Overview of the Activity

Team-based learning (TBL) is a highly-structured type of flipped-classroom strategy developed in the 1970s by Larry Michealson, a business professor, and implemented in medical education after its impact on student learning in large classroom settings was demonstrated. In the past 15 years, evidence of the method's impact on learning—including understanding of medical knowledge, critical thinking, and teamwork—has continued to grow and support implementation of the method. There are five fundamental components to TBL:

1) grouping of students into semester-long teams of 5-7 students,
2) individual, pre-class learning of specified content
3) a readiness assurance process (i.e., quizzes completed by individuals and then by teams) to motivate preparation and accountability,
4) in-class intra-team and inter-team problem-solving discussions in the lecture hall to consolidate learning, and
5) peer feedback of team members to promote team effectiveness.

Visual representation of a TBL module

The five fundamental components of TBL at the University of Utah:

1) Creation of student teams: TBL teams are created at the start of each Fall and Winter/Spring semesters in a manner that is transparent to the students and attempts to equitably divide student experiences between teams.

2) Preparation: Students complete preparatory materials before coming to class. Materials may consist of text, videos and/or online materials. Faculty should provide up to 15 specific and actionable objectives, crafted using the base of Bloom's taxonomy to describe what students should be able to do before coming to class (e.g. recall, describe, outline, list). This preparation should be designed to take the average student up to 2 hours to complete, with understanding that some students may require longer.

3) Readiness assurance: In the classroom, students are seated with their team and first complete an online individual readiness assurance test (iRAT) consisting of 5–10 multiple choice questions with up to 5 answer choices. After submitting their individual answers, they take the same test together as a team—this is the group readiness assurance test (gRAT). The team uses a scratch-off card that immediately reveals if students got the answer right or wrong; if they answer wrong, they can try again and receive half credit for a second choice. Students are not to leave the room between the iRAT and gRAT.

The course coordinators are responsible for posting the iRAT and keying gRAT cards appropriately so the answers are consistent between the two tests. Faculty should have RAT questions, with correct answers clearly identified, submitted to the course coordinators at least 1 week prior to the TBL activity.

Students are instructed to take care while scratching; no points will be returned if the wrong
response was accidentally scratched. Both the individual and group tests are scored and count towards students' course grades.

The readiness assurance process exists to motivate students to come prepared for the in-class group discussions; therefore students are not allowed to leave after completing the RATs. Students who cannot participate in the entire TBL discussion should contact their course directors to inform them and should not take the RATs. If a student does leave after the RATs, course directors should speak with the student and may remove their RAT points and/or submit a professionalism concern.

4) **In-class application exercises:** The remainder of the session is devoted to exercises that help students learn how to apply and extend the knowledge that they have pre-learned and been tested on. These are called group application exercises (GAEs). Up to 8 objectives, crafted using the higher levels of Bloom’s taxonomy (e.g. apply, synthesize, analyze, compare and contrast), can be achieved during a typical 110-minute TBL session. Teams are given complex, often integrated and case-based, problems that are typically in multiple-choice format, and must choose an answer out of up to 6 multiple choice options provided. Teams simultaneously display letter cards (options A-F) to indicate their answer choice, and the faculty facilitates a classroom discussion between teams. TBLs utilize the interaction between individual work, group work, and immediate feedback to enable understanding and retention of materials. The further function of this modality is to provide an environment for higher-order thinking to occur by allowing students to integrate and apply knowledge, and ideally for student teams to do the majority of teaching during the session.

5) **Student peer-feedback of team members:** To help promote team effectiveness and to teach students basic skills in giving effective feedback, each student will give two other students on their team written feedback twice per semester. The recipient of that feedback will use a rubric to grade it. The grade that students receive on the feedback they gave will contribute a small amount to their overall course grade. If a student submits the feedback or the grading late, s/he will lose the feedback points.

**Development of a TBL:**

TBL modules should be developed using a backwards design approach: 1) identify learning objectives, 2) create in-class group application exercises, 3) create and/or curate appropriate preparatory materials and 4) write RAT questions that directly test upon the preparatory materials and pre-class objectives. It is highly recommended that faculty new to TBL implementation observe at least one TBL session prior to developing and implementing a TBL session. We recommend that all faculty use the TBL template to help with the development process and to provide consistency among faculty TBL modules. It is strongly suggested that faculty have their TBL session materials reviewed by at least one other faculty member who is more experienced in TBL. The TBL Community of Practice is available to help review TBL materials and sessions (contact Kathryn.moore@neuro.utah.edu or mary.steinmann@hsc.utah.edu). Preparation of a TBL can take 8-24 hours; conversion of 1-3 lectures or flipped classroom activities into a TBL usually takes less time than creating one from scratch.

**Description and Expectations of the Activity in the Room**

**A. Readiness Testing**

- The iRAT and gRAT are both graded and contribute to the course grade. The iRAT is 5–10 questions long and is completed online on Canvas, while the identical gRAT is taken immediately after the iRAT by viewing the quiz questions on Canvas and answering them as a team using a scratch-off card that reveals the correct answer once chosen. No books, notes, references, phones, or other electronic devices are allowed during these quizzes. Students must remain in the room throughout the testing process. Individuals who arrive late for the iRAT may not participate in the iRAT, but may sit with their team for the gRAT.
b. Faculty may quickly clarify any concepts that were broadly missed on the RATs. However, reviewing material that students already demonstrated they know is not valuable and takes time away from the application phase of the TBL. The TBL literature also mentions written appeals process for RAT questions that remain in contention during the appeals/clarification time, although this rarely happens. This time is really meant to be no more than 5 minutes in the classroom.

C. RAT questions are NOT available to students after the session.

d. Students who are unable to attend a TBL and who speak with the course directors may be allowed to review the RAT questions and answers. However, whenever a student misses a TBL the points associated are sacrificed (regardless of the reason).

B. Application Process

A. The application process in TBL is based on the four S's:
   i. Significant problem—teams should be working on a problem that is meaningful to the students.
   ii. Same problem—teams should be working on the same problem
   iii. Specific choice—teams need to select one specific choice from the options offered.
   iv. Simultaneous reporting—teams must report their answers at the same time.

B. Keeping the idea of “significant problem” in mind when writing applications, one should note that the application exercises are intended to help students consolidate what they have learned in the preparation material and practice applying it to more complex problems and situations.
   i. Feedback from students: The materials should not be a regeneration of the material tested on the readiness tests. One should assume that students already have that knowledge, and the application should challenge them to use their knowledge in a higher level or unfamiliar situation.

C. The application problem or case is projected onto the screens in the classroom. A multiple-choice question concerning the problem is projected onto the screens. Students are given time to discuss the answers in their teams. The teams are then asked to simultaneously report their chosen answers. This is done by posting a colored card with the letter that corresponds to their answer.

d. This is followed by a faculty-facilitated discussion where teams are asked to give an explanation for their choices. The faculty should ask teams with different answers to explain their reasoning and should encourage groups to teach one another. Faculty can confirm correct answers or thought processes at the end of the student discussion of each question.
   • Gauging the time needed for teams to discuss a question and come to a specific choice is a TBL skill. Not enough time is frustrating for students, but too much time per question causes students to disengage. A timer can be used to keep track of student discussion time.
     • Feedback from students: 3 minutes is typically adequate per application question.
     • Faculty should time the application cases and questions to ensure that they will be able to complete all of their material by the end of the session.
     • Applications and answers are made available to students after the session.

**Attendance**

Students are expected to attend the entire TBL session.
Key References
5. Tyler Reimschisel, Anna L. Herring, Jennifer Huang & Tara J. Minor. A systematic review of the published literature on team-based learning in health professions education, Medical Teacher, 2017; In Press. DOI: 10.1080/0142159X.2017.1340636