

Michaelsen, L. K., Davidson, N., & Major, C. H. (2014). Team-based learning practices and principles in comparison with cooperative learning and problem-based learning. *Journal on Excellence in College Teaching*, 25(3&4), 57-84.

## **Team-Based Learning Practices and Principles in Comparison With Cooperative Learning and Problem-Based Learning**

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*The authors address three questions: (1) What are the foundational practices of team-based learning (TBL)? (2) What are the fundamental principles underlying TBL's foundational practices? and (3) In what ways are TBL's foundational practices similar to and/or different from the practices employed by problem-based learning (PBL) and cooperative learning (CL)? Most of the TBL vs. CL and PBL comparisons are organized in relation to the size of and strategies for forming groups/teams, the strategies for ensuring that students are familiar with the course content, the nature of the group/team assignments, the role of peer assessment, and the role of the instructor.*

### **Introduction**

Faculty members today are confronted with multiple, often conflicting, demands from various constituents. One of the most pervasive is an increased emphasis on securing external funding. Due to the reduction of funding from government sources, many universities are placing serious

pressure on faculty to secure grant funds to ensure financial sustainability. Subsequently, many of these same universities are asking faculty to teach larger classes in order to keep costs down while simultaneously pushing for more effective teaching to ensure student course satisfaction and increased enrollment.

Further straining faculty workloads, today's students are entering collegiate classes with a very different set of expectations and study habits than those of previous generations. Employers of our graduates often complain about what their new employees don't know and can't do, urging us to teach them a wider range of skills, capabilities, and attitudes, for example, a more positive attitude toward diversity and teamwork (David, David, & David, 2011; Hart Research Associates, 2008; Polk-Lepson Research Group, 2013). In addition to the increased instructional needs, the size and range of course textbooks continue to expand annually as a result of emerging research. This also places additional demands on the content faculty are responsible for covering.

As a result of these compounding challenges, the question that has emerged is this: "How can faculty accommodate all of these different demands and pressures?" This article will describe why and how team-based learning (TBL) has begun to emerge as a practical and effective approach for addressing most if not all of these difficult and potentially conflicting challenges. In addition, TBL transforms our classrooms into a more enjoyable experience for teachers and students alike (see Michaelsen, Knight, and Fink, 2004; Michaelsen, Parmelee, McMahon, and Levine, 2007; Michaelsen, Sweet, and Parmelee, 2008; Sweet and Michaelsen, 2012; Sibley and Ostafichuk, 2013).

There are two keys to TBL's effectiveness: (1) TBL shifts the focus of instruction away from the teacher as dispenser of information and instead places the focus on students actively engaging in activities that require them to *use* the concepts to solve problems, and (2) *every* aspect of a TBL course is specifically designed to foster the development of self-managed learning teams. Thus, in TBL classes, students are actively engaged with each other as they attempt to apply course concepts to solve authentic problems. Further, to the extent that its practices result in the development of effective, self-managed learning teams, TBL is far more powerful practical for fostering both engagement and learning than is possible with either individual interaction between the instructor and his or her students or even other forms of in-class, small-group work. These outcomes are possible only because, once developed, the teams provide a powerful intellectual and social foundation for dealing with genuinely challenging problems (McInerney & Fink, 2003). As a result, TBL courses

produce both deep learning and a wide variety of other positive outcomes, which include enabling students to develop a deep understanding of the concepts, a sense of responsibility to and for their teammates, a genuine appreciation of the power of team interaction, ethical decision making, and even improved work performance (MacCormack & Garvan, 2014). (See Haidet, Kubitz, and McCormack, 2014, in this issue for a current summary and analysis of the research on TBL to date.)

This article will first outline *how* TBL is able to produce such a wide range of positive outcomes by describing the foundational practices of TBL and comparing them with practices employed by two other widely used approaches that rely on small group work—problem-based learning (PBL) and cooperative learning (CL). Then the issue of *why* TBL works will be addressed by discussing the key principles involved in TBL and then contrasting these principles with traditional (lecture-based) educational practice. The article's final section will summarize the key similarities and differences between TBL and CL and PBL.

### **Foundational Practices of Team-Based Learning**

Four foundational practices are essential for implementing TBL: (1) strategically forming permanent teams; (2) ensuring student familiarity with course content by utilizing a Readiness Assurance Process; (3) developing students' critical-thinking skills by using carefully-designed, *in-class* activities and assignments; and (4) creating and administering a peer assessment and feedback system. Each of these practices has been described in detail elsewhere (Michaelsen et al., 2004; Michaelsen et al., 2007; Michaelsen et al., 2008; Sweet & Michaelsen, 2012), but they are briefly described below.

#### *Strategically Forming Permanent Teams*

To be maximally effective, learning groups in any setting require two very different types of assets that are directly affected by the way teams are formed and managed. First, groups must have sufficient intellectual resources to complete their assigned tasks. Second, the members must interact with each other in productive ways.

In TBL, the team formation and management processes are particularly critical for two reasons. One reason is that, because the primary objective is developing students higher-level thinking and problem-solving skills, students will be faced with a number of highly challenging assignments. Thus, the groups need to be fairly large (5-7 members), and intellectual

assets and liabilities in the class should be evenly allocated across groups in a class. The other reason is that, in TBL, groups must *develop into* effective self-managed teams (Fink, 2003). As a result, the team formation and management process in TBL has two important dimensions. First, the groups must be formed in a way that will minimize potential disruptions from cohesive subgroups (for example, pre-existing friendships). Options for forming TBL groups can be found in a variety of sources, including Michaelsen et al., 2004; Michaelsen et al., 2007; Michaelsen et al., 2008; Sweet & Michaelsen, 2012; and the TBL Collaborative website ([www.teambasedlearning.org](http://www.teambasedlearning.org)). Second, the membership of the groups must remain stable over a long enough period for the team-development process to come to fruition (Michaelsen, Watson, & Sharp, 1991; Watson, Kumar, & Michaelsen, 1993).

One area in which TBL, cooperative learning, and problem-based learning are in agreement is that the groups should be purposefully formed by the instructor, and, with a few exceptions in specific CL applications, the groups should contain members with diverse points of view. However, TBL differs from both CL and PBL with respect to how to maximize the likelihood that learning groups will have both the intellectual resources and effective social interactions they need to succeed. TBL utilizes larger groups (5-7 members) because of the increased risk that teams of less than 5 members will be resource-deficient when students are faced with the wide variety of challenging decision-based tasks that are characteristic of TBL courses (see Levine et al., 2014; Michaelsen et al., 2004; Michaelsen et al., 2007; Michaelsen et al., 2008; Sweet and Michaelsen, 2012). In CL, the groups are smaller (2-4 members) for two reasons. One is that, in the short run, smaller groups are both more efficient and more effective than larger groups in dealing with many types of tasks. The other reason is the assumption that appropriately designing the tasks and guiding students' interactions will compensate for any loss of input that might come from having smaller groups. Most CL tasks are structured to be completed within one class period, and these tasks can be handled by groups with 2-4 members. Furthermore, while TBL always uses permanent groups, in CL the duration of the groups is often determined by the tasks they will be asked to complete. For example, a typical think-pair-share activity would use short-term groups during a single class period. On the other hand, although none of the CL models requires permanent groups, some do use long-term groups of several weeks' duration.

TBL, CL, and PBL have very different strategies for promoting effective interaction. TBL relies on a team-development process that naturally occurs as a result of members receiving immediate and ongoing feedback

on their performance. Group work designed in cooperative learning typically relies on a combination of orchestrating positive interaction by assigning member roles (for example, recorder, summarizer), structuring interactions (for example, think-pair-share), and / or teaching group interaction skills through group processing discussions following each group activity (see Millis and Cottell, 1998; also see the articles by Kagan and by Johnson et al., 2014, in this issue). Like TBL, PBL has larger (5-8+ member) permanent teams, but it relies on a trained facilitator who, in most cases, is also content knowledgeable, to intervene when needed to keep groups on track and moving forward in a productive way (Major & Eck, 2000).

### *Ensuring Concept Familiarity With a Readiness Assurance Process*

The primary learning objective in TBL is to go beyond simply dispensing content and focus on ensuring that students have the opportunity to *practice using course concepts to solve problems*. Simply put, the primary focus of a TBL classroom is student learning, not faculty teaching. Although some time is spent on ensuring that students master the course content, the vast majority of class time is used for team assignments that focus on using course content to solve the kinds of problems that students are likely to face when they have to apply course material in real life. Figure 1 (adapted from Parmelee, Michaelsen, & Hudes, 2013) depicts the sequence of activities involved in implementing each unit of a TBL course.

A typical TBL course is organized into 5-7 major units, each of which begins with a pre-class individual assignment (for example, readings, Power Points, videos) that is designed to familiarize students with the key concepts from that unit. The first in-class activity for each unit is a Readiness Assurance Process (RAP), which consists of a short individual Readiness Assurance Test (iRAT) over the key ideas from the pre-class assignment. Following completion of the iRAT, students re-take the same Readiness Assurance Test as a team (tRAT) by coming to consensus on their answers. Ideally, they use the IF-AT “scratch-off” answer sheets (see Figure 2) that enable students to receive both real-time feedback on each of their decisions and partial credit for partial knowledge (see Michaelsen et al., 2008). After reviewing their tRAT scores, if the team feels they can make valid arguments for an answer on which they failed to receive full credit, they then have the opportunity to write evidence-based appeals. The final step in the RAP is an instructor clarification review (usually very short and always very specific) through which the instructor corrects any misperceptions of the material that may still remain, as indicated by team test performance and the appeals. The rest of the learning unit is spent with students

Figure 1  
TBL Implementation Steps

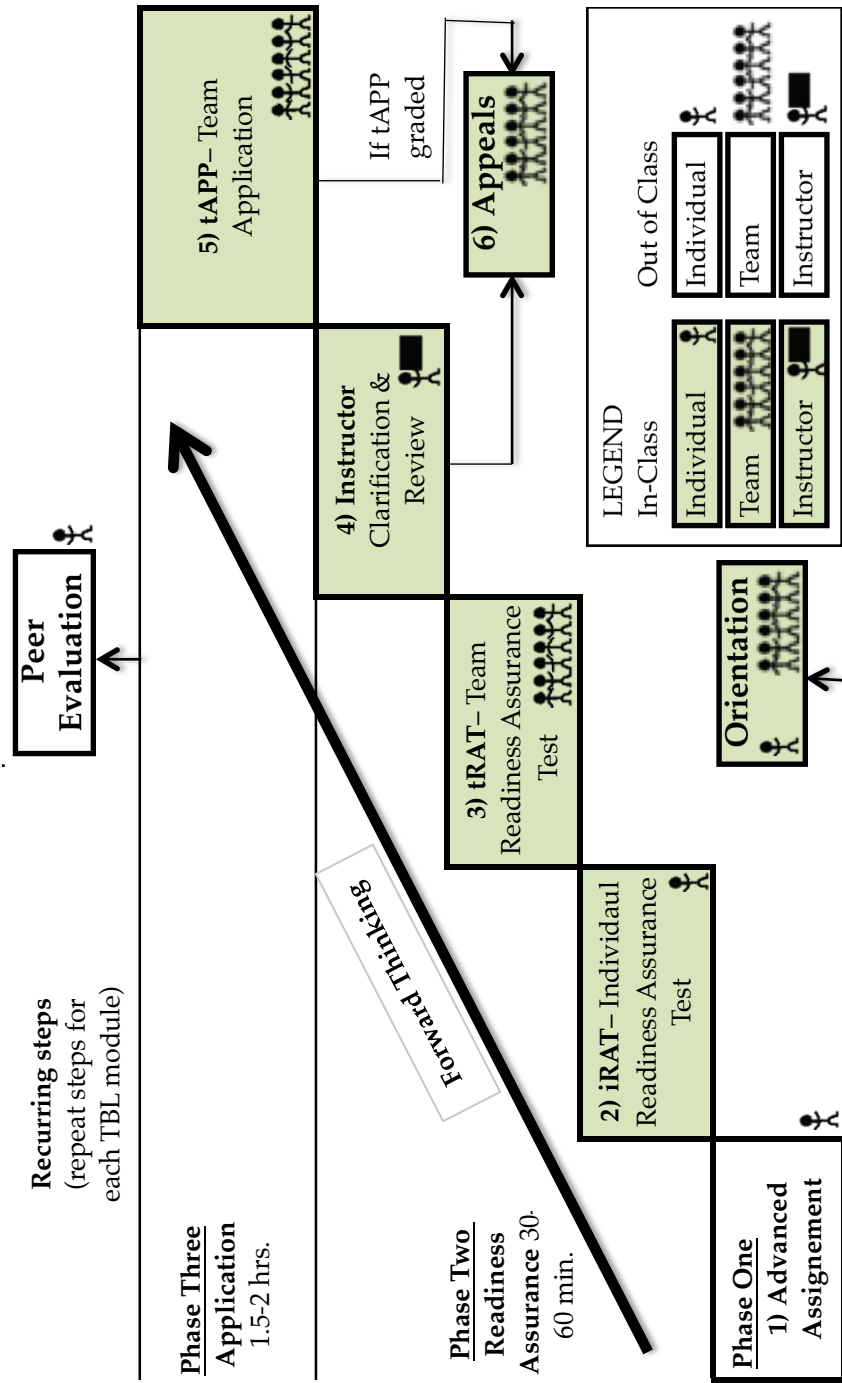




Figure 2  
Immediate Feedback Assessment Technique (IF AT)

**IMMEDIATE FEEDBACK ASSESSMENT TECHNIQUE (IF AT)**

Name TEAM #1 Test # 1

Subject \_\_\_\_\_ Total 34

**SCRATCH OFF COVERING TO EXPOSE ANSWER**

	A	B	C	D	Score
1.					<u>4</u>
2.					<u>1</u>
3.					<u>4</u>
4.					<u>2</u>
5.					<u>4</u>
6.					<u>4</u>
7.					<u>  </u>

putting course content to use by working on team applications (tAPPs).

The TBL practice of ensuring content coverage through the RAP is very different than in either CL or PBL. CL differs from either TBL or PBL in that, instead of being a specified step in the instructional sequence, concept coverage in CL can occur in a variety of ways. These could include lectures, individual study, and /or peer teaching through the use of strategies such as jigsaw (Aronson & Patnoe, 2011; Davidson & Worsham, 1992). Although the RAP phase of TBL and the learning activities in PBL have a similar goal—that is, to ensure students gain a comprehensive understanding of a set of problem-related concepts—the sequence of their instructional activities is exactly the opposite. With PBL, the problem comes first, and students' initial task is to decide what content they need to master through individual research and team discussions (Major & Eck, 2000). By contrast, TBL requires students first to study a set of concepts on their own to prepare for the RAP, during which they discuss and clarify and, if

needed, receive corrective instruction on the course concepts. Once a content understanding base is in place, students in TBL courses then become immersed in complex problems through which they must work together and, in the process, deepen their understanding of the concepts learned.

### **Using Well-Designed *In-Class* Team Application Assignments**

The final stage in the TBL instructional activity sequence for each unit of instruction is both the most important and the most challenging aspect of implementing TBL (see Figure 1). It involves having groups *use* the concepts to solve some sort of a problem so that students have the opportunity to enrich their understanding of the concepts as they try to apply them. Two important elements in the application assignments are that they must (1) foster accountability and (2) promote give-and-take discussion first within and then between teams.

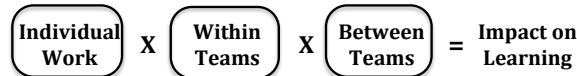
The key to creating and implementing effective team assignments is following what TBL users fondly refer to as the “4 S’s” (see Figure 3): (1) Assignments should always be designed around a problem that is **S**ignificant to students, (2) all of the students in the class should be working on the **S**ame problem, (3) students should be required to make a **S**pecific choice, and (4) groups should **S**imultaneously report their choices (see also Ostafichuk, 2013; Roberson and Franchini, in this issue). Further, these prescriptions apply to all three stages in which students interface with course concepts—individual work prior to group discussions, discussions within groups, and whole-class discussion between groups. The “4 S’s” are explained in greater detail next.

#### *Significant (to Students) Problem*

Effective TBL assignments must capture students’ interest (see Parmelee et al., 2013). Unless assignments are built around what they see as a relevant issue, most students will view what they are being asked to do as “busy work” (also referred to as “exercising” by Fink, 2003), and they will likely put forth the minimum effort required to get a satisfactory grade. The key to identifying what will be significant to students is using “backwards design” (Wiggins & McTighe, 1998). This philosophy implies that the actions involved in learning by doing have a greater impact than learning simply by knowing. For example, if instructors identify what they really want students to be able to *do* and give them the chance to try, it is very likely that instructors’ enthusiasm



Figure 3  
Effective Group Assignments



Maximum learning occurs when assignments at each stage are characterized by "4 S's":

- ◆ **Significant Problem**—Problem involves issues that are significant to students.
- ◆ **Same Problem**—Individuals/groups are working on the same problem, case or question.
- ◆ **Specific Choice**—Individuals/groups are required to use course concepts to make a specific choice.
- ◆ **Simultaneous Report**—Individuals/groups report their choices simultaneously.

will carry over to students in a way that rarely happens when teaching is organized around what instructors think students should know.

### *Same Problem*

Group assignments are effective only to the extent that they promote discussion and that, when groups work on different problems, students have to try to build inter-team discussions even though they are faced with a comparison of "apples and oranges." By contrast, having all of the groups work on the same problem energizes both the within- and between-team discussions. When all of the groups have a common frame of reference, within-groups discussions tend to be more focused and intense because students realize they will be accountable for quality of their thinking. This, in turn, provides an intellectual and emotional foundation for a more conceptually rich and energetic exchange in subsequent discussions between groups.

### *Specific Choice*

In general, the best activity to challenge students to engage in higher levels of cognitive complexity is to require them to make a specific choice (Michaelsen et al., 2008; Roberson & Reimers, 2012). In summarizing and

synthesizing a wide variety of learning, brain science, and education literature, Roberson and Franchini (in this issue) conclude that

*The most clarifying action a student can take is to make a decision. Requiring collective decision-making provides an opportunity for students to practice the kind of thinking we want to promote in our courses and disciplines and is the starting point for effective overall TBL course design. A well-constructed decision-based task integrates components of higher-order thinking: analysis of the particular situation to determine competing priorities and values; various lines of reasoning; use of relevant concepts, principles, laws, or other abstractions at play in the situation; reflective, critical thinking (*Are we sure of these facts? Are we sure we understand?*); and, ultimately, a judgment that is expressed in a visible, concrete action/outcome that can be evaluated. (pp. 278-279)*

Team tasks need to point students consistently toward making decisions, not simply rehashing information.

Examples of application activities in which students are working with the same problem include the following:

- What is the ideal site for a new dry cleaning business in Norman, Oklahoma, and what is the single most compelling reason for your decision? (Michaelsen et. al., 2004, p. 66).
- What drug would you recommend to reduce the blood pressure of a patient who is/has (give list of potentially complicating factors)? Why? (Michaelsen, Parmelee, McMahon, & Levine, 2007, p. 49).
- Which line on this tax form would pose greatest financial risk due to an IRS audit? (Michaelsen & Sweet, 2009, p. 21).
- Given a set of real data, which of the following advertising claims is least (or most) supportable? (Michaelsen & Sweet, 2009, p. 21).
- Given four short paragraphs, which is the best (or worst) example of an enthymeme? Why? (Michaelsen & Sweet, 2009, p. 21).

### *Simultaneous Reports*

Once groups have completed their deliberations on questions like those listed above, it is critical to have them simultaneously reveal their answer choices for two reasons. One reason is that simultaneous reporting provides everyone with immediate feedback on how their choices compare to those from other teams and, most important, highlights differences among the set of choices. The second reason for simultaneous report is that the team choice is clearly visible to the rest of the class, requiring teams to be accountable for, explain, and defend their position. (For a more detailed discussion of options for simultaneous reporting, see Sibley, 2012). By contrast, when teams report sequentially, the initial report sets a standard that influences all of the subsequent reports, because later-reporting teams usually emphasize similarities and downplay differences with the initial team's position—that is, “answer drift” (Michaelsen et al., 2008). Unfortunately, the absence of differences tends to reduce both the amount and intensity of the discussion about differences that is so critical to learning.

The assignments used with other group-based approaches are much less prescriptive and far less application focused than the 4-S team assignments in TBL. CL uses a wider range of activities than TBL, including tasks at all levels of the Bloom's Taxonomy: knowledge, comprehension, application, analysis, synthesis, and evaluation (Bloom, 1956). The main requirements are that the tasks or learning activities must be suitable for small-group interaction, and they must not be readily handled by individuals working alone. The three primary specifications for the group tasks are that students have to be clear about what they are discussing, how their conclusions will be reported, and how much time they have to discuss the issues activity (see Millis and Cottell, 1998). Concepts can also emerge in CL through exploration in the groups, followed by class discussion to gain a common understanding of the concepts and their critical attributes. CL instructors would agree with the appropriateness of decision tasks for promoting higher-order thinking, but they would also recognize other types of tasks to be legitimate and useful.

Although finding solutions to authentic, real-world problems is central to both TBL and PBL, the functions of the problems, the solutions, and the strategies for providing feedback on the quality of the teams' work are very different with TBL and PBL. With PBL, the primary focus is on developing students' understanding as they engage in three quite standard tasks that guide student efforts in relation to each problem situation. These tasks are as follows: (1) identifying content learning goals related to the problem (that is, what do we need to know to solve the problem);

(2) allocating responsibility for conducting the research needed to find information needed to answer the questions students have identified; and (3) once the potentially useful information has been identified, working together to solve the problem. Furthermore, in PBL, solving the problem involves making clear conceptual connections between the problem and the information gleaned in members' research, and feedback on the quality of the teams' efforts can come from a variety of sources, including the facilitator, other teams who may be assigned to review their work, and self-evaluations using pre-designed rubrics (Davidson & Major, 2013). In TBL, however, solving the problem always involves making a decision. Further, finding a solution (that is, making a decision) is *not* the end of the learning cycle. The decisions are then simultaneously reported and provide the basis for teams to receive feedback, first from other teams and, eventually, from the instructor, whose initial responsibility is to facilitate inter-team challenges and discussions.

### **Peer Assessment and Feedback**

There are four very different reasons that peer assessment and feedback are fundamental to TBL. One is to allay students' fears about potential "free-riders" that may have resulted from previous negative experiences with poorly designed group assignments. In this case, peer evaluations provide some reassurance that peers will have an incentive to do their fair share. The other three reasons that peer assessment and feedback are fundamental to TBL are related to the fact that the teams are permanent and must become self-managed. First, peer assessment and feedback help members to enhance both each other's ability to work together effectively (that is, process-related feedback) and to contribute ideas and information (that is, content-related feedback). Second, because the teams are working independently, the only individuals who *can* provide feedback are the team members themselves. Finally, members typically develop working relationships that provide both incentives and opportunities for helping each other develop the interpersonal and teamwork skills that are so important for their future success.

Peer assessment and feedback are far less important for either CL or PBL. In CL, both the incentives and opportunities for peer assessment and feedback are fewer than in TBL for at least three reasons. First, because the groups are smaller, the task of managing the group processes is less complicated and can be handled by a combination of assigning member roles, post-activity process discussions, group structures, or instructor facilitation. Second, there is less emphasis on grading group work in CL

than in TBL; some CL models never employ group grades (Kagan & Kagan, 2009). The issue of “free-riders” is critical in all group approaches, but is less related to grades in CL than in TBL or PBL. Finally, because much of the group interaction in CL is affected by role assignments or activity structures or instructor intervention, it is very difficult to sort out which outcomes (or lack thereof) are attributable to the members themselves, as opposed to the roles or processing, group structures, or instructor influence.

With PBL, even though the teams are permanent, there is still less of a need for peer assessment and feedback. Because the group sessions are under the guidance of a trained facilitator, members have far less of a need to assist in managing the process; because the students have less responsibility for managing the process, the majority of the feedback is on members’ *content*-related contributions; and at least part of the feedback comes from the facilitator, because he or she is also in a position to monitor the contributions of team members.

### **The Instructor’s Role in TBL, CL, and PBL**

Many of the differences between TBL and other group-based instructional approaches, including CL and PBL, stem from the fact that developing effective and self-managed teams is absolutely critical for TBL, while self-managed teams are not generally an objective for the other approaches. Thus, *the TBL instructor’s role consists of creating conditions in which teams will develop the ability to work effectively and independently*. There are three critical conditions for creating effective self-managed teams: (1) providing resources (that is, permanent and strategically formed 5-7 member teams whose members are explicitly accountable for pre-class preparation for the in-class group work), (2) using group tasks that require making decisions and provide the opportunity for immediate performance feedback (that is, tRATs and 4-S applications), and (3) ensuring that there are incentives (both extrinsic and intrinsic) for individuals to prepare for and participate in group activities and for groups to do high-quality work.

The opportunity for TBL groups to become self-managed teams results from a combination of two conditions. First, the groups must have complete freedom to manage their own interactions. Second, *every activity and assignment must be explicitly designed and managed to provide immediate performance feedback*. Both conditions are essential; if either is violated, the team development process will be slowed and, if the violations persist, may be completely derailed. For example, if the instructor prescribes how the groups are to go about their work, then the feedback is about the

instructor's instructions, not about the groups' choices. Further, without feedback on the quality of their choices, groups have no way to evaluate the effectiveness of the process they used to make them.

When groups do have immediate and ongoing feedback, however, members automatically (that is, with no prompting whatsoever from the instructor) and consistently engage in evaluating and improving their processes *while they are engaged in completing their assigned tasks* (Sweet & Sweet, 2009). With appropriate tasks, a number of positive changes occur within the groups. Over time, as the groups develop into teams, they

- become more effective at using their members' intellectual resources (at 25-30 hours of working together—Watson et al., 1991).
- are better able to cope with and take advantage of the resources potentially available in diverse groups (at around 30 hours—Watson et al., 1993).
- utilize different strategies for resolving conflict in reaching decisions. Early on, the dominant strategy is "compromise"—everyone is willing to lose a little just so they can reach agreement. Later on (at 25+ hours), compromise is completely off the table, and the groups use "problem solving" (Birmingham & Michaelsen, 1999).
- experience increases in their emotional intelligence and interpersonal/team-management skills (Borges, Kirkham, Deardorff, & Moore, 2012; Opatrny, McCord, & Michaelsen, 2013).

While the ultimate objective of the group work in TBL, CL, and PBL is essentially the same (that is, motivating students to engage in conversations about the content in ways that improve learning), the strategies for achieving this outcome are very different. Further, because the creation of self-managed teams is not central to the success of either CL or PBL, both approaches can (and often do) use strategies that are effective in promoting content-related discussions, but that also inhibit the team-development process. For example, with both CL and TBL, instructors typically are actively involved in managing the processes that the groups use as they engage in their work. With CL, the instructor's influence is often less direct, because he or she is typically working with multiple groups. However, many of the most widely used CL practices would not be a good fit for



TBL for one of two reasons. In some cases, the lack of fit results from the fact that the practices interfere with the groups' ability to manage their own processes. These practices would include assigning individual member roles, limiting resources, and using structured interactions such as think-pair-share and jigsaw. With other CL activities, the lack of fit with TBL would be more of a time and/or effectiveness issue. Because *every* group activity in TBL (tRATs and 4-S applications) is specifically designed to promote both content learning *and* team development, activities that focus solely on promoting open communications (community- and/or team- building activities, post-activity group process discussions, and the like) not only aren't needed, they are far less effective than providing *real-time performance feedback* while the groups/teams are engaged in doing their actual content-related "work" (see Edmondson, Bohmer, and Pisano, 2001). With PBL, the involvement is often very direct. During most group meetings, a trained facilitator is both physically present and expected to intervene when direction is needed to keep the groups effective and on task.

### **Fundamental Principles for Designing and Facilitating Team-Based Learning Courses**

Six fundamental principles guide every aspect of designing and facilitating a TBL course: (1) Plan backwards and execute forwards, (2) use mutually reinforcing activities in a specific sequence, (3) use a majority of class time for higher-level thinking application activities, (4) use activities and assignments so that they both promote learning and build team relationships, (5) provide frequent and immediate feedback on individual and team performance, and (6) employ a grading/reward system that promotes both individual and team accountability for doing high-quality work.

#### *1. Plan Backwards and Execute Forwards.*

In traditional lecture-based courses, teachers typically begin planning a course by identifying what content they need to "cover." In contrast, the design of a TBL course requires instructors to use "backward design" to get real clarity on what "mastery" looks like in their course (Wiggins & McTighe, 1998). To get this clarity, instructors engage the design process by asking themselves four questions (see Parmelee et al., 2013):

- “What do I want my students to be able to *do* with the material in this unit?” This question guides the development of *behavioral* (not just knowledge) objectives.
- “How can I *assess* whether or not students can do what I want them to be able to do?” This question guides the design of activities that require students to do something that is as close as possible to the desired behavioral outcome(s) specified in question 1 above.
- “What will students need to *know* in order to do what I want them to do?” This question guides the selection of the content that students will be expected to master prior to the first class meeting of the unit.
- “How can I assess whether students are *ready* to engage in the activities in which they will demonstrate their abilities to do what I want them to be able to do?” This question guides the assessment of students’ pre-class preparation.

The *execution* of TBL units follows exactly the reverse order, and, although the processes are very different, the intent of the sequence is similar to traditional teaching. In both cases, the objective is ensuring that students are familiar with a set of concepts. With TBL this is done through individual pre-class study and using a modest proportion of class time for the Readiness Assurance Process and focused corrective instruction (described above—see Michaelsen et. al, 2004). However, the majority of class time for team activities focuses on enhancing and/or assessing students’ ability to use course concepts. In contrast, with traditional teaching, the majority of class time (if not all of it) is used for transmitting course concepts from the instructor to students. Most of the application/critical thinking work is done outside of class, either by individuals or by groups that typically divide up the work required to produce a deliverable that is submitted as a graded course assignment.

## *2. Use Mutually Reinforcing Activities in a Specific Sequence.*

In contrast to the traditional model, in which a teacher’s role is primarily to select and dispense content, the TBL instructor spends much more time organizing content and facilitating the students’ experience of helping each other learn the content and how it can be used to solve problems. The sequence of the TBL Readiness Assurance process ensures

that students get several chances to engage with content and to judge and enhance their own level of understanding.

Using backwards design enables instructors to identify what content students can and should learn on their own during pre-class preparation. Many instructors have found that some form of “curating” of the content can be very helpful in this step—for example, by creating reading guides to help students focus their attention on the most important aspects of the readings. Starting each unit with an iRAT gives students an initial chance to judge their level of understanding of the material and, most important, ensures that team members are accountable for their own individual preparation. Next, during the tRAT, the immediate feedback from their peers and the IF-AT answer sheets provides both an additional incentive for students’ preparation and the opportunity to clarify their understandings of course material. Further, the immediate feedback from the IF-AT answer sheets enhances team development because, with each answer scratch-off, teams learn how effectively they are using members’ input in reaching their decisions. This immediate performance feedback both enables teams to become more effective and encourages individual members to acquire teamwork skills. Further, the tRAT and the appeals enable the teacher to identify and correct misunderstandings and/or gaps in students’ knowledge while there is ample time for corrective instruction. Finally, with well-designed applications activities, students learn why the course content is of value and are even more motivated to go through the cycle again with the next set of concepts.

By beginning each unit with the Readiness Assurance Process, teachers can count on having teams whose members are intellectually and socially prepared to work on challenging problems that support the development of higher-level thinking skills. By contrast, in a traditionally taught course that primarily involves knowledge dissemination, the teacher has very little information about the level of his or her students’ content understanding and little or no opportunity to correct misconceptions. Further, he or she has little or no ability to ensure that students will be effective in working together should he or she decide to use a group assignment.

### *3. Use the Majority of Class Time for Applications/Critical Thinking.*

TBL is *not* about covering content. From a student standpoint, the overall “feel” of the class must be that the class is about learning to *do* something as opposed to learning some facts so that they can pass a test. With TBL, the instructor is making an implicit bargain with students: “If you do the pre-class preparation, I’ll make sure that you are rewarded

by having the opportunity to see why the ideas are important to you.” The real payoff for students comes from opportunities to practice *using* the content on well-designed (that is, “4-S”) assignments. That is how to repay students for their effort to prepare for the RAP. In fact, having challenging 4-S applications is, ultimately, the single most important aspect of successfully implementing TBL. If students are able to see why the material is important, everything pretty much falls into place.

By contrast, in traditional courses the primary in-class activity is the teacher dispensing information. As a result, application-focused activities, if there are any, almost always take place outside of class. Further, the assignments typically require either individuals or groups to create a lengthy document and / or a presentation, and, with few exceptions, the feedback on their work is delayed to the point that students are more concerned about the grade they receive than the learning that the assignment was intended to produce.

#### *4. Use Assignments That Both Build Teams and Promote Learning.*

The nature of the assignments largely determines the effectiveness of learning groups in any setting. However, well-designed assignments are particularly important in TBL, because the entire approach hinges on being able to develop groups into self-managed teams. Fortunately, assignments that require a high level of team interaction promote both learning and team development (see Michaelsen et al., 2004). In most cases, team assignments will generate a high level of interaction if they (1) require teams to use course concepts to make decisions that involve a complex set of issues and, (2) enable teams to report their decisions in a simple form. When assignments emphasize making decisions, the sensible approach is to complete the task by engaging each other in a give-and-take content-related discussion (Roberson & Franchini, in this issue).

In contrast, assignments with complex outputs such as a lengthy document and / or a group presentation that are often used in traditional courses can completely undermine an attempt to implement TBL. This is because, in a group project outside of class, instead of promoting interaction and team development, the logical strategy for completing the assignment is to divide up the work among team members. Unfortunately, the outcome is that members are forced either to rely on one or two members to do most of the work or to assign segments to individual members who work pretty much alone on their part of the overall project. With either approach, instead of building teams, assignments of this type are likely

to create negative attitudes about group work. That's because the more students care about the grade, the more likely they are to feel that they have choose between one of two negative outcomes: (1) having to do more than their fair share of the work or (2) being at risk of getting a poor grade if anyone fails to do their part.

*5. Provide Frequent and Immediate Feedback  
on Individual and Team Performance.*

Immediate feedback is a primary instructional lever in TBL for two very different reasons. First, feedback is essential to content learning and retention—a notion that not only makes intuitive sense but is also well documented in the educational research literature (for example, Bruning, Schraw, & Ronning, 1994; Hattie & Timperley, 2007; Kulik & Kulik, 1998). Second, immediate feedback has tremendous positive impact on group development (for a review, see Birmingham and McCord, 2004). Further, immediate feedback is built into TBL's standard practices. The use of IF-AT answer sheets provides immediate feedback on both team members' understanding and teams' readiness for dealing with application problems. Similarly, simultaneously reported decisions on application-focused assignments provide immediate feedback to both individuals and teams. This is because the teams' choices are based on discussions that have just taken place, and their choices are open to challenges from both their peers and the instructor during the inter-team discussions.

With traditional courses, feedback on content understanding typically comes from midterm and final exams, and feedback on content applications is usually from the instructor after he or she has had the chance to evaluate students' work. As a result, the feedback is less effective than in TBL, because it is both less frequent and is often delayed to the point that there is little or no opportunity for corrective instruction. As a result, feedback in traditional instruction is almost exclusively summative in nature.

*6. Employ a Grading/Reward System  
That Promotes Individual and Team Accountability.*

Providing immediate feedback on the level of students' understanding is one key to holding individuals and teams accountable for doing high quality work. However, for many students, providing immediate feedback is not a sufficient source of motivation to ensure that they will do the work needed to master and apply course concepts. For many students, another key is using a reward system that links students' grades to each

of the activities that is essential for their own learning and for the success of their team. Thus, an effective grading system for TBL must meet two criteria (see Michaelsen et al., 2004). One criterion is that the grading system must include three components: (1) individual performance, (2) team performance, and (3) a peer assessment of individual members' contributions to their team. The other is that each of the three components must "count" enough so that students care about their score.

The grading system in most traditional courses is quite different. The only thing that typically counts is individual performance, unless the instructor assigns students to do a group project. In this case, he or she is also likely to include group performance and, possibly, some form of peer assessment as additional components in the grading system. Unfortunately, however, even if the groups turn in a satisfactory "product," the resulting grades are often a source of what is commonly known as the "free-rider" problem. In part the reason is that some, if not the majority, of students will honestly believe that they have done more than their fair share of the work. Furthermore, even if they believe they did more than their fair share, students are often reluctant to give low grades to the group members who failed to do their part.

### **Concluding Thoughts About TBL**

Probably the two most unique aspects of team-based learning are that it is highly dependent on being able to develop groups into self-managed and effective teams, and its foundational practices enable very nearly 100% of learning groups to develop into learning teams that are both capable of self-management and highly effective. Over the past 30 years, first author Larry Michaelsen has created and worked with 1,800 teams in both undergraduate and graduate classes, and in class sizes ranging from 7 to 240 students. During this time, only two teams have required *any* form of outside intervention. Further, neither intervention lasted more than five minutes, and both teams responded in a positive way and ended up being successful. The clearest evidence for the effectiveness of the teams comes from comparing the scores for the iRATs and tRATs. Based on the available records (since 1986), *the cumulative tRAT score of over 99.9+% of the teams in Michaelsen's TBL courses has been higher than the cumulative iRAT score of its very highest-scoring member* (1,201 of 1,202 teams). These results are both profound and represent an outcome the clarity of which is rarely, if ever, found anywhere in the social sciences.

There are two implications to these rather remarkable outcomes. One is that, in combination, the four fundamental TBL practices are overwhelm-



ingly effective in building effective and self-managed teams. The other is that these fundamental practices are truly fundamental. If the four key TBL practices are systematically and effectively implemented, groups *will* develop into effective self-managed teams; if not, the team-development process will be both slower and less reliable.

Thus, for the reasons outlined above in the discussion of TBL principles, it is not only possible, but essential, to measure one's TBL implementation against the set of fundamental TBL practices described here (see Haidet et al., 2012). Far too many faculty fail to realize that effectively using group work requires more than simply giving group assignments. In fact, although the problem probably exists with at least some CL and PBL users as well, most experienced TBL practitioners have encountered faculty colleagues who are adamant that TBL doesn't work because they had a bad experience with what they *thought* was TBL, when, in fact, they had failed to implement even one of TBL's fundamental practices.

On the other hand, faculty who deliberately and carefully implement the 4-step TBL process—strategically forming permanent teams, employing the Readiness Assurance Process to familiarize students with course content, using *in-class* 4-S assignments to develop students' critical-thinking skills, and holding peers accountable to each other with a peer assessment and feedback system—can be confident that the outcomes will be positive in a wide variety of ways (see Haidet et al., 2014, in this issue). More importantly, TBL creates classroom experiences that are much more enjoyable and productive for both instructors and their students because the students become partners in the learning process (see Sibley and Ostafichuk, 2013).

### **Concluding Thoughts About the Relationship Between TBL, CL, and PBL**

Team-based learning, problem-based learning, and cooperative learning are all forms of small-group learning, and they have much in common. All three approaches foster active engagement of students in the learning process by having students work together in purposefully formed small groups. Further, unlike the group work (typically projects that require producing a paper or presentation) used in conjunction with traditional lecture-based courses, groups in TBL, CL, and PBL classes do their work *during class time*.

The ultimate objective of the group work in TBL, CL, and PBL is essentially the same—that is, motivating students to engage in conversations about the content in ways that improve learning. Although the

specific strategies for achieving that outcome are different, the focus of class activity in all three approaches involves engaging students in challenging problem situations that require critical and creative thinking and interaction with other members of their group. All three approaches also emphasize the importance of holding students accountable by using some form of a summative assessment over the concepts related to the group work. Finally, all three approaches have a solid base of evidence that documents their effectiveness in achieving a wide variety of valuable educational outcomes (see articles by Albanese and Dast, 2014, and by Haidet et al., 2014, in this issue).

The biggest overall difference between TBL and CL and PBL is that TBL is a very clearly defined set of practices and principles, while CL and PBL are much larger “tents” under which a much wider range of practices for using group work are housed. Major comparisons and contrasts among TBL, CL, and PBL are discussed in this article. Many of these are summarized in Table 1 using the following four dimensions: group formation and size, concept familiarity, in-class assignments, and peer assessment (see Burgiss, McGregor, and Mellis, 2014).

There are a number of possible approaches in both CL and PBL, and each of these approaches has certain points in common, but many differences. The CL approaches most frequently used in higher education are the learning together (Johnson, Johnson, & Smith, 2014, in this issue), structural (Kagan, 2014, in this issue), group investigation (Sharan & Sharan, 1992), and eclectic (Millis, 2014, in this issue). The approaches that represent the opposite ends of the PBL continuum are 7-step and open-ended (Baud, Keogh, & Walker, 1985). For additional comparisons and contrasts between TBL and these subsets of CL and PBL, we suggest examining the points listed in Table 2 of the article by Davidson and Major (2014, in this issue) in relation to the fundamental practices and principles of TBL.

## **Conclusions**

In conclusion, team-based learning, cooperative learning, and problem-based learning all have a common goal of optimizing student learning, helping students develop higher-order thinking skills, and improving learning process and products. Each of these methods has strong advocates. They also each have a strong body of evidence to support them. These methods all require engaged students, group work, and observable products of learning. Each goes about getting there in different ways, with more or less emphasis on the structures and sequencing of instructional

Table 1  
A Comparison of the Practices of Team-Based Learning,  
Problem-Based Learning, and Cooperative Learning

<i>Practice</i>	<i>Team-Based Learning</i>	<i>Problem-Based Learning</i>	<i>Cooperative Learning</i>
<b>Team Formation and Size</b>	<ul style="list-style-type: none"> <li>• Instructor-formed</li> <li>• Permanent</li> <li>• Heterogeneous</li> <li>• 5-7 members</li> </ul>	<ul style="list-style-type: none"> <li>• Instructor-formed</li> <li>• Permanent</li> <li>• Heterogeneous</li> <li>• 5-8+ members</li> </ul>	<ul style="list-style-type: none"> <li>• Instructor-formed</li> <li>• Typically heterogeneous</li> <li>• 2-4 members—may vary with task</li> </ul>
<b>Ensuring Concept Familiarity</b>	Readiness Assurance: <ul style="list-style-type: none"> <li>• iRAT</li> <li>• tRAT</li> <li>• Appeals</li> <li>• Instructor tutorial</li> </ul>	Start with problem: <ul style="list-style-type: none"> <li>• Set research goals</li> <li>• Member research*</li> <li>• Peer teaching in team discussions</li> </ul>	Activities vary: <ul style="list-style-type: none"> <li>• Lecture</li> <li>• Individual study</li> <li>• Jigsaw</li> <li>• etc.</li> </ul>
<b>In-Class Assignments</b>	"4-S" Assignments: <ul style="list-style-type: none"> <li>• Significant problem</li> <li>• Same problem</li> <li>• Specific choice</li> <li>• Simultaneous report</li> </ul>	Start with problem: <ul style="list-style-type: none"> <li>• Set research goals</li> <li>• Member research*</li> <li>• Peer teaching in team discussions</li> </ul>	Activities require: <ul style="list-style-type: none"> <li>• Face-to-face interaction</li> <li>• Structured tasks suitable for group work</li> <li>• Interdependence</li> </ul>

Table 1 (continued)  
A Comparison of the Practices of Team-Based Learning,  
Problem-Based Learning, and Cooperative Learning

<i>Practice</i>	<i>Team-Based Learning</i>	<i>Problem-Based Learning</i>	<i>Cooperative Learning</i>
<b>Peer Assessment</b>	<ul style="list-style-type: none"> <li>• Quantitative</li> <li>• Qualitative</li> <li>• Formative</li> <li>• Summative</li> </ul>	<ul style="list-style-type: none"> <li>• Used in some forms of PBL</li> <li>• Under facilitator's direction</li> </ul>	<ul style="list-style-type: none"> <li>• Feedback during group process/reflection</li> <li>• Peer assessment occasionally used</li> </ul>
<b>Strategies for Promoting Productive Interaction in Groups/Teams</b>	<p>Develop self-managed teams by using:</p> <ul style="list-style-type: none"> <li>• Permanent groups</li> <li>• Grade incentives</li> <li>• Peer assessment and feedback</li> </ul> <p>Facilitate immediate performance feedback during/ from:</p> <ul style="list-style-type: none"> <li>• Readiness Assurance</li> <li>• "4-S" assignments</li> </ul>	<p>Presence of a trained facilitator who:</p> <ul style="list-style-type: none"> <li>• Monitors interaction</li> <li>• Provides guidance when needed</li> <li>• Provides feedback to group/ members</li> </ul>	<ul style="list-style-type: none"> <li>• Smaller groups</li> <li>• Group structures</li> <li>• Assigned member roles</li> <li>• Post-activity reflection/ process discussions</li> <li>• Team/ class building activities</li> <li>• Monitoring interaction</li> <li>• Providing guidance when needed</li> <li>• Providing feedback to group/ members</li> </ul>

*Note.* \*between sessions to gather information for team discussions.

activities. What they all offer higher education instructors, however, is tried and true methods that engage students in learning and, in turn, improve educational outcomes.

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