The Essential Elements of Team-Based Learning

Adapted from Chapter 1 of Michaelsen, L., Sweet, M. & Parmalee, D. (2009) *Team-Based Learning: Small Group Learning's Next Big Step*. *New Directions in Teaching and Learning*, 7-27.

Team-Based Learning (TBL) probably relies on small-group interaction more heavily than any other commonly-used strategy instructional in post-secondary education (e.g. for comparative discussion of different approaches, see Fink, 2002, 2004, Johnson, Johnson & Smith, 2007; Millis & Cottell, 1998, Michaelsen, Peterson & Sweet, 2009). This conclusion is based on three facts. First, with TBL, group work is central to both exposing students to and enhancing their ability to apply the 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 specifically designed and sequenced to both improve learning and promote the development of self-managed learning teams.

This chapter begins with a very brief overview of TBL to ground readers in the basics so they can most benefit from the detailed discussions that follow. Next we discuss the four essential elements of TBL, and then walk through the steps required to implement TBL. Finally, we examine some of the benefits that students, administrators and faculty can expect from a successful implementation of TBL.

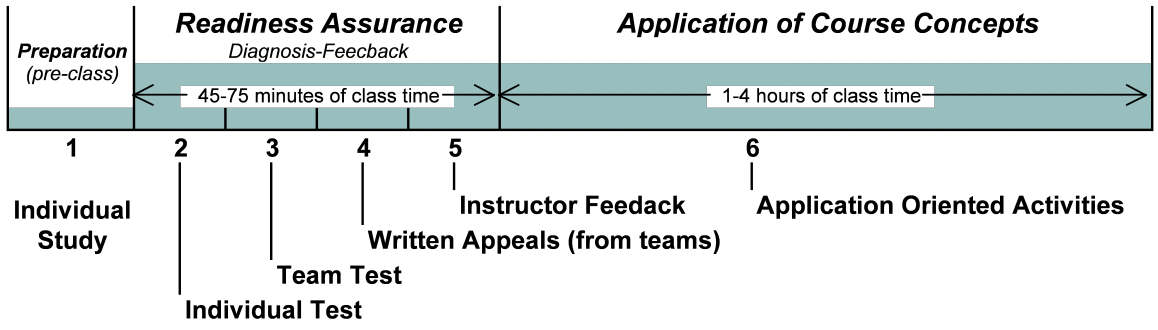
A Broad Overview of TBL

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 (e.g., Krathwohl, 2002) and, although some time in the TBL classroom 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 at some point in the future. Figure 1 outlines generally how time in one unit of a TBL course is organized.

Figure 1

Team-Based Learning Instructional Activity Sequence

(Repeated for each major instructional unit, I.e., 5-7 per course)



In a TBL course, students are strategically organized into permanent groups (for the entire term) and the course content is organized into major units (typically 5-7). 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 (over the key ideas from

the readings) which students first complete as individuals, then they take the exact same test again as a team, coming to consensus on team answers. Students receive immediate feedback on the team test and they then have the opportunity write evidence-based appeals if they feel they can make valid arguments for their answer to questions, which 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 actually use those concepts to solve problems is no small task. Making this shift requires changes in the roles of both instructors and students. The instructor's primary role shifts from dispensing information to designing and managing the overall instructional process and the student's 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 team work. Changes of this magnitude do not happen automatically and, based on past experience, may even seem to be dreams rather than achievable realities. They are, however, highly reliable outcomes when the four essential elements of TBL are successfully implemented. These essential elements are:

- **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, and
- **Assignment Design -** group assignments must promote both learning *and* team development.

When these four essential elements are implemented in a course, the stage is set for student groups to evolve into cohesive learning teams. This section briefly explores each of these elements.

Essential Element 1 – Groups must be properly formed and managed. TBL requires that the instructor oversee the formation of the groups so that he or she can manage three important variables. One is ensuring that the groups have adequate resources to draw from in completing their assignments and approximately the same level of those resources across groups. The second is avoiding membership coalitions are likely to interfere with the development of group cohesiveness. The third is 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 also be as diverse as possible. Each group should contain a mix of student characteristics which might make the course easier or more difficult for a student to do well in the course (e.g. previous course work and/or course-related practical experience) as well as demographic characteristics like gender, ethnicity, and so on. 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 (e.g., Brobeck, et al., 2002) and educational research (e.g., Chan, Burtis & 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 asset when members have worked together over time and under conditions that promote group cohesiveness (Watson, Kumar & 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 (e.g. boyfriend/girlfriend, fraternity brothers, etc.) 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 all term. Because it is human nature to seek out similar others, allowing students free reign in forming their own groups practically ensures the existence of potentially disruptive subgroups (Fiechtner & Davis, 1985; Michaelsen & Black, 1994).

Time—a key factor in team development. Any group dynamics textbook will tell you that groups need time to develop into high-performing teams, regardless of whether you favor sequential/life-cycle models (e.g., Tuckman, 1965, Tuckman & Jensen, 1977), cyclic models (e.g., Worchel, 1994), equilibrium models (e.g., Gersick & Hackman, 1990), or adaptive/non-sequential models (e.g., 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.

Essential Element 2 – Students must be accountable for their individual *and* group work. In lecture classes, there is no real 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. Further, teams must also 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 & Tetlock, 1999).

Accountability for individual pre-class 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 the task was designed to stimulate. *No amount of discussion can overcome absolute ignorance.* Furthermore, lack of preparation also hinders the cohesiveness development 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 individual students be made accountable for class preparation.

Much to the surprise and delight of many TBL users, students frequently internalize the importance of individual member preparation to the point that they voluntarily come to class early to coach each other for the RATs. Further, in contrast to traditional courses in which to brightest students are often reluctant to share their knowledge, it is not uncommon for pre-RAT study sessions to include both high scoring students along with team members who might otherwise struggle with the pre-class readings (e.g., non-native English speakers, non-traditional students, etc.—see Goodson, 2004)

Accountability for contributing to their 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 team work, reliable class attendance, attendance at team meetings that may have occurred outside of class, positive contributions to team discussions, valuing and encouraging input from fellow team members, and so on. Peer assessment is

essential because team members are typically the only ones who have enough information to accurately evaluate one another's contributions.

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. Practical suggestions for how to achieve both of these outcomes below will be discussed below.

Essential Element 3 – Students must receive frequent *and* immediate 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 (e.g., Bruning, Schraw & Ronning, 1994; Kulik & Kulik, 1998; Hattie & Timperlie, 2007). Second, immediate feedback has tremendous impact on group development (for a review, see Birmingham & McCord, 2002, 2004).

Essential Element 4 – Team assignments must 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 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, most students chose 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 of they typically impact intra-team discussions in two different ways. First, discussions are likely to be much shorter because students are likely to feel and urgency to get going on the "real" work—creating 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 products outputs such as a lengthy document seldom contribute to team development because they are likely to have created by individual members working alone on their part of the overall project.

Conclusion – Part I. By adhering to the four essential elements of TBL—careful design of one's 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 pre-existing relationships between a subset of team members. Holding students accountable for preparation and attendance motivates team members to behave in pro-social 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 each 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 redesign process

involves making decisions about and/or designing activities at four different points in time. These are: 1) before class begins, 2) the first day of class, 3) each major unit of instruction and, 4) near the end of the course. In this section, we discuss the practical steps a TBL instructor takes at each of these points in time, but for a treatment that is even more detailed and practical, the interested reader is directed to Michaelsen, et. al, (2004), Michaelsen and Sweet (2008) and Sweet & Michaelsen (2012).

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 the don't put to use until a final project that is due just prior to final exams.

TBL, however, uses a fundamentally different knowledge-acquisition/knowledge-application model. With TBL students repeat the knowledge-acquisition/knowledge-application cycle several times *within each individual course*. With TBL, students individually study the course content, discuss it with their peers and the instructor (see the Readiness Assurance Process below) 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 those objectives.

Identifying instructional objectives: The process of "backward design." 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, TBL courses are planned around what you want students to be able to *do* when they have finished your course, and only then do you think about what they need to know. Wiggins and McTighe (1998) coined the term "backward design" to describe this method of course design, and it is the method which enables the instructor to build a course which 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 only taught with conceptual familiarization as your goal, it can be surprisingly difficult to identify what exactly you want students to be able to *do* upon completion of a given course, but the following question is a good a good place to start.

What are the students who really "get it" <u>doing</u> which 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 them do something that makes you think "Hey! They *really* got from my class what I *wanted* them to get—*there's the evidence right there!*" When designing a course "backward," the question you ask yourself is: *What, specifically, is <u>that</u> evidence?* What could a former-student be doing in a moment like that to make it obvious they really internalized what you were trying to teach them and are putting it to use in a meaningful way?

For every course there are several answers to this question and these different answers will correspond to the "macro" units of the re-designed 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 they really learned what you wanted them to learn. For now, don't think about the classroom; just imagine they are doing something in a real organizational context. Also, don't 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 they are doing, what *decisions* they are 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 your 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 upon which you can base your students' grades.

Once you have brainstormed your "Aha! They get it!" scenarios and the details that accompany them, now let's step into the classroom. Those half-dozen or so scenarios are what you want your students to be able to *do* when they are done with your class. These are your instructional objectives and they 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 text book, the contents of your course-packet, experiential exercises, and are likely to prompt you to provide supplementary materials of your own creation or simply reading guides to help students focus on what you consider most important in the readings or lab findings. In addition, it 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 especially requiring students to learn by *doing* (e.g. see Miller, 1991 and Michaelsen & McCord, 2006) are coming much closer to approaching 'real'), but you can provide enough relevant information about those settings to design activities which require your students to face the same kinds of problems and make the same kinds of decisions they will make in the 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 determining an instructional objective, it is crucial to know how you are going 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 yes, you absolutely *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 re-designing the course is to ensure that the grading system is designed to reward the right things. An effective grading system for TBL must: 1) provide incentives for individual contributions and effective work by the teams, as well as 2) 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 the above concerns are alleviated by a grading system in which a significant proportion of the grade is based on: 1) individual performance, 2) team performance, and 3) each members' contributions to the success of their 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. (Assigning relative weight is addressed in the next section.)

The first hours of class: getting started on the right foot. 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. The first objective is ensuring that students understand *why* you (the instructor) have decided to use TBL and what that means about the way the class will be conducted. The second objective is to actually form the groups. The third and fourth objectives are alleviating students' concerns about the grading system and setting up mechanisms to encourage the development of positive group norms.

Introducing students to TBL. Because the roles of both the instructor and the students are so fundamentally different from traditional instructional practice, it is absolutely critical that students understand both the rationale for using TBL and what that means about the way the class will be conducted. Educating the students about TBL requires (at a minimum) providing students 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 by the instructor and *demonstrated* by one or more activities.

In order to foster students' understanding of TBL, we recommend two activities. The first involves explaining the basic features of TBL using overhead transparencies (or a Power Point presentation) and clearly spelling out how our 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 which, with class periods of less than an hour, might occur on day 2, involves using part of the first class as a demonstration of a Readiness Assurance Process (see below) using either the course syllabus, a short reading on TBL and/or about some potentially useful ideas such as what helps and hinders team development or strategies for giving helpful feedback (see Michaelsen & Schultheiss, 1988) as the "content" material to be covered.

Forming the groups. As discussed above, when forming groups, one must consider the course-relevant characteristics of the students and the potential for the emergence of sub-groups. 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 *this* class. For a particular course, characteristics that could make it easier for a student to succeed might include such things as previous relevant course work or practical experience, access to perspectives from other cultures, etc. Most commonly, student characteristics making it more difficult for them 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 actually 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 graphic depiction of how to form groups quickly and effectively, see Sweet, 2008 and for a more detailed explanation and video demonstration see 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 group at risk.

Many choose to alleviate student concerns about grades by directly involving students in "customizing" the grading system to *this* class. Students become involved by participating in an exercise called "Setting Grade Weights" (Michaelsen, Cragin & Watson, 1981—see Appendix B of Michaelsen, et. al, 2004). Within limits set by the instructor, representatives of the newly-formed teams negotiate with one another to reach consensus (i.e., all of the representatives must agree) on a mutually acceptable set of weights for each of the grade components: individual performance, team performance, and member's contributions to the success of their teams. 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.

Ensuring content coverage: The Readiness Assurance Process. As described in the introduction of this chapter, each unit of a TBL course begins with a Readiness Assurance Process (RAP), occurring at least 5-7 times per term. The RAP provides the foundation for individual and team accountability and has five major components: 1) assigned readings, 2) individual tests, 3) group tests, 4) an appeals process, and 5) instructor feedback. The following paragraphs provide a detailed treatment of each of the RAP components

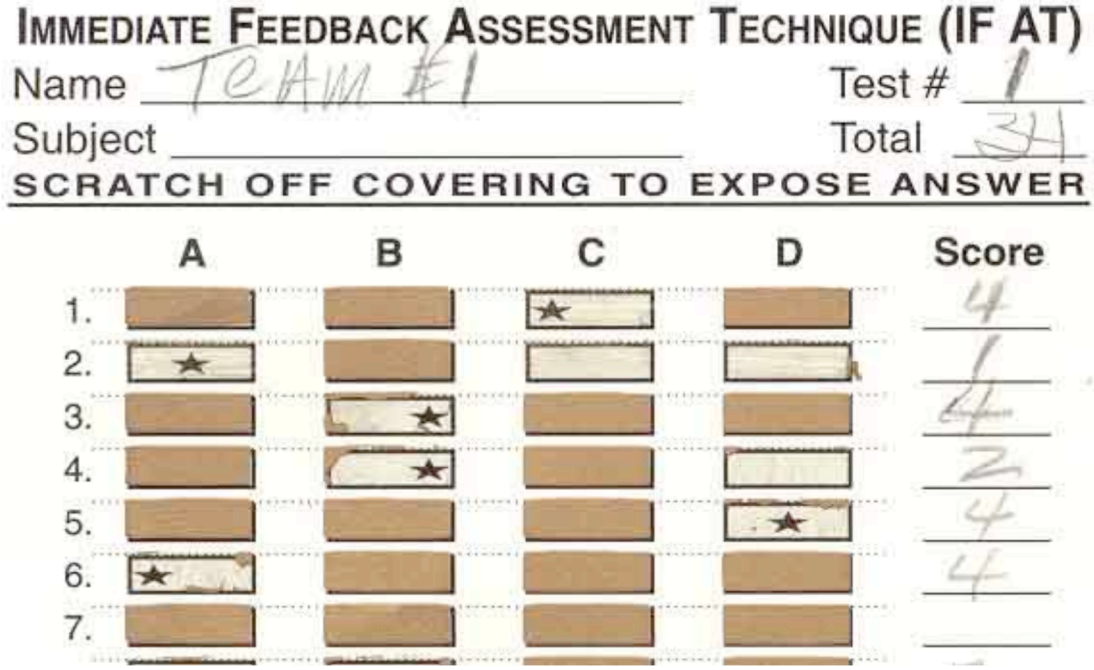
Assigned readings. Prior to the beginning of each major instructional unit, students are given reading and other assignments that should contain information on the concepts and ideas that must be understood to be able to solve the problem you identified for this unit in the backward design activity (see above). Students are to 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 pre-class assignments. The iRATs typically consist of multiple-choice questions that, in combination, enable the instructor to assess whether or not students have a sound understanding of the *key* concepts from the readings. As a result, the iRAT questions should focus on foundational concepts (and avoid picky details) but, be difficult enough to create discussion within the teams.

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 the third phase, students re-take the *same test*, but this time the teams must reach agreement on the answers to each test question and immediately check the correctness of their decision using an IF-AT® self-scoring answer sheet (see Figure 2) that provides real-time 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 do find the mark, but their score is reduced with each unsuccessful scratch. This allows teams to receive partial credit for proximate knowledge.

Figure 2



The IF-AT® 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). Further, using the IF-AT® answer sheets makes it possible to provide real-time content feedback to multiple (in fact many) without requiring them to maintain the same work pace.

Getting real-time feedback from the IF-AT® provides two key benefits to the teams.

- Real-time feedback enables members to correct their misconceptions of the subject matter. Finding a star immediately confirms the validity of their choice, but finding a blank box lets them know they have more work to do.
- Real-time feedback 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 my judgment, using the IF-ATs with the tRATs is the single most effective tool one can use to promote both concept understanding and cohesiveness in learning teams and anyone who doesn't use them will miss a sure-fire way to increase their ability to successfully implement TBL.

Appeals. At this point in the Readiness Assurance Process, students proceed to the fourth phase. This phase gives students the opportunity to refer to their assigned reading material and

appeal any questions that were missed on the group test. That is, students are allowed to do a focused re-study of the assigned readings (this phase is "open-book") to "challenge" the teacher about their responses on specific items on the group test or about confusion created by either the quality of the questions or inadequacies of the pre-class 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 on the group test. 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 involves 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 pre-class reading assignment.

The Readiness Assurance Process in Summary. The Readiness Assurance Process allows instructors to minimize class time often used to cover material that students can learn on their own. Time is saved because the instructor's input occurs *after* students have: 1) individually studied the material, 2) taken an individual test focused on key concepts from the reading assignment, 3) re-taken the same test as a member of a learning team, and 4) 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 he or she 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 teachers report being able to cover more with the Readiness Assurance Process than they can through lectures (e.g. Knight, 2002, 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 pre-class 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 even continues to build during the final stage of the process, i.e., when the instructor is presenting information. This is because, unlike lectures, the content of the instructor's comments is determined by students' choices/actions during the Readiness Tests. Thus, the instructor's comments provide either positive reinforcement (thus, they celebrate together) or corrective instruction (thus, particularly in the presence of other groups, is an external threat).

Even though 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 pre-class preparation and a lively discussion, the RAP builds the intellectual competence of team members. Second, because they have immediate performance feedback, the experience of working together during tRAT and in preparing appeals enhances 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: Group application assignments. 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 some sort of a problem. These application assignments must both foster accountability and foster give-and-take discussion first within and then between groups, and 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." These are: 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 3). Further, 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 3

Four Keys for Creating Effective Group Assignments

Individual Work	x	Within Teams	x	Between Teams	=	Impact on Learning

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

- **Significant Problem.** Individuals/groups should work on a problem that is significant to students.
- **Same Problem.** Individuals/groups should work on the same problem, case or question.
- **Specific Choice.** Individuals/groups should be required to use course concepts to make a specific choice.
- **Simultaneous Report.** Whenever possible individuals and groups should report their choices simultaneously.

Key #1—*Significant* [to students] 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 "busy work" 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 "backwards design." If you identify something you really want students to be able to *do* and give them the chance to try, it is very 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.

Key #2—*Same* problem. Group assignments are only effective 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 engage in a "comparison of apples and oranges" and students will not be exposed to feedback on the quality of their thinking either as individuals or as teams. In order to facilitate a conceptually rich and energetic exchange, students must have a common frame of reference that is only possible when they are working on the same problem, i.e., the same assignment/learning activity.

Key #3—*Specific* choice. As previously discussed, cognitive research shows that learning is greatly enhanced when students are required to engage in higher-level thinking (e.g., Mayer, 2002; Pintrich, 2002; Scandura, 1983). In order to challenge students to process information at higher levels of cognitive complexity, "lead them into situations which they can only escape 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 100% 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* such as:

- Which line on this tax form would pose 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's 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 "make-a-specific-choice" assignments and a rationale as to why they work so well in promoting both student learning and team development, see Chapter 3 of Michaelsen, et al. 2004, Michaelsen & Sweet 2008, Sweet & Michaelsen, 2012).

Key #4—Simultaneous reports. Once groups have made their choices, they can share the result of their thinking with the rest of the class in one of two ways: 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," (Sweet, Michaelsen & Wright, in press) limits both learning and team development for a variety of reasons. One is that it is most likely to occur in when the problems being discussed have the greatest potential for producing a meaningful discussion. That is because the more difficult and/or ambiguous the problem, the greater the likelihood that: 1) the initial response would be incomplete or even incorrect, and 2) 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 is forced to open the discussion.

On the other hand, requiring groups to simultaneously reveal their answers virtually eliminates the main problems that result from sequential reporting. For example in a tax accounting course (see-Key #3 above, teams' choices on an assignment requiring teams choose a specific line on a tax form that would pose 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, Michaelsen and Wright, in press). Requiring a simultaneous public commitment to a specific choice increases both learning and team development because each team is: 1) accountable for their choice, 2) motivated to defend their position, 3) the more difficult the problem, the greater the potential for disagreements that are likely to prompt give-and-take discussion and, 4) the teams become more cohesive as they pull together in an attempt to defend their position.

Near the end of the term. 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 using specific kinds of activities near the end of the term. These are activities that cause students to reflect on their experience during the semester. Their reflecting is focused on several different areas. In most cases, these end-of-the-semester activities are aimed at reminding students of what they have learned about: 1) course concepts, 2) the value of teams in tackling intellectual challenges, 3) the kinds of interaction that promotes effective team work and, 4) themselves.

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 normal courses. As a result, some students are somewhat uneasy—even if they are aware that the scores from TBL sections on "common" mid-term 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 don't 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 RATs, 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 RATs 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 (e.g. see Michaelsen et. al., 2004, p.163). Most students are literally stunned when they see the pattern of scores for the entire class. In the past 20 years, *over 99.9+% of the nearly 1,600 teams in our classes have outperformed their own <u>best</u> member by an average of nearly 11%.* 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 (e.g., see Michaelsen, Watson & 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 & 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 different 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: 1) reflect on how the interactions among team members have changed over time and formulate a list of "members' actions that made a difference," 2) share their lists with team members, and 3) create a written analysis that summarizes the barriers to their team's effectiveness and what was done to overcoming them. The other, and more effective approach, involves the same assignment but, having 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, two important things happen. One is that members really get to know each others' 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 them. The other is that, 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 ___ for additional info).

Encouraging the development of positive team norms. Learning teams will only be successful to the extent that individual members prepare for and actually attend class. We have learned, however, that when we provide students with ongoing feedback on attendance an individual RAT scores, the link between pre-class preparation and class attendance team performance is so obvious that we can count on norms promoting pre-class preparation and attendance pretty much developing on their own. One very simple, yet effective, way to provide such feedback to the students is through 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 the RATs and other assignments (see Appendix D-B1.1 in Michaelsen et. al., 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. Further, promoting a public awareness of the team scores further 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 management education, TBL produces a wide variety of benefits for students, for management education administrators, and for 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. With Team-Based Learning:

1. Most students progress well beyond simply acquiring factual knowledge and achieve a depth of understanding that can only come through solving a *series* of problems that are too

complex for even the best students to complete through their individual effort. Virtually every student develops a deep and abiding appreciation of the value of teams for solving difficult and complex and real-world problems.

2. Many students gain profound insights into their strengths and weaknesses as learners and as team members.
3. Compared to a traditional curriculum, faculty members in a wide variety of contexts have observed that introducing TBL enables the "at risk" students (probably because of the increased social support and/or peer tutoring) to successfully complete and stay on track in their course work.

Benefits from an administrative perspective. Many of the benefits for administrators are related to the social impact of the fact that the vast majority groups develop into effective learning teams. With team-based learning:

1. Almost without exception, the groups develop into effective *self-managed* learning teams. As a result, the faculty and/or professional staff time used for training facilitators and involved in team facilitation is minimal.
2. TBL is highly const-effective since it can be successfully employed in large classes and across the entire spectrum of management courses.
3. Using the kinds of assignments that are characteristic of TBL, virtually eliminates administrators' frustrations in dealing with the aftermath (and even legal implications) that often occur when interpersonal hostilities develop to the point that groups are incapable of doing effective work.

Benefits for faculty. There is tremendous benefit to the faculty who use TBL. Because of the student apathy that seems to be an increasingly common response to the 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 a place of excitement that is rewarding for both them and the instructor. With team-based learning:

1) Instructors seldom have to worry about students not being in class or failing to prepare for the work that he or she has planned.
2) When students are truly prepared for class, interacting with them is much more like working with colleagues than with the "empty vessels" that tend to show up in lecture–based courses.
3) 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, "it's about learning *not* about teaching" view of the education process that is a normal outcome of the "backward-design" aspect of TBL, instructors and students tend to become true partners in the education process.

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Why TBL Works

Teams focus on making decisions

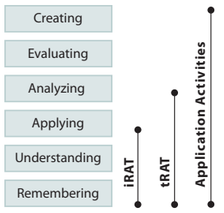
Having TBL assignments based on discussion and decision-making, and not building lengthy product prevents many of the undesirable group behaviors common in "divide and conquer" product based assignments. Many traditional group assignments are actually individual assignments, with little reason for student interaction, except at final product compilation.

Teams problem-solving improves

Teams quickly switch from voting/compromise to real problem solving as they get to know and trust each other. Birmingham and Michaelsen (1999) found that two thirds of teams (n = 192 teams) started by using voting and compromise to avoid decision-making conflict early in team development and that NO teams used voting or compromise after only 5 test together. Focus changed from "who is right" to "what is right"

Activities progress through Bloom's levels

Since the primary course goal in TBL shifts from conveying course content to helping the students learn how to apply course concepts to solving relevant, interesting and significant problems, the TBL instructional sequence naturally progresses to higher Bloom's levels as individuals progress through the modules.



The initial acquisition of content and important foundational knowledge occurs during the Readiness Assurance Process which has the students progress through **Remembering**, **Understanding** and into the simple **Applying** level of Bloom's taxonomy. The Application Activities can take students through the higher Bloom's levels of **Analyzing**, **Evaluating** and **Creating**. The whole class discussions following the simultaneous report in the Application Activities give the students the opportunity to articulate and examine their own thinking, to explore a variety of different perspectives, and finally arrive at a socially verified version of the "truth" or optimal solution.

Teams outperform best member

By reviewing student performance part way through the semester you can send a powerful message about the effectiveness of team work.

> In the Past 20 years, over 99.95% of the teams have outperformed their best member by an average of nearly 14%.
>
> In fact, the worst team typically outperforms the best student in the class!
>
> Michaelsen et al, 1989

Attention focuses on harder concepts

As students progress through the Readiness Assurance Process, there is a natural shift in instructional focus to the harder, more difficult concepts. This shift is caused by the underlying structures in the Readiness Assurance Process.
The differential attention on more difficult concepts begins in the Team Readiness Assurance Test. During the tRAT, the teams will often vote on questions, accepting consensus when it exists and quickly moving on. On more difficult questions, where there is no simple consensus, they will discuss for a longer period of time. The length of the discussion is affected by the overall difficulty of the question and the underlying concepts. Each time the team scratches off the IF-AT card and does not find the correct answer, they return to the question for further discussion. Following the tRAT, the teams are encouraged to appeal incorrect answers. This pushes the teams into further discussions and back into the reading material, exactly where they are having the most difficulty. Once the Appeals Process is complete, the instructor can provide a targeted mini-lecture on the most troublesome concepts.

	Easy Concepts	Hard Concepts
Readings	✓	✓
Individual Readiness Assurance Test	✓	✓
Team Readiness Assurance Test	✓	✓
Appeals Process Research & Intra-team discussion		✓
Appeals Process Written Justification		✓
Mini-lecture Instructor Clarification		✓

Works in large class settings

TBL was originally developed by Larry Michaelsen, at the University of Oklahoma Business School when his classes went from 40 to 120. He was unwilling to give up the effective outcomes that were possible in the smaller class using Socratic discussion. When he first tried TBL, he was surprised at how effective it was. TBL is now routinely used in large classes (up to 400, but more typically 120-150 Students with a single facilitator) and is even possible in difficult classroom spaces (i.e. tiered lecture theatres). Bottom line is - give students something compelling enough to work on and they will ignore the limitations of the room.

Can Large Classes Be an Asset?

What was the impact of the large class size on what you gained from taking this course?

Helped more than it hurt	49%
Helped and hurt	18%
Neutral	24%
Hurt more than it helped	7%
Hurt a great deal	2%

Michaelsen, Knight, Fink, 2002

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What is TBL?

Team-Based Learning – *A special form of collaborative learning using a specific sequence of individual work, group work and immediate feedback to create a motivational framework in which students increasingly hold each other accountable for coming to class prepared and contributing to discussion.*

Michael Sweet

Paradigm Shifts

- Course goal shifts from knowing to applying
- Teacher shifts from "sage on stage" to "guide at side"
- Students shift from passive to active
- Responsibility for learning shifts from instructor to student

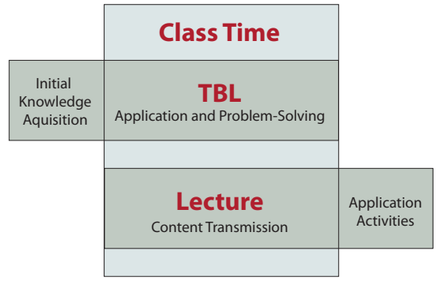
TBL dramatically shifts the focus of classroom time from conveying course concepts by the instructor to the **application of course concepts** by student teams.
In the TBL process, students acquire their initial exposure to the content through readings and are held accountable for their preparation using a Readiness Assurance Process (RAP). Following the RAP, the bulk of class time is used to practice applying content in a series of team application exercises. The components of TBL are very adaptable to many situations, disciplines and classroom types.

Four Key TBL Design Principles

- **Large teams** are required (5-7); teams should be diverse and permanent.
- **Accountability** for student pre-class preparation and contributing to team success
- **Students make complex decisions** that require the use of the course concepts that can be reported in simple form
- **Frequent and timely feedback** must be given to students.

Instructional focus shifts to learning how to use course concepts

TBL shifts the bulk of content acquisition out of the classroom and gives students the responsibility for gaining the initial understanding of course concepts through the Readiness Assurance Process.
With TBL, students spend the bulk of class time in the application of course concepts to problem-solving. This is in contrast to the traditional lecture model, where the bulk of classroom time is spent conveying course content and team application assignments are most often completed outside of the classroom.
By shifting application activities into the classroom, the students can better use the expertise of the instructor and get more immediate feedback on their decisions and thinking process.



In a traditional course when a student team completes an application assignment, the instructor often only gets to view the final product and therefore has limited opportunity to provide students with timely feedback as their application assignment progresses. By contrast, since TBL application activities occur in the classroom, there are opportunities for rich and detailed feedback from both peers and the instructor.

Typical TBL Module

How TBL Works

Getting Your Students Ready

The Readiness Assurance Process (RAP) occurs at the beginning of each major instructional unit. The RAP ensures that students are held accountable for completing the pre-class reading and have acquired the foundational knowledge that they will need for the in-class team work that follows.

At the first class meeting of a module, a multiple-choice test (15-20 questions) is given. It covers key concepts and important foundational knowledge from the readings. The test is first taken individually and then immediately re-taken as a team test using the IF-AT (Immediate Feedback Assessment Technique) "scratch and win" testing cards. At the completion of the team test, teams are encouraged to "appeal" incorrect answers for extra marks. The appeals process requires teams to look up the "right" answer and complete a written form that is only considered after the class meeting. The appeals process pushes students back into the readings right where they are having the most difficulty. Following the appeals process the instructor provides a short clarification in the form of a mini-lecture. The focus of this clarification is often informed by the item analysis from the individual tests (if tests are scanned in real-time in the classroom).

Readiness Assurance

1 Pre-Readings

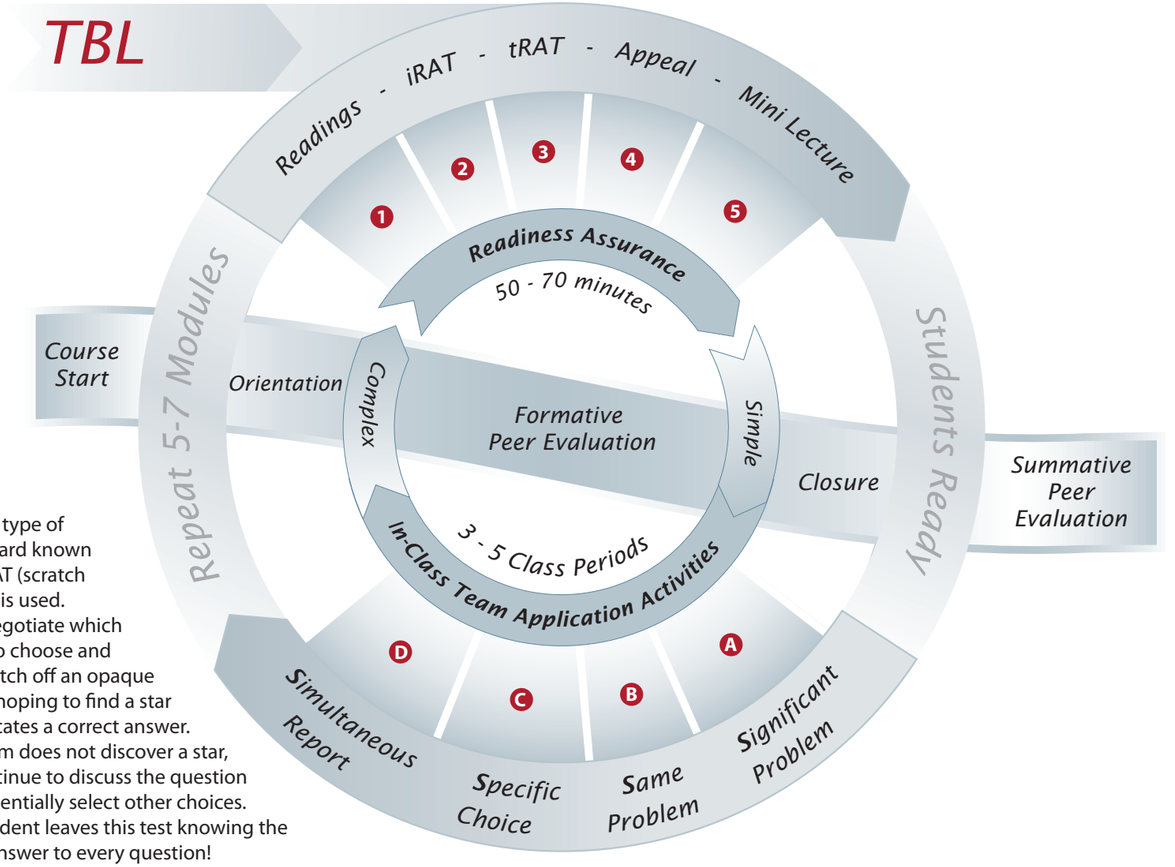
Readings typically consist of 30-50 pages (textbooks, monographs, reports and papers). It can be worthwhile to provide a reading guide if the students are new to reading the literature of the discipline. "Less is More" with readings. Students tend to do no reading at all when page counts get too high. They seemingly devote a fixed length of time to reading, no matter the length or complexity of the readings, so use their attention wisely.

2 Individual Readiness Assurance

The Individual Readiness Assurance Process Test (iRAT) typically consists of 15-20 multiple-choice questions. The iRAT holds students accountable for acquiring important foundational knowledge from the readings that will ready them to begin problem-solving in subsequent class sessions. The questions are typically written at Bloom's levels: remembering, understanding and simple applying. The test is normally administered using scantron, but a scanner is not required.

3 Team Readiness Assurance

The Team Readiness Assurance Process Test (tRAT) is completed in teams using the same test as the iRAT.



A special type of scoring card known as an IF-AT (scratch and win) is used. Teams negotiate which answer to choose and then scratch off an opaque coating, hoping to find a star that indicates a correct answer. If the team does not discover a star, they continue to discuss the question and sequentially select other choices. Every student leaves this test knowing the correct answer to every question!

4 Appeals

During the closing of the team test, the instructor circulates around the room and encourages teams to appeal questions they got incorrect. This forces students back into the reading material exactly where they are having difficulty. The team then researches the "right" answer and may choose to complete the appeals form with their rationale and defense for their answer. The instructor collects these forms and considers them after class.

5 Mini-lecture

To conclude the Readiness Assurance Process, the instructor reviews the item analysis from the individual tests and focuses a short mini-lecture on the concepts that are most problematic for the students. In the words of Bob Philpot at South University, "TBL helps me understand the 10-15% of the course material, I really need to talk to the students about."

Following the Readiness Assurance Process, the bulk of class time is spent with students working in teams applying course concepts and solving problems.

In-Class Activities (4 S's)

- **Significant Problems**. Teams work on a relevant, significant problem.
- **Same Problem**. Teams work on the same problem.
- **Specific Choice**. Teams required to make a specific choice.
- **Simultaneous Report**. Teams report simultaneously.

In the TBL classroom, the bulk of class time is spent having student teams solve and discuss relevant, significant problems. Structuring the problems around the TBL 4S's lets you leverage the power of team processing without many of the problems (like social loafing) that are inherent in other forms of small-group work learning. The structure of the TBL activities gives individuals, teams and the whole class many opportunities to reflect and get feedback on the specifics of their thinking and their process for arriving at their answer. The activity reporting allows students to engage with a diverse set of perspectives and approaches to problem-solving.

A Significant Problem

Select a Significant Problem

For a successful application activity, it is best to select a significant, relevant problem that captures the interest of students. The quality of the problem ultimately is the most powerful factor in influencing the effectiveness of an application activity. Problems should require students to use course concepts to solve them. Backwards Design can be used here to: first decide on the problem, and then trace things back to the course concepts that the students would need to solve the problem. By understanding the course concepts at play, you can then select appropriate readings and construct appropriate Readiness Assurance Tests.

B Same Problem

Teams are given the Same Problem

Giving the same problem to all teams lets you create reporting opportunities for teams to defend, challenge, discuss, and examine each other's thinking and problem-solving process. Having the teams work on the same problem ensures the comparability of student decisions and acts as a potent discussion starter. The sequential report, where teams work on different problems, is often a very low energy event, where other students have little motivation to examine the thinking and decisions presented.

C Specific Choice

Each team must make a Specific Choice

Open-ended questions have long been the hallmark of our efforts to foster critical thinking in our students, but complex, open-ended question might be too challenging for the novice learner. The most significant drawback in using open-ended questions is the difficulty in efficiently letting students report their answers and the difficulty in comparing their answers with their peers. This opportunity for comparability of decisions is one of the major strengths of the TBL reporting process.

D Simultaneous Report

Teams Simultaneously Report their decision

Simultaneous reporting can be accomplished with the simple holding up of a card indicating a particular choice. When a particular team sees that another team has made a different decision, they naturally want to challenge the other teams' decision. In the ensuing conversation, the teams challenge each other and defend their own thinking. The reporting requires teams to articulate their thinking to other teams – putting their thoughts into words. This helps cognitively with the process of creating enduring, deep understanding. The feedback from their peers is very immediate and focused on "how did you arrive at your decision" and not "which is the right answer."