

Twelve tips for doing effective Team-Based Learning (TBL)

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Abstract

Team-based learning (TBL) in medical education has emerged over the past few years as an instructional strategy to enhance active learning and critical thinking – even in large, basic science courses. Although TBL consistently improves academic outcomes by shifting the instructional focus from knowledge transmission to knowledge application, it also addresses several professional competencies that cannot be achieved or evaluated through lecture-based instruction. These 12 tips provide the reader with a set of specific recommendations which, if followed, will ensure the successful design and implementation of TBL for a unit of study.

Introduction

Medical educators have long recognized two important realities. One is that being able to recite all the subtle differences between one form of a disease and another is a very different kind of knowledge than being able to quickly diagnose the correct form of that disease suffered by a real, living patient. The other is that medical students must master both kinds of knowledge.

In traditional medical education, students were exposed to the two different kinds of knowledge at different times and in different settings. The content was typically taught in lecture-based courses and, later (some years later) students learned to use the content during their time in clinical rotations.

Delaying students' opportunity to learn to use the content, however, does not fit well with what we now know about how adults learn best – the kind of learning that both 'sticks' and can be transferred to novel situations. As a result, medical educators have experimented with a number of approaches for enabling students to more closely connect the content and concept acquisition with its application – e.g. problem-based learning (PBL), case presentation.

The purpose of this article is to describe an approach that, like PBL, immediately and intensively engages students with the kinds of problems they will encounter in medical practice. With this approach, team-based learning (TBL), some classroom time is spent on ensuring that students master the course content. However, the major emphasis is on concept application, and the processes through which students learn both the content and the applications are specifically designed so that student groups develop into *self-managed learning teams*. As a result, a single instructor can both provide content expertise and oversee the learning endeavors of an entire class.

For a course with TBL as part of its learning activities, students are strategically organized into permanent groups (for the entire term of the course) and the course content is organized into major units (typically five to seven). Before *each* in-class event, students must study assigned materials because

each module begins with the readiness assurance process (RAP). The RAP consists of a short test (over the key content and concepts from the readings or other activities, e.g. dissection) which students first complete as individuals, then they take the exact same test again as a team, coming to consensus on each question. Students receive immediate feedback on the team test and they then have the opportunity to write evidence-based appeals if they feel they can make valid arguments for their answers to questions which they got wrong. The final step in the RAP could be a 'lecture' (usually very short and always very specific) to enable the instructor to clarify any misperceptions that become apparent during the team test and the appeals, but also could be a between-team discussion about why the selected correct answers are best – fielded by the instructor. Once the RAP is completed, the remainder (and the majority) of the learning module is spent on in-class activities and assignments that require students to practice *using* the course content by solving challenging problems.

TWELVE TIPS

Tip 1: Start with good course design

TBL is an instructional strategy that works best when it is integrated *tightly* with a course's design. It can be the primary mode of instruction or work alongside other learning activities, i.e. focused lecture, service learning, self-directed online tutorials. We recommend using Dee Fink's *Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses* (2003) for guidance in defining a course's (or curriculum's) contextual issues, goals, assessments, learning activities, and feedback mechanisms. Often, instructors will 'try out' a TBL module or two in an existing course, either replacing a set of lectures or small group sessions that had required recruiting and herding many faculties. This is a valid way to gain experience with how to implement it, but, usually, it is hard to incorporate the peer evaluation component since the number of meetings will be few.

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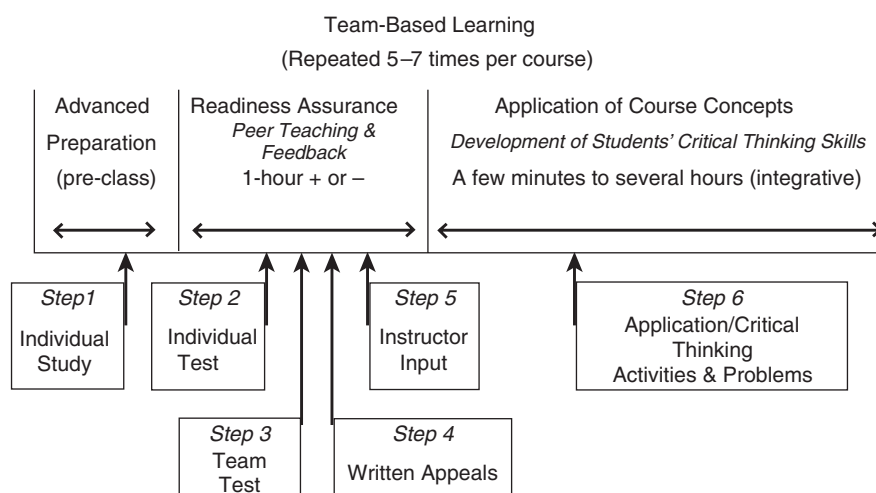


Figure 1. Instructional activity sequence for TBL content unit.

Tip 2: Use a ‘backwards design’ when developing TBL courses and modules

With backwards design (Wiggins & McTighe 1998) the first question to ask yourself is, ‘What do I want my students to be able to DO by the end of this unit of study?’ Whether designing a single TBL module for a unit of study, e.g. Starling’s Law and cardiovascular physiology, or a series of modules that form the basis of an entire course, clarify what you want the students to be able to do by the end of the module or course. For example, a goal for a module in physiology/pharmacology focused on Starling’s Law would be for the students to be able to apply their understanding of Starling’s law to accurately interpret physiologic data from a case of congestive heart failure, explain how Starling’s Law governs which findings, predict which pharmacologic agent will affect specific components of heart function. A traditional course in anatomy would have many TBL modules, each one presenting a new clinical problem vignette linked to the cadaver dissection component of the course and giving the students multiple opportunities to learn the daily applicability of anatomy knowledge for clinical practice.

This single question is often the hardest one for instructors who are ‘content-driven’ to ask themselves. There is just so much ‘content’ that we feel our students must know before they can make use of it – but, TBL provides a way to have them master the content while they are applying it and get feedback on how well they are ‘getting it’ as they go.

Tip 3: Make sure you organize the module activities so that students can reach your learning goals and you (and they) will know that they have done it

After clarifying what you want your students to be able to do by the end of the module, the next step in backwards design is creating a group application exercise. This should be a

problem that requires students to use all of the preparatory knowledge and their team’s brainpower to analyze, interpret, and then commit to a choice or a decision. Further, you should avoid the temptation to ask a series of questions as a means of ‘leading students through the thinking process.’ It is far better to require them to make a difficult choice and let them work together to master the concepts and to discover and internalize the relationships between them in the process of coming to a conclusion.

Once you have decided what you want students to be able to do and how you will assess whether or not they can do it, the next two steps in backwards design are identifying what content elements the class must master before they are ‘ready’ to solve the problem (i.e. the information that the students need to learn outside of class to be prepared for the module) and write the questions for the readiness assurance test (RAT) (and do not call it a quiz – its purpose is readiness assurance and you should emphasize its role by the terms you use in talking about it).

Tip 4: Have application exercises that promote both deep thinking and engaged, content-focused discussion

Over the years, we have come to realize that the single most important aspect of successfully implementing TBL is what your assignments require students to create. Whatever the content, if you ask them to produce a lengthy document, they will divide up the work which, in turn, will reduce learning and, all too often, will result in negative feelings about their peers and skepticism about working in a group. On the other hand, we have learned that, by using well-designed assignments, students will both learn from each other and develop a great deal of confidence in the value of working in a team.

The key to designing effective assignments is ensuring that what students are asked to do is characterized by 4 S’s at each of the stages in which they engage with the course

content – working alone, working within their team, and working across teams (i.e. whole-class discussion). The 4 S's are:

Significant Problem

For a successful group application exercise, select or create a problem that the student can readily recognize as the kind of problem that will be encountered in 'real life,' make it **Significant**. In medical education, this is easy – there are an infinite number of patient cases that are rich with data to be interpreted, decisions to be made. But, there has to be a clear link between the content that underlies the exercise and its application. At the conclusion of the hypothetical module on Starling's law/physiology, you want to hear your students talking about how the basic principles of the law are applicable to understanding cardiac contractility in stress situations and how to approach interventions. In addition, the answers to these questions should never be discoverable in a text or article or lecture notes – they can only come from team members collaborating to figure them out.

Same Problem

With TBL, all of the small groups must be working on the **Same Problem**. If you assign different problems to different small groups, students are not accountable to each other because you lose the benefit of having any semblance of a robust discussion (and learning!) between-group discussion of the problem. Further, if you allow groups to choose their own problem, they are not even accountable to you – unless you are willing to do the research that you hope they would do.

Specific Choice

When your assignments require students to agree on a specific choice, the only way they can accomplish the task is by working together to critically appraise a situation, examine the existing evidence, and make a professional judgment. Further, the more specific the question, the better the learning. For instance, if your module was about depression and pharmacologic interventions, a good question would be 'Identify the set of neurotransmitters that are affected by the best drug choice for this patient' and not 'What would be the best drug for this patient' because a more specific question requires a deeper analysis.

Simultaneous Report

You create an important 'moment of truth' when all the small groups are asked to post their responses to a question at the same time. Two things happen *as soon as students realize that the choice they will be making will be open to challenges from other groups*. One is that, because of the potential of an 'us versus them' situation, group cohesiveness increases. The other is that students are far more engaged in the within-groups discussion because they realize that they would not be able to hide if they do not 'get it right.' In addition, by engaging students exploring how they arrived at

Individual versus Team Readiness Assurance Test Scores*

- In the majority of classes, the lowest team score will be higher than the highest individual score in the entire class.
- Overall, approximately 4% of the individual scores will be higher than the lowest team score in a class.
- Teams will outscore their own very best member 99.9+ percent of the time (i.e., 1,114 of 1,115 teams).

*Based on 30 years of data from 6,161 students in 1,115 teams.

Figure 2. RAT scores.

their respective answers, you can readily create a class discussion that is far more informative to you and your students than asking, 'Somebody say what they think about thus-and-such.'

We have also learned two lessons – sometimes by sad experience – about the 4 S's. One is that failing to do *any one* of the 4 S's substantially reduces both the intensity of class discussions and the resultant learning. The other is that, if you fail to do *any two* of the 4 S's, learning is minimal and pretty much the only reason that students are willing to complete the assignment is that it will have a negative impact on their grade.

Tip 5: Do not underestimate the importance of the RAP

The RAP is designed to link students' advance preparation to the group application exercises and provides a remarkable and powerful opportunity for individual feedback and peer teaching within the teams. In addition, the RAP lets you (and the students) know if you need to address gaps in their understanding. If the content area is particularly difficult, e.g. autonomies, odds ratios and predictive values in critical appraisal, liver pathology, then the RAP should be separated in time from the group application exercise so that the instructor can give corrective feedback and/or provide additional input before they begin to tackle the group application exercise. However, you do not have to cover everything – only what you (and the students) know they need help with.

The RAP, when done well, unfailingly produces five priceless outcomes even though it typically uses only a fraction of the overall class time (usually about 25–30%) for any given unit of instruction. These are:

- (1) Effective and efficient content coverage.
- (2) Development of real teams and students' interpersonal and teamwork skills.
- (3) Students gain an experience-based insight about the value of diverse input.
- (4) Development of students' self-study and life-long learning skills.

- (5) Class time during which you can provide the content expertise to ensure that students develop critical thinking skills.

In addition, data from the RAP provides data that definitively answers the question of whether or not individuals are likely to be held back by working in teams. Based on data from the past 23 years of using TBL (Michaelsen and Parmelee, unpublished), teams will score higher than their own very best member 99.9+% of the time¹ and the most common outcome is that the worst team score will be higher than the highest individual score in an entire class.

Unfortunately, we have seen some instructors miss out on part or all of these valuable outcomes because they have, for whatever reason, decided to: (1) skip either the individual or the group component – or both; (2) use questions that are merely designed see if the students did the reading, e.g. asking ‘picky’ or meaningless questions unrelated to the objectives of the module; and (3) view this process as a way of getting another assessment for their course grade. The RAP is not just another ‘quiz’ and neither instructors nor students will reap its many potential benefits if it is treated as such.

Tip 6: Orient the class to why you are using TBL and how it is different from previous experience they may have had with learning groups

Most students will not have had a classroom experience like TBL. In fact, the majority of their experience with group work will have been struggling to complete poorly designed assignments that forced them into the uncomfortable position of having to choose between doing more than their fair share or risk getting a bad grade and/or having to deal with difficult group members just to get anything done at all.

These concerns are real and must be addressed or you will have a difficult time getting student buy-in unless students understand both why you are using TBL and how TBL is designed to avoid the problems that they, all too often, have come to expect are a normal outcome from doing group work. At a minimum, you need to outline your course objectives and provide an explanation of how they would be achieved in a traditionally taught course *versus* how you will achieve them by using TBL. Other suggestions to help them understand and accept TBL include: (1) giving a practice RAT (many use the course syllabus as the ‘subject matter’ for the test); (2) engaging them in the process of determining the grading system for the course (Michaelsen et al. 2004) and, throughout the course; and (3) reminding them about the benefits they are experiencing along the way.

Tip 7: Highlight accountability as the cornerstone of TBL

The cornerstone of success of TBL is that the natural outcome of its processes is that individuals, teams, and the instructor are immediately and clearly accountable for behaving in ways that promote learning. Students are accountable for coming to class, preparing before they come, and investing time and

effort working in their team. The instructor is accountable for providing students with the cognitive foundation they will need to be ready to tackle the kinds of problems they will face in medical practice and giving them opportunities to practice developing their application skills.

When TBL is fully employed, the vast majority of students are prepared, come to class, and engage each other in productive ways as they work together. As a result, even the students who start out with a skeptical attitude because of past negative experiences with learning groups will eventually embrace TBL – ‘Finally, hard work as an individual and hard work as a group pays off.’

As for the accountability of the instructor, some students will inevitably start out with the impression that he/she is not ‘teaching’ as in other classes, i.e. using lectures to state what will be on the final exam, and, worse, we (the students) are having to do all the work. Further, if the instructor is not following through with his/her side of the bargain – doing a good job of: (1) providing students with the opportunity to practice using well-designed applications assignments (i.e. using the 4 S’s) and (2) reminding students of the benefits that they are getting – then the doubts and the resentment are likely to persist.

Tip 8: Providing a fair appeals process will inspire further learning

Inevitably, some students will disagree with your selection of a best answer on a RAT question. They will do so on one of two bases: the question was written in such a way that they were confused or they feel you made an error in your interpretation of the content. The appeals process (Michaelsen 2008, p.24) provides the opportunity, preferably while they are still in class, to either re-write a question that they feel was poorly written or articulate, in writing, why they feel their answer was better, using references if appropriate. Accept appeals from a team only; award credit to the appealing team(s) only and to the individual scores of the members of those teams.

The appeals process provides a number of benefits. One is that it motivates students to do a focused re-study of the exact material that gave them the most trouble. Another is that, the process of trying to put together a successful appeal requires to think deeply about both the specific ideas and the overall context within which they reside. Finally, students can often re-write your questions so that indeed they are better!

Tip 9: Peer evaluation is a challenge to get going, but it can enhance the accountability of the process

There are several ways to set up a peer evaluation process for the course, and it may take some trial and error to find the one that fits well with your institution or course’s culture (Levine RE 2008, Chapter 9). There are, however, numerous benefits from putting forth the effort. One of the most important is that, when you use peer evaluations, students are accountable to the members of their team. Another is that a well-designed peer evaluation process enables students to learn how to give

constructive feedback to one another and to gratefully receive constructive feedback from peers – an invaluable competency for future practice.

Tip 10: Be clear and focused with the advanced preparation

A criticism of TBL is that the instructor identifies the learning needs for the students, thereby robbing them of the opportunity to explore the potential domain of the content and make some judgments about what they need to know. Based on past experience, when you are specific about what you want them to master before a TBL module, including posting action-oriented objectives such as ‘Be able to articulate how dopamine affects sodium channels at the receptor level,’ you invite them to go beyond doing the minimum of preparation since that will only help for the individual part of the RAP. They learn quickly that for their team to be really successful in the group work, they must master the advance assignment assiduously and devote additional effort to exploring the content domain. Tying the TBL objectives to the course objectives is essential.

Tip 11: Create the teams thoughtfully

We have three principles to guide the process of getting a class into teams: (1) make the process transparent so all students know how they ended up in a particular team, even if the process is totally random; (2) distribute what you define as ‘resources’ for a team as evenly as possible, for instance, a beginning class of medical students might have several students who have advanced degrees in one of the basic medical sciences, so you want to assign them to different teams; and (3) strive for the teams to have a diverse composition, i.e. gender balance, rural or urban backgrounds, science/nonscience majors. Letting a class know that teams that have diversity within, however defined, will have unique strengths to draw upon in the challenging modules ahead.

Tip 12: Several low-budget ‘props’ facilitate the implementation of a good module

One does not need to spend several thousands of Euros for the latest audience response system or any high-definition technology to get a well-constructed TBL module to work. We recommend using IFAT™ response forms for the group readiness assurance because students will hover over the scratch-off card, talk with each other, make eye contact, and be passionate about whether or not the correct answer is going to emerge. They receive immediate feedback, let one another know things like ‘You were right! Next time make us listen to you!’ Prepare folders for each team, color code the components to make the sequence of activities clear, collect everything so that you do not have to start ‘de nova’ every year – a good module is a treasure. Buy or build flagpoles to demarcate the position of teams; laminate the lettered cards for simultaneous responses. Require students to stand and face

the class when speaking – you will not need a roving microphone once they learn to be quiet when someone is speaking.

Conclusions

We are grateful to have been invited to provide these 12 TIPS. Over the past few years, we have provided many faculty development workshops and consultations, around the world, to introduce medical educators to TBL and assist them with its implementation in a variety of settings. In most cases, TBL has produced a positive transformation of the classroom experience for both the students and the instructor. Sometimes, however, we hear comments from faculty such as: ‘I tried it a few times, but gave up because the students didn’t like it,’ or ‘Does one have to use all the components? The GRAT sounds like a waste of time.’ Unfortunately, whenever we ask about the details of a less-than-successful attempt, we almost always learn that one or more of the components had been omitted or altered substantially. The strategy has been well tested and works, but works best when all of the components are included in the design and implementation.

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Note

1. Based on data from 6161 students in 1115 teams since 1986–1114 team scores were higher than the score of their own very best member.

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