

# TEAM-BASED LEARNING

IMPROVE THE EFFECTIVENESS OF GROUP WORK IN LABS/TUTORIALS  
BY FOLLOWING THESE EVIDENCE-BASED BEST PRACTICES:

## DID YOU KNOW?

Research suggests groups of 3-5 are the optimal size for learning

## READINESS ASSURANCE PROCESS

In order to optimize participation and learning during labs and tutorials, it is helpful if students arrive after being familiarized with the material.

Pedagogical experts suggest that the readiness assurance process follows these steps:

- Pre-class learning
  - Delivered via assigned readings, lecture captures, modules, etc.
- Individual tests
  - Brief tests covering the pre-class learning material
- Group tests
  - Same test as individual tests, but completed in groups
- Mini-lecture (optional)
  - The instructor can further explain material covered in pre-class learning

## DID YOU KNOW?

Assigning grades to these tests can help ensure that students complete the pre-class learning activities

## APPLICATION ACTIVITIES

Pedagogical experts recommend that application activities consider the "4 Ss":

- Significant: is the problem/question relevant to course material?
- Same problem: all groups working on the same problem
- Simultaneous reporting: all groups submit solution at same time
- Specific choice: solution should be clear and specific.

## DID YOU KNOW?

Attaching grades to peer evaluation reduces "social loafing"

## PEER EVALUATION

Provide students the opportunity to give feedback to each other

**I** TBL is a collection of practices that support one another for powerful instructional effect. This chapter describes the building blocks of team-based learning and the steps necessary to put them into place.

## The Essential Elements of Team-Based Learning

*Larry K. Michaelsen, Michael Sweet*

Team-based learning (TBL) possibly relies on small group interaction more heavily than any other commonly used instructional strategy in postsecondary education (for comparative discussion of different approaches, see Fink, 2004; Johnson, Johnson, and Smith, 2007; Millis and Cottell, 1998). This conclusion is based on three facts. First, with TBL, group work is central to exposing students to and improving their ability to apply course content. Second, with TBL, the vast majority of class time is used for group work. Third, courses taught with TBL typically involve multiple group assignments that are designed to improve learning and promote the development of self-managed learning teams.

This chapter begins with a brief overview of TBL. Next, we discuss the four essential elements of TBL and then walk through the steps required to implement them. Finally, we examine some of the benefits that students, administrators, and faculty can expect from a successful implementation of TBL.

### **A Broad Overview of TBL**

The primary learning objective in TBL is to go beyond simply covering content and focus on ensuring that students have the opportunity to practice using course concepts to solve problems. Thus, TBL is designed to provide students with both conceptual and procedural knowledge. Although some time in the TBL classroom is spent 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 in the future. Figure 1.1 outlines generally how time in one unit of a TBL course is organized.

In a TBL course, students are strategically organized into permanent groups for the term, and the course content is organized into major units—typically five to seven. Before any in-class content work, students must study assigned materials because each unit begins with the readiness assurance process (RAP). The RAP consists of a short test on the key ideas from the readings that students complete as individuals; then they take the same test again as a team, coming to consensus on team answers. Students receive immediate feedback on the team test and then have the opportunity to write evidence-based appeals if they feel they can make valid arguments for their answer to questions that they got wrong. The final step in the RAP is 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.

Once the RAP is completed, the remainder (and the majority) of the learning unit is spent on in-class activities and assignments that require students to practice using the course content.

## **The Four Essential Elements of Team-Based Learning**

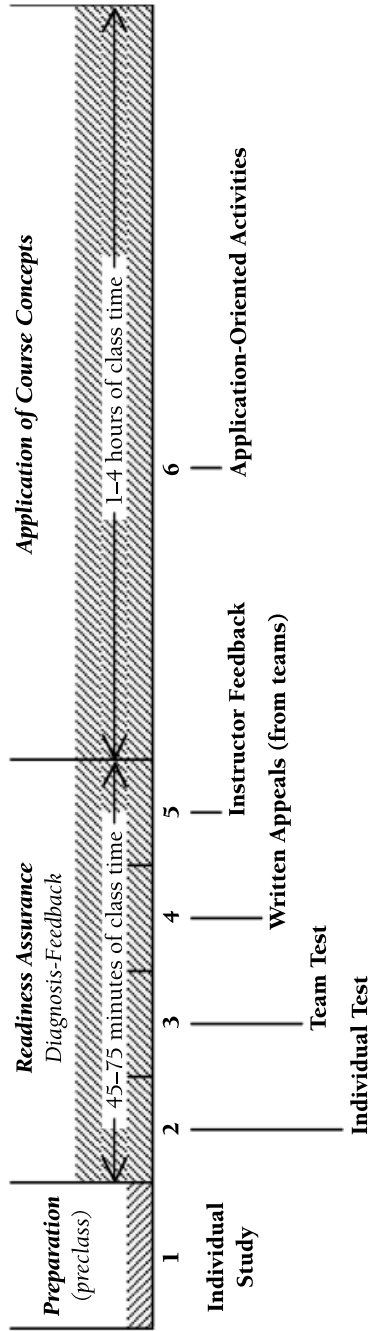
Shifting from simply familiarizing students with course concepts to requiring that students use those concepts to solve problems is no small task. Making this shift requires changes in the roles of both instructor and students. The instructor's primary role shifts from dispensing information to designing and managing the overall instructional process, and the students' role shifts from being passive recipients of information to one of accepting responsibility for the initial exposure to the course content so that they will be prepared for the in-class teamwork.

Changes of this magnitude do not happen automatically and may even seem to be a dream rather than an achievable reality. They are, however, achievable when the four essential elements of TBL are successfully implemented:

- **Groups.** Groups must be properly formed and managed.
- **Accountability.** Students must be accountable for the quality of their individual and group work.
- **Feedback.** Students must receive frequent and timely feedback.
- **Assignment design.** Group assignments must promote both learning and team development.

When these four elements are implemented in a course, the stage is set for student groups to evolve into cohesive learning teams.

**Figure 1.1. Team-Based Instructional Activity Sequence**



*Note:* This sequence is repeated for each major instructional unit—typically five to seven per course.

**Element 1: Properly Formed and Managed Groups.** TBL requires that the instructor oversee the formation of the groups so that he or she can manage three important variables: ensuring that the groups have adequate resources to draw from in completing their assignments and approximately the same level of those resources across groups, avoiding membership coalitions that are likely to interfere with the development of group cohesiveness, and ensuring that groups have the opportunity to develop into learning teams.

*Distributing Member Resources.* In order for groups to function as effectively as possible, they should be as diverse as possible. Each group should contain a mix of student characteristics that might make the course easier or more difficult for a student to do well in the course (for example, previous course work or course-related practical experience) as well as demographic characteristics like gender and ethnicity. The goal here is to equip groups to succeed by populating them with members who will bring different perspectives to the task.

Findings in both group dynamics research (Brobeck and others, 2002) and educational research (Chan, Burtis, and Bereiter, 1997) illuminate the positive impact of diverse input in problem-solving discussions on both learning and performance. When group members bring many different perspectives to a task, their process of collaborative knowledge building in pursuit of consensus is powerful to watch. In addition, although member diversity initially inhibits both group processes and performance, it is likely to become an asset when members have worked together over time and under conditions that promote group cohesiveness (Watson, Kumar, and Michaelsen, 1993).

*Minimizing Barriers to Group Cohesiveness: Avoiding Coalitions.* Coalitions within a group are likely to threaten its overall development. In newly formed groups, either a previously established relationship between a subset of members in the group (such as a boyfriend and girlfriend or fraternity brothers) or the potential for a cohesive subgroup based on background factors such as nationality, culture, or native language is likely to burden a group with insider-outsider tension that can plague the group throughout the term. Because it is human nature to seek out similar others, allowing students free rein in forming their own groups practically ensures the existence of potentially disruptive subgroups (Fiechtner and Davis, 1985; Michaelsen and Black, 1994).

*Time.* Any group dynamics textbook will tell you that groups need time to develop into high-performing teams, regardless of whether you favor sequential or life cycle models (Tuckman, 1965; Tuckman and Jensen, 1977), cyclical models (Worchel, Wood, and Simpson, 1992), or adaptive or nonsequential models (McGrath, 1991). For this reason, students should stay in the same group for the entire course. Although even a single well-designed group assignment usually produces a variety of positive outcomes, only when students work together over time can their groups become cohesive enough to evolve into self-managed and truly effective learning teams.

**Element 2: Student Accountability for Individual and Group Work.** In lecture classes, there is no need for students to be accountable to anyone other than the instructor. By contrast, TBL requires students to be accountable to both the instructor and their teammates for the quality and quantity of their individual work. Furthermore, teams must be accountable for the quality and quantity of their work as a unit. (For a review of the effects of accountability on an array of social judgments and choices, see Lerner and Tetlock, 1999.)

*Accountability for Individual Preclass Preparation.* Lack of preparation places clear limits on both individual learning and team development. If several members of a team come unprepared to contribute to a complex group task, then the team as a whole is far less likely to succeed at that task, cheating its members of the learning that the task was designed to stimulate. No amount of discussion can overcome absolute ignorance. Furthermore, lack of preparation also hinders the development of cohesiveness because those who do make the effort to be prepared will resent having to carry their peers. As a result, the effective use of learning groups clearly requires that individual students be made accountable for class preparation.

*Accountability for Contributing to The Team.* The next step is ensuring that members contribute time and effort to group work. In order to accurately assess members' contributions to the success of their teams, it is imperative that instructors involve the students themselves in a peer assessment process. That is, members should be given the opportunity to evaluate one another's contributions to the activities of the team. Contributions to the team include activities such as individual preparation for teamwork, reliable class attendance, attendance at team meetings that may have occurred outside class, positive contributions to team discussions, and valuing and encouraging contributions from fellow team members. Peer assessment is essential because team members are typically the only ones who have enough information to evaluate one another's contributions accurately.

*Accountability for High-Quality Team Performance.* The third significant factor in ensuring accountability is developing an effective means to assess team performance. There are two keys to effectively assessing teams. One is using assignments that require teams to create a product that can be readily compared across teams and with "expert" opinions, and the other is using procedures to ensure that such comparisons occur frequently and in a timely manner.

**Element 3: Frequent Immediate Student Feedback.** Immediate feedback is the 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 educational research literature (Bruning, Schraw, and Ronning, 1994; Kulik and Kulik, 1988; Hattie and Timperley, 2007). Second, immediate feedback has tremendous impact on group development (for a review, see Birmingham and McCord, 2004).

**Element 4: Assignments That Promote Both Learning and Team Development.** The most fundamental aspect of designing team assignments that promote both learning and team development is ensuring that they truly require group interaction. In most cases, team assignments generate a high level of interaction if they require teams to use course concepts to make decisions that involve a complex set of issues and enable teams to report their decisions in a simple form. When assignments emphasize making decisions, most students choose to complete the task by engaging each other in a give-and-take content-related discussion. By contrast, assignments that involve producing complex output such as a lengthy document often limit both learning and team development because they typically inhibit intrateam discussions in two ways. First, discussions are likely to be much shorter because students are likely to feel an urgency to create the product that is to be graded. Second, instead of focusing on content-related issues, they are likely to center on how to divide up the work. Thus, complex product outputs such as a lengthy document seldom contribute to team development because they are likely to have been created by individual members working alone on their part of the overall project.

**Summary.** By adhering to the four essential elements of TBL—careful design of groups, accountability, feedback, and assignments—teachers create a context that promotes the quantity and quality of interaction required to transform groups into highly effective learning teams. Appropriately forming the teams puts them on equal footing and greatly reduces the possibility of mistrust from preexisting relationships between a subset of team members. Holding students accountable for preparation and attendance motivates team members to behave in prosocial ways that build cohesiveness and foster trust. Using RAPs and other assignments to provide ongoing and timely feedback on both individual and team performance enables teams to develop confidence in their ability to capture the intellectual resources of all their members. Assignments that promote both learning and team development motivate members to challenge others' ideas for the good of the team. Also, over time, students' confidence in their teams grows to the point that they are willing and able to tackle difficult assignments with little or no external help.

## Implementing Team-Based Learning

Effectively using TBL typically requires redesigning a course from beginning to end, and the redesign process should begin well before the start of the school term. The process involves making decisions about and designing activities at four different times: before class begins, the first day of class, each major unit of instruction, and near the end of the course. In this section, we discuss the practical steps a TBL instructor takes at each of these points, but for a treatment that is even detailed and practical, we direct readers to Michaelsen, Knight, and Fink (2004).

**Before Class Begins.** Traditional education, particularly in undergraduate programs, has tended to separate knowledge acquisition from knowledge application both between and within courses. In a typical biology course, for example, students listen to lectures through which they are expected to absorb a great deal of knowledge that they will then later be asked to put to use in a biology lab. In fact, even within higher-level courses, students often spend much of the term absorbing knowledge that they do not put to use until a project that is due just prior to the final exam.

TBL uses a fundamentally different knowledge acquisition and knowledge application model. With TBL, students repeat the knowledge acquisition and knowledge application cycle several times within each individual course. They individually study the course content, discuss it with their peers and the instructor, and immediately apply it in making choices that require them to use their knowledge. Thus, students in TBL courses develop a much better sense of the relevance of the material because they seldom have to make unreasonably large inferences about when and how the content might become useful in the real world. Rather than being filled with libraries of “inert knowledge” (Whitehead, 1929), from which they then later must extract needed information with great effort, students walk away from TBL courses having already begun the practical problem-solving process of learning to use their knowledge in context.

This benefit, however, does not occur by accident. Designing a successful TBL course involves making decisions related to first identifying and clustering instructional objectives and then designing a grading system around them.

*Identifying Instructional Objectives.* Designing a TBL course requires instructors to “think backward.” What is meant by “think backward”? In most forms of higher education, teachers design their courses by asking themselves what they feel students need to know, then telling the students that information, and finally testing the students on how well they absorbed what they were told. In contrast, designing a TBL course requires instructors to “think backward”—backward because they are planned around what they want students to be able to do when they have finished the course; only then do instructors think about what students need to know. Wiggins and McTighe (1998) used the term *backward design* to describe this method of course design, which enables the instructor to build a course that provides students both declarative and procedural knowledge (in other words, conceptual knowledge and the ability to use that knowledge in decision making). This is a useful distinction, but if you have taught only with conceptual familiarization as your goal, it can be surprisingly difficult to identify what exactly you want students to be able to do on completion of a course. The following question is a good good place to start.

What are the students who really understand the material doing that shows you they get it? Imagine you are working shoulder-to-shoulder with a former student who is now a junior colleague. In a wonderful moment,



you see that colleague do something that makes you think, “Hey! She really got from my class what I wanted her to get. There’s the evidence right there!” When you are designing a course backward, the question you ask yourself is: “What specifically is that evidence? What could a former student be doing in a moment like that to make it obvious she really internalized what you were trying to teach her and is putting it to use in a meaningful way?”

For every course, there are several answers to this question, and these different answers correspond to the units of the redesigned version of the course. A given real-world moment will likely demand knowledge from one part of a course but not another, so for any given course, you should brainstorm about a half-dozen of these proud moments in which a former student is making it obvious that she really learned what you wanted her to. For now, do not think about the classroom; just imagine she is doing something in an actual organizational context. Also, do not be afraid to get too detailed as you visualize these moments. In fact, come up with as many details as you can about how this former student is doing what she is doing, what decisions she is making, in what sequence, under what conditions, and so on.

These detailed scenarios become useful in three ways. First, the actions taking place in the scenarios will help you organize your course into units. Second, the scenarios will enable you to use class time to build students’ applied knowledge instead of inert knowledge. Third, the details of the scenario will help you design the criteria for the assessments on which you can base students’ grades.

Once you have brainstormed the scenarios and the details that accompany them, you have identified your instructional objectives, which often involve making decisions that are based on insightful applications of the concepts from your course. Now you are ready to ask three more questions:

- *What will students need to know in order to be able to do those things?* Answers to this question will guide your selection of a textbook, the contents of your course packet, experiential exercises, and are likely to prompt you to provide supplementary materials of your own creation or simple reading guides to help students focus on what you consider most important in the readings or lab findings. In addition, the answers will be key in developing questions for the readiness assurance process.
- *While solving problems, what knowledge will students need to make decisions?* Answers to this question will help you import the use of course knowledge from your brainstormed real-world scenarios into the classroom. You may not be able to bring the actual organizational settings in which your scenarios occurred into the classroom, although computer simulations, video (including full-length feature films), and requiring students to learn by doing (see Miller, 1991, and Michaelsen and McCord, 2006) are coming much closer to approaching the real world. But you can provide enough relevant information about those settings to design

activities that require students to face the same kinds of problems and make the same kinds of decisions they will make in clinical and laboratory settings.

- *What criteria separate a well-made decision from a poorly made decision using this knowledge?* Answers to this question will help you begin building the measures you will use to determine how well the students have learned the material and how well they can put it to use under specific conditions.

In summary, TBL leverages the power of action-based instructional objectives to not only expose students to course content but also give them practice using it. When you are determining an instructional objective, it is crucial to know how to assess the extent to which students have mastered that objective. Some teachers feel that designing assessments first removes something from the value of instruction—that it simply becomes teaching to the test. With TBL the view is that you should teach to the test as long as the test represents (as closely as possible) the real use to which students will ultimately apply the course material: what they are going to do with it, not just what they should know about it.

*Designing a Grading System.* The other step in redesigning the course is to ensure that the grading system is designed to reward the right things. An effective grading system for TBL must provide incentives for individual contributions and effective work by the teams, as well as address the equity concerns that naturally arise when group work is part of an individual's grade. The primary concern here is typically borne from past group work situations in which students were saddled with free-riding team members and have resented it ever since. Students worry that they will be forced to choose between getting a low grade or carrying their less able or less motivated peers. Instructors worry that they will have to choose between grading rigorously and grading fairly.

Fortunately, many of these concerns are alleviated by a grading system in which a significant proportion of the grade is based on individual performance, team performance, and each member's contributions to the success of the teams. As long as that standard is met, the primary remaining concern is that the relative weight of the factors is acceptable to both the instructor and the students.

**The First Day of Class.** Activities that occur during the first few hours of class are critical to the success of TBL. During that time, the teacher must accomplish four objectives: ensure that students understand why you (the instructor) have decided to use TBL and what that means about the way the class will be conducted, form the groups, alleviate students' concerns about the grading system, and set up mechanisms to encourage the development of positive group norms.

*Introducing Students to TBL.* Because the roles of instructor and students are so fundamentally different from traditional instructional practice, it is critical that students understand both the rationale for using TBL and

what that means about the way the class will be conducted. Educating students about TBL requires at a minimum providing them with an overview of the basic features of TBL, how TBL affects the role of the instructor and their role as students, and why they are likely to benefit from their experience in the course. This information should be printed in the course syllabus, presented orally, and demonstrated by one or more activities.

In order to foster students' understanding of TBL, we recommend two activities. The first is to explain the basic features of TBL using overhead transparencies (or a PowerPoint presentation) and clearly spelling out how the learning objectives for the course will be accomplished through the use of TBL, compared to how the same objectives would be achieved using a lecture-discussion course format. The second activity is a demonstration of a readiness assurance process using the course syllabus, a short reading on TBL, or some potentially useful ideas, such as what helps and hinders team development or strategies for giving helpful feedback (see Michaelsen and Schultheiss, 1988) as the content material to be covered. (In a class period of less than an hour, this activity might occur on day 2.)

*Forming the Groups.* When forming groups, you must consider the course-relevant characteristics of the students and the potential for the emergence of subgroups. As a result, the starting point in the group formation process is to gather information about specific student characteristics that will make it easier or more difficult for a student to succeed in the class. For a particular course, characteristics that could make it easier for a student to succeed might include previous relevant course work or practical experience or access to perspectives from other cultures. Most commonly, characteristics making it more difficult for students to succeed are the absence of those that would make it easier, but might include such things as a lack of language fluency.

We recommend forming the groups in class in the presence of the students to eliminate student concerns about ulterior motives the instructor may have had in forming groups. (For a depiction of how to form groups quickly and effectively, see Michaelsen and Sweet, 2008, and for a more detailed explanation and video demonstration, go to [www.teambasedlearning.org](http://www.teambasedlearning.org).)

*Alleviating Student Concerns About Grades.* The next step in getting started on the right foot with TBL is to address student concerns about the grading system. Fortunately, student anxiety based on previous experience with divided-up group assignments largely evaporates as students come to understand two of the essential features of TBL. One is that two elements of the grading system create a high level of individual accountability for pre-class preparation, class attendance, and devoting time and energy to group assignments: counting individual scores on the readiness assurance tests and basing part of the grade on a peer evaluation. The other reassuring feature is that team assignments will be done in class and will be based on thinking, discussing, and deciding, so it is highly unlikely that one or two less-motivated teammates members can put the entire group at risk.

Many instructors choose to alleviate student concerns about grades by directly involving students in customizing the grading system to the class. Students become involved by participating in setting grade weights (Michaelsen, Cragin, and Watson, 1981; Michaelsen, Knight, and Fink, 2004). Within limits set by the instructor, representatives of the newly formed teams negotiate with one another to reach a consensus (all of the representatives must agree) on a mutually acceptable set of weights for each of the grade components: individual performance, team performance, and each member's contributions to the success of the team. After an agreement has been reached regarding the grade weight for each component, the standard applies for all groups for the remainder of the course.

**Each Major Unit of Instruction.** Each unit of a TBL course begins with a readiness assurance process (RAP), which occurs at least five to seven times each term. The RAP provides the foundation for individual and team accountability and has five major components: (1) assigned readings, (2) individual tests, (3) team tests, (4) an appeals process, and (5) instructor feedback.

*Assigned Readings.* Prior to the beginning of each major instructional unit, students are given reading and other assignments that should contain information on the concepts and ideas that must be understood to be able to solve the problem set out for this unit. Students complete the assignments and come to the next class period prepared to take a test on the assigned materials.

*Individual Test.* The first in-class activity in each instructional unit is an individual readiness assurance test (iRAT) over the material contained in the preclass assignments. The tests typically consist of multiple-choice questions that enable the instructor to assess whether students have a sound understanding of the key concepts from the readings. As a result, the questions should focus on foundational concepts, not picky details, and be difficult enough to stimulate team discussion.

*Team Test.* When students have finished the iRAT, they turn in their answers (which are often scored during the team test) and immediately proceed to the third phase of the readiness assurance process, the tRAT. During this third phase, students retake the same test, but this time as a team, and the teams must reach agreement on the answers to each test question. They then immediately check the correctness of their decision using the intermediate feedback assessment technique (IF-AT), a self-scoring answer sheet (see Figure 1.2) that provides feedback on each team decision. With the IF-AT answer sheets, students scratch off the covering of one of four (or five) boxes in search of a mark indicating they have found the correct answer. If they find the mark on the first try, they receive full credit. If not, they continue scratching until they find the mark, but their score is reduced with each unsuccessful scratch. This allows teams to receive partial credit for proximate knowledge.

The answer sheets are an effective way to provide timely feedback on the team RATs (not the iRATs—otherwise members would know the answers before the team test and discussion would be pointless). Furthermore, using

**Figure 1.2. Immediate Feedback Assessment Technique**

**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>

the answer sheets makes it possible to provide real-time content feedback to multiple teams without requiring them to maintain the same work pace.

Getting real-time feedback from the IF-AT provides two key benefits to the teams. First, it enables members to correct their misconceptions of the subject matter. Finding a star immediately after scratching the choice confirms the validity of it, and finding a blank box lets them know they have more work to do. Second, it promotes both the ability and the motivation for teams, with no input from the instructor, to learn how to work together effectively. In fact, those who have used the IF-ATs for their tRATs have learned that doing so virtually eliminates any possibility that one or two members might dominate team discussions. “Pushy” members are only one scratch away from embarrassing themselves, and quiet members are one scratch away from being validated as a valuable source of information and two scratches away from being told that they need to speak up.

The impact of the IF-AT on team development is immediate, powerful, and extremely positive. In our judgment, using the IF-ATs with the tRATs is the most effective tool available for promoting both concept understanding and cohesiveness in learning teams. Anyone who does not use them will miss a sure-fire way to implement TBL successfully.

*Appeals Process.* At this point in the readiness assurance process, students proceed to the fourth phase, which gives them the opportunity to refer to their assigned reading material and appeal any questions missed on the group test. That is, students are allowed to do a focused restudy of the assigned readings (this phase is “open book”) to challenge the teacher about their responses on specific items on the team test or about confusion created by either the quality of the questions or inadequacies of the preclass readings.

Discussion among group members is usually very animated while the students work together to build a case to support their appeals. The students must produce compelling evidence to convince the teacher to award credit for the answers they missed. Teachers listening to students argue the fine details

of course material while writing team appeals report being convinced their students learn more from appealing answers they got wrong than from confirming the answers they got right. As an integral part of the readiness assurance process, this appeals exercise provides yet another review of the readings.

*Instructor Feedback.* The fifth and final part of the readiness assurance process is oral feedback from the instructor. This feedback comes immediately after the appeals process and allows the instructor to clear up any confusion students may have about any of the concepts presented in the readings. As a result, input from the instructor is typically limited to a brief, focused review of only the most challenging aspects of the preclass reading assignment.

*The Readiness Assurance Process in Summary.* This process allows instructors to minimize class time that often is used instead to cover material that students can learn on their own. Time is saved because the instructor's input occurs after students have individually studied the material, taken an individual test focused on key concepts from the reading assignment, retaken the same test as a member of a learning team, and completed a focused restudy of the most difficult concepts. A cursory review of team test results illuminates for instructors which concepts need additional attention so that they can correct students' misunderstandings. In contrast to the concerns many instructors express about "losing time to group work" and not being able to cover as much content, many others report being able to cover more with the readiness assurance process than they can through lectures (Knight, 2004). Leveraging the motivational power and instructional efficiency of the readiness assurance process leaves the class a great deal of class time to develop students' higher-level learning skills as they tackle multiple and challenging application-oriented assignments.

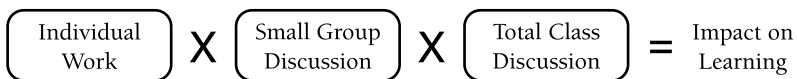
Beyond its instructional power, the readiness assurance process is the backbone of TBL because it promotes team development in four specific ways. First, starting early in the course (usually the first few class hours), students are exposed to immediate and unambiguous feedback on both individual and team performance. As a result, each member is explicitly accountable for his or her preclass preparation. Second, because team members work face-to-face, the impact of the interaction is immediate and personal. Third, students have a strong vested interest in the outcome of the group and are motivated to engage in a high level of interaction. Finally, cohesiveness continues to build during the final stage of the process when the instructor is presenting information. This is because unlike lectures, the content of the instructor's comments is determined by students' choices and actions during the readiness tests. Thus, the instructor's comments provide either positive reinforcement (they celebrate together) or corrective instruction (which, particularly in the presence of other groups, can be experienced as embarrassing and, in this way, provide an "external threat" that builds cohesiveness within a group). Although the impact of the readiness assurance process on student learning is limited primarily to ensuring that they have a solid exposure to the content, it also increases students' ability to

solve difficult problems for two reasons. First, by encouraging preclass preparation and a lively discussion, the process builds the intellectual competence of team members. Second, because they have immediate performance feedback, the experience of working together during the group and in preparing appeals heightens their ability and willingness to provide high-quality content feedback to one another. As a result, the readiness assurance process provides a practical way of ensuring that even in large classes, students are exposed to a high volume of immediate feedback that in some ways can actually be better than having a one-on-one relationship between student and instructor.

*Promoting Higher-Level Learning.* The final stage in the TBL instructional activity sequence for each unit of instruction is using one or more assignments that provide students with the opportunity to deepen their understanding by having groups use the concepts to solve a problem. These application assignments must foster both accountability and give-and-take discussion first within and then between groups. Designing these assignments is probably the most challenging aspect of implementing TBL.

The key to creating and implementing effective group assignments is following what TBL users fondly refer to as the 4 S's: (1) assignments should always be designed around a problem that is *significant to students*, (2) all of the students in the class should be working on the *same* problem, (3) students should be required to make a *specific* choice, and (4) groups should *simultaneously* report their choices (Figure 1.3). Furthermore, these procedures 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 the following paragraphs.

**Figure 1.3. Keys to Creating Effective Group Assignments**



**To obtain the maximum impact on learning, assignments at each stage should be characterized by 4 S's:**

- **Significant** – Individuals and groups should work on a problem, case, or question demonstrating concept's usefulness.
- **Same problem** – Individuals and groups should work on the same problem, case, or question.
- **Specific choice** – Individuals and groups should be required to use course concepts to make a specific choice.
- **Simultaneously report** – If possible, individuals and groups should report their choices simultaneously.



- *Significant problem.* Effective assignments must capture students' interest. Unless assignments are built around what they see as a relevant issue, most students will view what they are being asked to do as busywork and will put forth the minimum effort required to get a satisfactory grade. The key to identifying what will be significant to students is using backward design. If you identify something you want students to be able to do and give them the chance to try, it is likely that your enthusiasm will carry over to your students in a way that rarely happens when you organize your teaching around what you think students should know.
- *Same problem.* Group assignments are effective only to the extent that they promote discussion both within and between groups. Assigning students to work on different problems practically eliminates meaningful discussions because students have little energy to engage in a comparison of apples and oranges, and students will not be exposed to feedback on the quality of their thinking as either individuals or teams. In order to facilitate a conceptually rich and energetic exchange, students must have a common frame of reference that is possible only when they are working on the same problem, that is, the same assignment or learning activity.
- *Specific choice.* Cognitive research shows that learning is greatly enhanced when students are required to engage in higher-level thinking (Mayer, 2002; Pintrich, 2002; Scandura, 1983). In order to challenge students to process information at higher levels of cognitive complexity, an educational adage (sometimes attributed to William Sparke) is that teaching consists of causing people to go into situations from which they cannot escape except by thinking.

In general, the best activity to accomplish this goal is to require students to make a specific choice. Think of the task of a courtroom jury: members are given complex information and asked to produce a simple decision: guilty or not guilty. As a result, nearly one hundred percent of their time and effort is spent digging into the details of their content. In the classroom, the best way to promote content-related discussion is to use assignments that require groups to use course concepts to make decisions on questions such as these:

- Which line on this tax form would pose the greatest financial risk due to an IRS audit? Why?
- Given a set of real data, which of the following advertising claims is least (or most) supportable? Why?
- What is the most dangerous aspect of this bridge design? Why?
- Given four short paragraphs, which is the best (or worst) example of an enthymeme? Why?

For a much more thorough discussion of assignments and a rationale as to why they work so well in promoting both student learning and team development, see Michaelsen, Knight, and Fink, (2004).



- *Simultaneous reports.* Once groups have made their choices, they can share the result of their thinking with the rest of the class sequentially or simultaneously. The problem with sequential reporting is that the initial response often has a powerful impact on the subsequent discussion because later-reporting teams tend to change their answer in response to what seems to be an emerging majority view—even if that majority is wrong.

This phenomenon, which we call answer drift, limits both learning and team development for a variety of reasons. One is that it is most likely to occur when the problems being discussed have the greatest potential for producing a meaningful discussion. That is because the more difficult or ambiguous the problem is, the greater the likelihood is that the initial response would be incomplete or even incorrect, and subsequent groups would be unsure about the correctness of their answer. Another is that answer drift discourages give-and-take discussions because later responders deliberately downplay differences between their initial answer and the one that is being discussed. Finally, sequential reporting limits accountability because the only group that is truly accountable is the one that opens the discussion.

Requiring groups to simultaneously reveal their answers virtually eliminates the main problems that result from sequential reporting. Consider the question in a tax accounting course on an assignment requiring teams to choose a specific line on a tax form that would pose the greatest financial risk due to an IRS audit. One option would be for the instructor to signal the teams to simultaneously hold up a card with the line number corresponding to their choice (others simultaneous report options are discussed in Sweet, Wright, and Michaelsen, 2008). Requiring a simultaneous public commitment to a specific choice increases both learning and team development because each team is accountable for its choice and motivated to defend its position. Moreover, the more difficult the problem, the greater the potential is for disagreements that are likely to prompt give-and-take discussion, and the teams become more cohesive as they pull together in an attempt to defend their position.

**Near the End of the Course.** Although TBL provides students with multiple opportunities for learning along the way, instructors can solidify and extend student understanding of both course content and group process issues by reminding students to reflect on what the TBL experience has taught them about course concepts, the value of teams, the kinds of interaction that promote effective teamwork, themselves, and how certain aspects of the course have encouraged positive group norms.

*Reinforcing Content Learning.* One of the greatest benefits of using TBL is also a potential danger. Since so little class time is aimed at providing students with their initial exposure to course concepts, many fail to realize how much they have learned. In part, this seems to result from the fact that with TBL, the volume of their lecture notes is far less than in typical courses. As a result, some students are a bit uneasy—even if they are aware that the

scores from TBL sections on common midterm exams were significantly higher than scores from non-TBL sections. As a result, on an ongoing basis—and especially near the end of the course—instructors should make explicit connections between end-of-course exams and the RAT questions and application assignments. In addition, an effective way to reassure students is devoting a class period to a concept review. In its simplest form, this involves (1) giving students an extensive list of the key concepts from the course, (2) asking them to individually identify any concepts that they do not recognize, (3) compare their conclusions in the teams, and (4) review any concepts that teams identify as needing additional attention.

*Learning About the Value of Teams.* Concerns about better students being burdened by less motivated or less able peers are commonplace with other group-based instructional approaches. TBL, however, enables instructors to provide students with compelling empirical evidence of the value of teams for tackling difficult intellectual challenges. For example, in taking both individual and team tests, students generally have the impression that the teams are outperforming their own best member, but are seldom aware of either the magnitude or the pervasiveness of the effect. Near the end of each term, we create a transparency that shows cumulative scores from the tests for each team—the low, average, and high member score; the team score; and the difference between the highest member score and the team score (see Michaelsen, Knight, and Fink, 2004). Most students are stunned when they see the pattern of scores for the entire class. In the past twenty years, over 99.9 percent of the nearly sixteen hundred teams in our classes have outperformed their own best member by an average of nearly 11 percent. In fact, in the majority of classes, the lowest team score in the class is higher than the single best individual score in the entire class (Michaelsen, Watson, and Black, 1989).

*Recognizing Effective Team Interaction.* Over time, teams get increasingly better at ferreting out and using members' intellectual resources in making decisions (Watson, Michaelsen, and Sharp, 1991). However, unless instructors use an activity that prompts members to explicitly think about group process issues, they are likely to miss an important teaching opportunity. This is because most students, although pleased about the results, generally fail to recognize the changes in members' behavior that have made the improvements possible.

We have used two approaches for increasing students' awareness of the relationship between group processes and group effectiveness. The aim of both approaches is to have students reflect on how and why members' interaction patterns have changed as their team became more cohesive. One approach is an assignment that requires students to individually reflect on how the interactions among team members have changed over time and formulate a list of members' actions that made a difference, share their lists with team members, and create a written analysis that summarizes the barriers to their team's effectiveness and what was done to overcome them. The

other, and more effective, approach is the same assignment, but students prepare along the way by keeping an ongoing log of observations about how their team has functioned (see Hernandez, 2002).

*Learning About Themselves: The Critical Role of Peer Evaluations.* One of the most important contributions of TBL is that it creates conditions that can enable students to learn a great deal about the way they interact with others. In large measure, this occurs because of the extensive and intensive interaction within the teams. Over time, members get to know each other's strengths and weaknesses. This makes them better at teaching each other because they can make increasingly accurate assumptions about what a given teammate finds difficult and how best to explain it to that person. In addition, in the vast majority of teams, members develop such strong interpersonal relationships that they feel morally obligated to provide honest feedback to each other to an extent that rarely occurs in other group-based instructional approaches (see Chapter Two, this volume, for examples).

**Encouraging the Development of Positive Team Norms.** Learning teams will be successful only to the extent that individual members prepare for and attend class. We have learned, however, that when we provide students with ongoing feedback on attendance and individual test scores, the link between preclass preparation and class attendance team performance is so obvious that we can count on norms promoting preclass preparation and attendance pretty much developing on their own. One simple yet effective way to provide such feedback to students is the use of team folders. The folders should contain an ongoing record of each member's attendance, along with the individual and team scores on tests and other assignments (Michaelsen, Knight, and Fink, 2004). The act of recording the scores and attendance data in the team folders is particularly helpful because it ensures that every team member knows how every other team member is doing. Furthermore, promoting public awareness of the team scores fosters norms favoring individual preparation and regular attendance because doing so invariably focuses attention on the fact that there is always a positive relationship between individual preparation and attendance and team performance.

**Benefits of Team-Based Learning.** In part because of its versatility in dealing with the problems associated with the multiple teaching venues in higher education, TBL produces a wide variety of benefits for students, educational administrators, and individual faculty members who are engaged in the instruction process.

*Benefits for Students.* In addition to ensuring that students master the basic course content, TBL enables a number of outcomes that are virtually impossible in a lecture-based course format and rarely achieved with any other small group-based instructional approach. When TBL is well implemented, students can progress considerably beyond simply acquiring factual knowledge and achieve a depth of understanding that can come only through solving a series of problems that are too complex for

even the best students to complete through their individual effort. In addition, virtually every student develops a deep and abiding appreciation of the value of teams for solving difficult and complex problems. They can gain profound insights into their strengths and weaknesses as learners and as team members.

Compared to a traditional curriculum, faculty members in a wide variety of contexts have observed that introducing TBL enables at-risk students to successfully complete and stay on track in their course work, probably because of the increased social support or peer tutoring.

*Benefits from an Administrative Perspective.* Many of the benefits for administrators are related to the social impact of the fact that the vast majority of groups develop into effective learning teams. When team-based learning is well implemented:

- Almost without exception, groups develop into effective self-managed learning teams. As a result, faculty and other professional staff time used for training facilitators and involved in team facilitation is minimal.
- TBL is cost-effective since it can be successfully employed in large classes and across academic programs.
- The kinds of assignments characteristic of TBL reduce the potential for interpersonal hostilities within teams to develop to a point where administrators must deal with the personal, political, and possibly even legal aftermath.

*Benefits for Faculty.* There is tremendous benefit to faculty who use TBL. Because of the student apathy that seems to be an increasingly common response to traditional lecture-based instruction, even the most dedicated faculty tend to burn out. By contrast, TBL prompts most students to engage in the learning process with a level of energy and enthusiasm that transforms classrooms into places of excitement that are rewarding for both them and the instructor. When team-based learning is well implemented:

- Instructors seldom have to worry about students not being in class or failing to prepare for the work that he or she has planned.
- When students are truly prepared for class, interacting with them is much more like working with colleagues than with the empty vessels who tend to show up in lecture-based courses.
- Because instructors spend much more time listening and observing than making formal presentations, they develop many more personally rewarding relationships with their students.

When the instructor adopts the view that the education process is about learning, not about teaching, instructors and students tend to become true partners in the education process.

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