required to make a specific choice, and present a simultaneous report. A group can become a team after working together for several sessions. There are 6 fundamental principles of TBL that are used for designing and facilitating a TBL course:

- 1) Prepare backwards and carry out forwards.
- 2) Use mutually reinforcing tasks in a particular sequence.
- 3) Use the majority of class time for higher-level thinking with knowledge application activities.
- 4) Use exercises and assignments to facilitate learning and build team relationships.
- 5) Provide regular and immediate feedback on individual and team performance.
- 6) Use a grading/reward system to encourage individual and team responsibility for the high-level quality of the work.

Four basic activities are central to the implementation of TBL, which include: 1) strategically forming permanent teams; 2) ensuring content familiarity through the use of a Readiness Assurance Process; 3) developing students' critical-thinking skills by using well-designed in-class team application assignments; and 4) implementing a peer assessment and feedback system.

TBL facilitates the learning process for the students through the following 6 steps.¹

Step 1: Advance assignments

Step 2: Individual readiness assurance test (iRAT)

Step 3: Team/group readiness assurance test (tRAT or gRAT)

Step 4: Instructor clarification review

Step 5: Team/group application problem (GAP)

Step 6: Appeal process

If TBL is implemented correctly, there is little doubt that comparable or better academic outcomes relative to either lecture-based formats or more conventional small group learning models can be achieved.³⁻⁶ However, TBL has been modified in several ways for its employment in the field of medical education resulting in inconsistent reported benefits.

Modified TBL

Modifications to traditional (so-called classical or typical) TBL have been employed in several medical curriculum during the past ten years. TBL has been incorporated into a physiology and anatomy courses as a backbone for their modules in either a semester or an academic year.^{7,8} In some modified TBL, the step 3 (the team readiness assurance test or group test) is replaced with the step 5 (the application of the concept and problem-solving exercises), and the TBL session is ended with a tutor wrap-up.⁹⁻¹¹ Concept maps have been used as a vehicle for modifying classical TBL exercises. Such modifications include replacing the individual assessment (iRAT) that uses multiple-choice questions with concept maps and combining the group assessment (tRAT or gRAT) and application exercise in which teams develop concept maps.¹² Changing the sequence and adding a particular step into the traditional TBL are also employed in modified TBL. In such changes, TBL starts with the iRAT followed by the preparatory assignments, the tRAT, a group application problem and the final examination scores.¹³ The omission of the iRAT and tRAT has also been employed in TBL activities. Such modified TBL includes merely the application/analysis/interpretation questions followed by an online quiz that is at the level of factual detail or comprehension level of Bloom's taxonomy.¹⁴



It is interesting to note that, although the TBL activities are modified, the response of the participants to these TBL activities is still positive; ie, it helps to improve students' performance, increases students' engagement, and improves students' perception of the courses, which suggests that the TBL structure can be modified without loss of the intended learning outcomes.

How Does Dysfunctional TBL Develop?

TBL appears to have a number of benefits compared to conventional lecture-based teaching. First, the acquisition of knowledge is the responsibility of the individual students; ie, less time for lectures, more time for other learning-related activities. Second, students receive feedback regarding the extent of their learning when discussing the answers to the questions during the tRAT. Third, students are actively involved in applying what has been learned to new issues. This effort to apply what one has learned is assumed to facilitate its consolidation of the memory and the subsequent retrieval of the information and knowledge.¹⁵

Research involving the effects of TBL on the learning of students is still limited. Most studies focus on attitudes toward TBL, demonstrating that students tend to favor TBL over other forms of teaching. Some studies examined the learning outcomes, contrasting TBL with traditional learning. However, studies aimed at examining whether the goals of TBL are achieved are rare. One principle of TBL, for example, is that success during both the tRAT and application activities is based on the knowledge gained during individual learning. Is that really the case? Regarding the role of the instructor, he or she may only play an excessively minor role when clarification is required during team discussions. In addition: Does the expected role of the collaborative learning during team discussions truly occur? The previous research on the application of TBL offers very few quantitative answers to these questions.

1) Inadequate Preparation of Resources and Questions

TBL requires students to study the assigned topics in advance using educational resources provided by the instructor. To be maximally effective learning groups, students must have sufficient intellectual resources to complete their assigned tasks.² In the class, students must demonstrate their knowledge by responding individually to a set of questions in the iRAT, usually in a multiple-choice format. It is important that the questions be focused on the concepts or knowledge that the students need to learn in order to solve the team application problem in the next step. In the tRAT, the group still respond to the same set of questions and finalize a consensus regarding the answer. After clarification by the instructor on the concepts that the students have been working on, if asked, the groups must defend their choices to the class. The group may also ask the teacher to consider an alternative response to the one that was chosen, so that the group can justify the reasons they have chosen their answer as the best. Creating good questions and choices will facilitate discussion within and defense by the groups in this clarification step. For the application exercise, the problems must be realistic, so that the students are adequately prepared to address similar problems that they will face in their careers.¹⁶ In addition, room resources and quality of the learning materials definitely need to be considered when doing TBL, especially in larger classes, to ensure the effectiveness of TBL.¹

2) Dysfunctional Group

It is not enough to merely form a student group and tell them to work together to achieve the goals. The instructor must work to transform the group into a team by explaining the importance of teamwork, defining clear goals for the team project, and establishing a social bond among members as well as positive interdependence to strengthen their work.¹⁷ A team is not the same as a small group due to the high level of trust between members and a commitment to the



benefits of the group. If the members spend time collaborating, working on a task that becomes a shared goal, and receiving regular feedback on their performance, the group will become a team and works efficiently and successfully to achieve their goals.¹⁸ Each student can exercise a high level of effort and can criticize each other without offending their teammates because truthful interaction is valued by all of them. The goal of TBL for students is to apply the knowledge or concepts that they have learned in the pre-class preparation step in order to solve practical problems that are similar to those that they will face in the real world of work. Dysfunctional group learning could lead to the failure of students to construct their own understanding of scientific concepts through a process of negotiation and consensus building with their peers.

3) Inadequate Roles of the Instructor

In addition to preparation of appropriately educational resources, creation of good questions, and facilitation of team building, the role of an instructor is also important, with regard to refining and expanding the students' comprehension of the course content and group processes. This can be done by encouraging the expression of their thoughts on: 1) what the TBL experience has offered them in terms of course concepts, group engagement promoting effective teamwork, and the importance of teams; and 2) how certain aspects of the course have promoted positive group expectations.¹⁹ Feedback on individual and group work allows students to be mindful of the quality of their work, their learning, and how they work together as a team. Grading the group work gives the teams an incentive to make the most efficient use of their time and strive to do their best to achieve good results.²⁰ Failure to do this could distort the goal of TBL.

4) Erroneous Treating TBL as Just an Ordinary Small Group Activity

TBL enhances various kinds of learning that incorporates the use of small groups and is distinct

from other small group teaching strategies because it is a particular learning technique, not a series of small group activities.¹ It also creates a team that is a social unit distinct from a small group. Small group activities are used to help students understand the content of the course and improve learning by working on activities, for which require students to use their acquired knowledge. However, TBL provides students with an opportunity to understand how to apply knowledge, through both quantitative (due to the time spent on the application activities) and qualitative enhancement (the ability to solve incrementally challenging problems).²¹ Such enhancements are possible because working in a team allows for more intellectual resources to be used in the problem-solving, and because spending time together enables the group to work together as a high-performance team.¹⁵

5) Inappropriately modified TBL

As mentioned earlier, various forms of modified TBL have been employed in a large-class teaching. Some types of modified TBL exclude the iRAT and tRAT in their activities. Although students seem to favor these activities, it should be noted that the survey focuses mainly on the satisfaction level of the students regarding their attitudes toward TBL.^{9-11,14} In classical TBL, a Readiness Assurance Process (RAP) is designed to ensure that students gain a comprehensive understanding of a set of concepts related to the problems.³ This process requires students to first study the set of concepts on their own, and, if needed, to receive corrective instruction on the course concepts. Once a basic understanding of the content is in place, students in TBL courses are then engaged in complex problems which require them to work together and deepen their understanding of the learned concepts.¹⁷ In addition to acquiring knowledge, the RAP also fosters team formation by transforming the group into a team.²² Without RAP, the achievement of the TBL's goals may be impaired.



Suggestions

TBL has revolutionized medical education as it promotes the collaborative skills required by medical doctors. This teacher-driven approach also facilitates student-student interaction. Thus, medical schools that want to implement TBL in their curriculum and gain the benefits of TBL should ensure that those involved in the curricular process understand the essence of TBL, and should consider the following suggestions in order to avoid dysfunctional TBL.

1) A key factor for successful implementation may be the embrace of student-centered pedagogy by medical teachers. This is accomplished by staff development program in TBL training. In addition, another important factor for the success of TBL is the support and leadership of the higher administration.²³

2) The success of TBL depends on the high-level functioning of the teams of students. For medical graduates, development of teamwork skills is a crucial learning outcome that has been shown to be fostered by TBL.²⁴ Teamwork skills are strengthened by focused reflection during the group sessions and on the success of teamwork by providing feedback to team members.²⁵

3) The use of TBL may be seen as disruptive and face early challenges due to student resistance,²⁶ which is more likely when there are concurrent classes or sessions using conventional lecture-based pedagogy.²⁷ Medical students' appreciation of TBL and other active learning methods can be influenced by the maturity of the instructional design.²⁸ Changes in the educational philosophy of medical schools is best viewed through a longer-term lens in order to understand the need for medical teachers to gain expertise in implementing new teaching methods. Medical teachers should be encouraged to adopt active instructional strategies that require students to engage in and direct their own learning.

4) Classical TBL has been modified in several ways and is employed either as an additional teaching

method or as a backbone of course modules. Although there is no evidence that changes and omission of some steps of TBL may affect the learning outcomes that are achieved from TBL activities, instructors should ensure that students receive the maximum benefits from the activities similar to those from the classical ones. In classical TBL, a proportion of the summative grade is assigned to each component, including the iRAT, tRAT, application exercise, and peer review.²⁷ Faculty staff should encourage students to discuss the relative merits of individual effort, teamwork and trust issues among themselves. A graded peer review process at the end of the course is another necessary method of ensuring students' accountability involved with before-class preparation and good participation on the team.²⁹

It is noteworthy to reassure that TBL is solidly grounded in a constructivist theory of learning.²⁵ Students expose inconsistencies between their existing understandings and new experiences thus promoting development of new personal mental frameworks built upon prior knowledge. In particular, the application exercises include real-world issues that require critical thinking. Appropriately-designed TBL can make extensive use of the social context through facilitated collaboration and incentivized teamwork, which is relevant to modern learning theory.^{30,31}

Conclusions

TBL is most likely well-suited to the rapidly growing field of medicine that requires us to educate life-long learners, and prepare medical students for the interprofessional settings and teamwork of healthcare practice. However, in order to gain the most benefits from its advantages, instructors must properly and effectively implement TBL in their courses and must ensure that the students achieve the goal of learning through the TBL activities, and appropriate reflection, feedback, and assessment. Monitoring for the occurrence of dysfunctional TBL is thus highly recommended.



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การเรียนรู้แบบใช้ทีมเป็นฐานที่ไม่บรรลุผล

เพิ่มพันธุ์ ธรรมสโรช

สถาบันการแพทย์จักรีนฤเบดินทร์ คณะแพทยศาสตร์ โรงพยาบาลรามาธิบดี มหาวิทยาลัยมหิดล สมุทรปราการ ประเทศไทย

การเรียนรู้แบบใช้ทีมเป็นฐาน (Team-based learning, TBL) เป็นวิธีการสอนที่ขับเคลื่อนด้วยนวัตกรรมโดยใช้ลำดับกิจกรรมเฉพาะ เพื่อส่งเสริมความรับผิดชอบของบุคคลและของกลุ่มในนักเรียนกลุ่มเล็กๆ ที่ได้จัดตั้งขึ้นเพื่อตอบคำถามและแก้ไขปัญหา การเรียนรู้แบบใช้ทีมเป็นฐานดูเหมือนจะมีประโยชน์หลายประการเมื่อเปรียบเทียบกับการสอนแบบบรรยายและการเรียนกลุ่มย่อยแบบดั้งเดิม อย่างไรก็ตาม การเรียนรู้แบบใช้ทีมเป็นฐานได้ถูกดัดแปลงไปหลายวิธีเพื่อใช้ในการสอนในหลักสูตรของโรงเรียนแพทย์ การวิจัยเกี่ยวกับผลกระทบของการเรียนรู้แบบใช้ทีมเป็นฐานต่อการเรียนรู้ของนักเรียนยังมีจำกัด และการศึกษาว่าการเรียนรู้แบบใช้ทีมเป็นฐานนั้นบรรลุเป้าหมายหรือไม่ ยังมีน้อย โรงเรียนแพทย์ที่ต้องการนำการเรียนรู้แบบใช้ทีมเป็นฐานไปใช้ในหลักสูตร ควรแน่ใจก่อนว่า ผู้ที่เกี่ยวข้องกับหลักสูตรเข้าใจสาระสำคัญของการเรียนรู้แบบใช้ทีมเป็นฐานจริงๆ รายงานบททวนนี้มีวัตถุประสงค์หลักเพื่ออธิบายว่าการเรียนรู้แบบใช้ทีมเป็นฐานที่ไม่บรรลุผลนั้นอาจเกิดขึ้นได้อย่างไรและได้เสนอแนะแนวทางเพื่อหลีกเลี่ยง

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