A Simple Introduction to Team-Based Learning

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ABOUT THIS WHITE PAPER

Collaborative and other forms of learning that require students to work together in groups to complete assignments or projects are often used by faculty to enhance student learning. Team-Based Learning (TBL), first developed in the late 1970's by Larry Michaelsen at the University of Oklahoma, has attributes that make it unique among active teaching and learning strategies. TBL allows faculty to 'flip' the classroom using a proven, research based, learning sequence premised upon four essential elements.

In this white paper, instructors will learn how to:

- introduce flipped, team-based learning into their classrooms
- form and manage effective team-based learning teams
- design a team-based application activity
- assign preparatory work for team-based learning
- use peer-evaluation to rate the effectiveness of the teams.

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Introduction: What Is Team-Based Learning (TBL)?

TBL is a systematic flipped approach to teaching and learning that employs well-researched and documented teaching strategies. It provides for active learning based on the strengths of student collaboration and accountability.

TBL was developed in the late 1970's by Dr. Larry Michaelsen at the University of Oklahoma. It is the original flipped classroom approach to teaching and learning.

What are the benefits of TBL?

With TBL, students…

- become active learners rather than passive recipients of information
- work and learn with peers
- apply concepts collaboratively
- receive immediate feedback
- receive peer evaluation

For teachers, TBL…

- provides a plan for 'flipping' the classroom
- holds students accountable for preparation
- increases students' ability to solve complex problems
- encourages lively, engaging class dialogue – Socratic learning
- facilitates learning vs. transmission of information
- includes student evaluation of peers

Team-Based Learning differs from other approaches to cooperative/collaborative learning. An advantage of using TBL over other means or methods of flipping your classroom is that TBL not only provides the framework to ensure that students prepare for class but allows faculty a means to assess this preparation and a means through which the instructor can 'see' what the students are able to do as a result of this preparation.

It is important to orient students to the process. TBL faculty often incorporate a mini-TBL module over the course syllabus during the first week of class.

This exposes students to the process of TBL: advanced preparation > iRAT > tRAT > appeals > application exercise.

The TBL collaborative website (http://www.teambasedlearning.org/) provides orientation videos and other recommendations that can help you help students to understand TBL.

It is important to emphasize to students your rationale for why you are using TBL. In order for your students to experience the learning that occurs when TBL is "done right", all elements of TBL need to be included.

① Getting Started with Team-Based Learning

There are four essential elements to team-based learning, each of them equally important:

- First, teams must be properly formed and managed (see Appendix A).
- Second, you need to include a readiness assurance process. As with any flipped classroom protocol, you need to have a way of insuring that students are ready for class.
- Third, you need to include application of content information. This is the point at which we are able to see whether or not our students are able to take the information they have learned and apply it to scenarios and to problem solving in a team setting.
- The fourth and last essential element is student accountability. There are multiple points throughout the Team-Based Learning process where student accountability becomes evident.

Element 1: Team formation and management

The first of the essential elements is the proper formation and management of teams. In doing this, you will ensure that groups of students will become teams that can collaborate to solve problems. Groups are different than teams. Groups are just accumulations of people--teams have a goal and a purpose. So we need to ensure that the groups of students will become teams, and that they will have as equitable distribution of resources as possible.

A complete discussion about how to form successful teams for team-Based Learning will be found in Chapter Two of this report and in Appendix A.

Element 2: Readiness assurance process.

The second of the essential elements of Team-Based Learning is the readiness assurance process.

The readiness assurance process ensures that the students have prepared to share and apply the content information they gained from the pre-assignment. They bring to class the information from the readings, videos, or worksheets that they have been assigned, to share and help solve the application problems.

There are four parts to the readiness assurance process:

1. the pre-assignment
2. an Individual Readiness Assessment Test
3. a Team Readiness Assessment Test
4. team appeals

The *pre-assignment* is student homework outside of the class. It is the only part of Team-Based Learning where students are expected to complete work before they come to class, or outside of the classroom environment. The purpose for this is to ensure that students have the foundational content information necessary to address the application problem. The pre-assignment can be targeted textbook readings.

I recommend targeted textbook readings rather than whole chapters, simply because students are overwhelmed if you tell them they need to read 100 pages for a test in a week. It's better if you specify particular topics or page numbers.

In my anatomy and physiology classes, I know that the students do not need to know every word in every chapter, so I will go through and assign particular sections that will provide the foundational knowledge needed to solve problems. It may be videos or PowerPoint presentations that you have made, or that are available online. It might be completion of a worksheet where the student is expected to go out and find some information on their own. There are many other possibilities for a pre-assignment. It may be textbook readings, an interview, or library research.

The students then come to class and take the *Individual Readiness Assessment* Test, or the IRAT. This consists of 5- 20 short multiple-choice questions that are based on the pre-assigned readings or work. The IRAT is designed to consider major concepts at a lower level of the learning taxonomy (you want your students to *recall* and *define*), but it should be challenging. The questions that are asked, the formulation of the multiple-choice questions, need to be of high quality.

Students are overwhelmed if you tell them they need to read 100 pages for a test in a week.

Once the students have completed their Individual Readiness Assessment Tests, they come together in their teams to take the *Team Readiness Assessment Test*, or TRAT. It begins immediately following the IRAT, and at this point the students will be gathered in their teams for the remainder of the TBL module.

The Team Readiness Assessment Test is the very same multiple choice question test that the students took during the IRAT.

But rather than completing the Scantron bubble sheets or other reporting forms that the students used during the IRAT, we often use a very powerful immediate feedback assessment technique form developed by Epstein Enterprises that we refer to as the IF-AT Form.

This allows the students to take the test, and if they are incorrect on their first choice, they get a second choice, or a second opportunity to answer correctly. The discussion within the teams continues until the teams discover what the answer is.

This allows teams to make a decision as to the correct choice. It's kind of like a scratch and win *form* in test form. If they are incorrect they will find that there is no star when they scratch the form. The team reconvenes for further discussion and determines another choice, until they reveal a star and have learned the correct answer. By using these IF-AT Forms, individual students have already self-corrected, and have immediate feedback that is can address misconceptions or incorrect ideas.

Following the Team Readiness Assessment Test there is an appeals process. In the appeals process, teams can appeal questions they answered incorrectly on the Team Readiness Assessment Test. The appeals are only accepted from teams, not individuals, so the entire team has to be involved in presenting an appeal. The appeals form (found in Appendix _ of this white paper) requires that students discern if there was ambiguity in a question or ambiguity in the readings themselves. During the appeals process, the student teams can use a textbook or other resource to research the appeal.

Following the four-step readiness assurance process, the instructors may find that they need to provide a mini-lecture for clarification of content before moving on to the next element of TBL. This might not always be the case, but in some cases, students may still be a little fuzzy about some of the content information, and some of the answers that they came up with on the application, or on the Team Readiness Assessment Test. You need to address these misconceptions or potential misconceptions prior to the teams moving on to solving problems in the application.

ELEMENT 3: APPLICATION

The third essential element of Team-Based Learning is the *application of content information.* The application of content information is really the soul of Team-Based Learning. After all, we want our students to be able to do *something* with the information that they are learning in our class, not just to simply serve as repositories for this information. They have to be able to take it and apply it to real-world scenarios. So application of content information is the integral part of Team-Based Learning.

There are four components that must be included to make application activities work. We develop complex problems based on the framework we refer to as *the 4S Framework.*

- The first of the S's is that the problem the students are working on must be ***significant.*** That means that the answer to the problem cannot be Googled. The student should not have easy access to a solution to the problem. They must work together to solve the scenario. This will ensure that later, during discussion, each team is aware of the places that the other students have gone in their research. They're discussing the problems from the same page.
- The problem must require that teams make a ***specific choice.*** You don't want to leave open-ended questions. They must be forced to make a decision.
- So very often, we will use a similar format to multiple-choice questions in a more complex sort of way. They need to choose a ***single answer***. The answers may not be given to them. In any case they have to make a specific choice. They have to come up with a single solution.
- And finally, the teams have to report their answers at the ***same time***. This is to prevent teams from changing their minds when they see what the other teams have decided. If you have the teams answer simultaneously, or report their answer simultaneously, it leads to richer discussion and better debate within the class.

Element 4: Student accountability

The fourth essential element in Team-Based Learning is *student accountability*. There are multiple points during a Team-Based Learning class where students are accountable either to themselves, to others or to the teacher for what they are contributing. The grade that they earn on the Individual Readiness Assessment Test IRAT is their grade. They are responsible for how well they do.

Typical grades on the IRAT range from about 60 percent to 80 percent. Individual students tend not to do as well as teams.

Accountability to the team becomes important on the TRAT, where the team discusses the questions. The TRAT scores tend to be greater than 85 percent across the board.

In the application activity, students are accountable to their teammates to help them solve the problem. They come together, they collaborate, and they make a decision. At some point, usually toward the end of the semester, students are given the opportunity to evaluate their teammate's contribution to the success of their teams.

There are many ways to do the peer evaluation. Examples of peer evaluation forms can be found in Team-Based Learning books. Team-Based Learning: A Transformative Use of Small Groups in College Teaching from 2004 has wonderful examples. A more recent book, Getting Started with Team-Based Learning published in 2014, has great examples. Or you can design your own, determining for yourself what it is you want your students to evaluate one another for.

Addressing these four essential elements will get you started with Team-Based Learning.

2 Forming and Managing Effective Team-Based Learning Teams

On the first day of class, when I'm introducing Team-Based Learning to my students, I often hear a few groans. I ask the students how many have been involved in team work or group work before. I ask the ones who have for some pros and cons. One of the most common "cons" is the problem of freeloaders in the team—students who will sit back and let the others do the work and who will receive the same grade as the rest, regardless of the effort that they have put forth.

Many students complain about the difficulty of finding time to get together with their team. That truly is a problem these days, when many of our students are working and/or have families. Unfortunately, the students who don't have those kind of demands on their time often tend to blame the ones who do for being unable to make it to the meetings.

One of the most common "cons" is the problem of freeloaders in the team—students who will sit back and let the others do the work.

My students have also observed that cliques tend to form in the classroom and frequently within their team. They may have found that some students on the team are overly assertive and forceful in their opinions, while many are much less assertive and opinionated but just as likely to have correct answers.

The students do have some "pros" associated with teamwork. They recognize that everyone has different knowledge that they bring to the team or to the group, and that that is an opportunity to learn from one another. Other people bring experience that individual students might not have. The students learn to rely on others in the team when challenges arise, when they're unable to complete a project or meet a commitment. Finally, they've seen friendships and alliances form within the class that can extend well beyond the class.

But it's the "cons" that will be detrimental to Team-Based Learning if not addressed. Most concerns can be addressed through one of the two essential elements of TBL. The first essential element is proper team formation (see chapter 1). It is up to the instructor to form the teams and the instructor must make sure that team formation is transparent and criterion based.

The second element that address these concerns is student accountability. In team-based learning the students are accountable not only to themselves, but to their teammates, as well as to the teacher. In explaining these ideas to the students, they become more comfortable with the idea of using TBL in the classroom.

Forming teams
Depending on the size of the class, I try to form teams of 5-7 students each.

Diversity is important. We find that instructor-divided teams can be more diverse. Each student brings different knowledge to the teams.

And the teams are permanent. That's important.

It takes a while for a group of students to actually become a team, where they are accountable to each other, they work well together, and they can solve problems together. So in team-based learning, the teams that are formed in my classes on the first day of class remain in place until the end of the semester. All teamwork is completed with the same individuals.

So how do you form teams?

If you have a class size up to about 100 students, you can have the students line up and count off.

There are different ways of having the students line up.

- Students can line up based on the length or type of work experience that they bring to a particular class. If it's a business class, some students may have relevant business experience. You would have those students line up first. Students with less experience line up after them and so on until all of the students are accounted for.
- Some students may have prerequisite or other related coursework that is more recent than their classmates. You can have them line up by discipline. In a health care-related course, you might have all of the nursing majors line up first, then dental hygiene majors then other health science-related disciplines line up.
- I sometimes have students line up based on how much time has passed since they have taken a particular prerequisite, in order of who has taken these courses most recently. I will have the students who have taken a class the previous semester line up first. Two semesters ago, line up second, and so on.
- You can have students complete a survey about their relevant experience. Faculty can devise different surveys based on what they think are the assets that the teams will need. You can use previous grades. (Keep in mind federal privacy regulations.)
- If you are in a program where you are working with a cohort of students, you can have students line up based on who they had as a previous teacher. (Some teachers are more rigorous than others.)

It doesn't matter how you sort your teams. What you need to do is make sure that you have criteria that allows for a diversity within the teams and that allows for equitable distribution of the important resources around the classroom.

After you have sorted your students, they will count off by the number of teams that you want to have in your class. Remember, you want to have teams that are fairly large, five to seven students each. If you have a class of 70 students, you'll have ten teams of seven. Have the students count off one through ten and then start over again. Each of the numbers will form a corresponding team.

If you have fewer students, say 25, you can have three teams of six and one team of seven, for a total of four teams.

The only reason that you would rearrange teams after this transparent formation would be to ensure diversity.

For instance, research has shown that mixed-gender teams do much better than single-gender teams. Where I teach, it's primarily nursing and health-related students. Male students are few and far between. If it happens that I have five men in a class, and they end up being distributed among only two out of, say, six or seven teams, then I want to rearrange the teams so there is only one man on each of them.

If you rearrange teams like this, be sure you explain to the students what you're doing and why. Transparency is really important.

If a team happens to be formed of students who are mostly from a single major, you will want to redistribute those, so that again you have a more even distribution of resources.

If you rearrange teams like this, be sure you explain to the students what you're doing and why. Transparency is really important—it enables the students to trust in the process as well as in the instructor.

Once the teams have been sorted, I have the students convene in teams to introduce themselves and to exchange contact information, phone numbers, e-mail addresses, and maybe a little bit of background information about each other. I also have them choose a team name. I find a team name gives them a sense of identity and belonging.

Now that teams are formed, how do we first introduce accountability into team-based learning? I schedule a practice team-based learning module early. On the second day of class, the students will take an Individual Readiness Assessment Test (IRAT).

Then they will reconvene and take a Team Readiness Assessment Test (TRAT). Students tend to like that because it's the first time that they can discuss the answers.
Then they do an application exercise. The students learn how to contribute to problem solving.

This readiness assurance test, on the second day, is sometimes based on the syllabus. But if you really want to get right into the meat of the content, you can base the test on the introduction or the first chapter of the textbook. (Using the syllabus has the advantage of ensuring that the students have read it.)

Finally, after we have completed the application exercise, or after we have completed discussion of the application, I allow the students to do an initial peer evaluation. They can see how they will be

evaluating the other people on their team throughout this semester and at the end of the semester, when the peer evaluation will be taken into account for grading purposes.

I also have them do a formative peer evaluation midway through the semester. This is largely to give the students who think they are doing okay, but who their teammates don't perceive as contributing much, time to change how they are working and contributing.

Then finally, there is a summative peer evaluation at the end of the course. That is the point at which the peers really have to consider what the individual contributions have been, how each team member contributed, what their strength and weaknesses were as team members. You can find peer evaluation forms in Appendix B of this report.

The following books also have good peer-evaluation models in them:
- *Team-Based Learning: A Transformative Approach to Small-Group Learning in the College Classroom* Michaelsen *(2004)*
- *Team-Based Learning for Health Professions Education (2008)*
- *Social Sciences and Humanities Using Team-Based Learning (2012)*
- *Getting Started with Team-Based Learning (2014)*

You can also design your own peer evaluation form. What is it you think your students need to be addressing when they're looking at their peers? How do we give and receive positive feedback?

You can also refer to the team-based learning collaborative website http://www.teambasedlearning.org/ for some examples of peer evaluation. If you are a member of the collaborative, you can go on their LISTSERV for more information or to ask questions about peer evaluation.

③ DESIGNING A TEAM-BASED APPLICATION ACTIVITY

The application of knowledge to complex scenarios is really the soul of Team-Based Learning.

When we design a course or an individual learning module, we want to know what our students will be able to do when they've completed that module or that course. It provides students the opportunity for deep, meaningful learning, through problem solving, inter-team discussion, intra-team discussion, debate. All of these opportunities help students to learn from one another in a richer environment.

When you are designing a Team-Based Learning application activity, it is suggested that you begin by using backward course design. (Backward course design is discussed in the Dee Fink's book, *Creating Significant Learning Experiences*. It is also discussed by Wiggins and McThige in *Understanding by Design* books.)

Backward course design begins at the end—with the learning objectives that you want your students to accomplish.

When you begin to design a course or a team-based learning module, start by asking yourself what it is you want your students to be able to do at the end of the course or the module. Then you design the application activity that will allow the students to demonstrate that ability.

Team-based learning application activities are designed around what is referred to as the 4S Framework (explained on p. 10). To remind you, the four S's stand for a significant problem, the same problem, and a problem that requires specific choice, and simultaneous reporting.

Let's go through these.

A *significant* problem is one in which the students and the student teams would not be able to look in their textbook for the answer. A significant problem is one that cannot be googled. So you want to have a problem where students must assimilate and synthesize information that they have brought from their pre-assignment.

All teams must be assigned to the same problem. If teams are working on the same problem, we can have a richer inter-team discussion of the problem when they are done. That means that students are required to make a decision and will need to defend or explain the basis for their decision, when it comes time for discussion. We don't want students to waver. They have to make a decision, and they have to be able to support it.

The teams must also report their answers simultaneously. This is to prevent teams from changing their mind based on what it is they see other teams reporting. Everybody displays their answers at the same time, and then the discussion will follow.

Here, for example, is an application exercise that I use in a pharmacology course.

> *The students are given their pre-assigned readings. The pre-assignment includes short video clips and specific textbook readings from their pharmacology textbook and also from a psychiatry textbook. From these readings, I expect them to know basic treatment options for depression.*
>
> *When the students have done their preparation, the teams are presented with a case study involving a patient whose recent history indicates the possible onset of depression. Students are provided with the patient's family history, symptoms, concerns, lab test scores, current life events and other relevant information.*
>
> *Students are then asked to decide on the best treatment option for this patient. There are five options given--cognitive behavioral therapy, psychotherapy, three forms of prescription drug therapy, and finally an herbal remedy. The students, after having done their pre-assigned reading, should be familiar with each of these.*
>
> *Even though more than one option may be plausible, each team must discuss and come to a consensus on a single choice.*
>
> *Each team has been given a set of five colored cards, each labeled with the letters A through E. Once each team has made a decision, they're asked to choose a card, representing their choice. On a signal, all teams hold up the card representing their choice of answer. At this point, the instructor facilitates discussion.*
>
> *If all teams have the same answer except for one "outlier" team, then you can stimulate discussion by asking this team to defend their choice. Ask the other teams to respond.*
>
> *If there is a variety of answers, each team should be asked to support and defend their answer.*
>
> *If all teams choose the same answer, the instructor might ask why an alternate option was not chosen. Teams may be addressed one by one and asked why they didn't choose the other answers.*
>
> *Again, if all teams choose the same answer, you can ask what the second best option might be, or what the least preferable option would be, and have the teams reconvene and discuss further.*

If all teams answer in the same way, it might be a good idea to consider redesigning the exercise, or to take another look at how the other questions were worded. You want to ensure that all teams are not answering in the same way all the time.

Discussion can continue until you feel that all of the salient features of the topic have been addressed, the students have ironed out any differences, and they're able to go away feeling that they have accomplished something.

You should be prepared for students to ask you what the correct answer or best option is. The answer of course is that as long as they're able to support their decision, it doesn't matter what the correct option is.

Even in math classes or statistics classes, you should write your question so that there are multiple plausible answers.

Using the colored cards is especially useful in very large classrooms, since they enable students to see very quickly what the other teams answered. But there are other options for simultaneous reporting. I've offered some other ideas in Appendix __ at the end of this report. The team-based learning books mentioned on page 14 also have alternatives for simultaneous reporting.

Students sometimes like to write their answers on whiteboards. They can diagram their thought processes on them. I have 18x18-in. whiteboards in my classrooms and 120 different-colored marking pens.

For more information about simultaneous reporting, you can refer to the Team-based Learning Collaborative website (http://www.teambasedlearning.org/), which has numerous resources. If you become a member of the Team-Based Learning Collaborative you will have access to the LISTSERV, where you'll find multiple people with many options to help you.

Following the inter-team discussion, you need closure for the class. Remind the students of the salient points of the entire module. Ask them to describe the purpose and the objectives of the module, so that they will be able to apply what they've learned, to the next team-based learning module, and maybe even to their next class!

4 ASSIGNING PREPARATORY WORK

The flipped classroom idea is to ensure students prepare before class, and then become actively involved with the material when they get to class.

In Team-Based Learning one of the essential elements is the readiness assurance process. It consists of five steps.

1. The first step is the *pre-assignment*—the homework. This is the only part of Team-Based Learning where a student is expected to do work outside of class.
2. Next comes the *Individual Readiness Assessment Test* or the IRAT.
3. Following the IRAT is the *Team Readiness Assessment Test* or TRAT.
4. Then, students have the opportunity to *appeal*.
5. Finally, there's the *clarification of content* by the teacher, if necessary.

The pre-assignment helps to ensure that students have the foundational content necessary to solve an application problem

The pre-assignment can consist of targeted textbook readings. By "targeted" I mean that I try not to assign entire textbook chapters. Rather I go through the textbook and try to select the content that is absolutely necessary for the students to know in order to reach the course objectives. In my anatomy and psychology classes, I know that the students do not need to know all of the text in any given chapter of the textbook. By targeting the readings, you're making better use of their study time while making the assignment less scary for the students.

The pre-assignment can also consist of videos or PowerPoint presentations that you have made, or that are available on the Internet. There are many very good YouTube videos for college-level coursework.

Another effective pre-assignment is to give students a worksheet that they will need to consult relevant parts of the textbook to complete. Or you can broaden the required research to include other sources that they must find on their own.

When the students next come to class, they take the Individual Readiness Assessment Test or IRAT. The IRAT contains between five and 20 multiple-choice questions that are based on the pre-assignment. My anatomy and physiology material is pretty detail-laden, so I like to keep the IRAT to about 10 to 15 questions.

These tests are targeted at major concepts, and at lower levels of the learning taxonomy--but they should be challenging. Details, definitions, and descriptions are good IRAT questions. There are many resources available to help you write quality multiple-choice questions.

Confidence-testing

I often use something called "confidence-testing" forms for the IRAT. Confidence testing is a multiple-choice test format that lets students wager on their confidence in the correct answer. What it comes down to is that students don't need to put all of their eggs in one basket.

The two ways that I use confidence testing for my students can be seen in Appendix __. Under the IRAT module there are figures that show the two forms: on the left is the Scantron form and on the right is the paper/pencil form.

If you're using a Scantron form for confidence testing and you have multiple-choice questions with four choices each, A to D, each question should correspond to four lines on the Scantron form. Each question is answered four times, on lines one, two, three, and four.

If the student is completely confident in their answer, they choose the same answer each of the four times the question is asked (as in the illustration in the appendix). If they are correct, they get one full point for that question.

But on the second question in the example, represented on the Scantron form by lines five through eight, the student is not quite so confident. They are about 75 percent confident in answer C. But they also like answer D. So what they do is they fill in three C ovals for questions five through eight, and one D oval. That means that if C is the correct answer, they'll get 75 percent of the point for that question.

On question three on the Scantron form, the student has no idea what the answer might be, so they fill in all four options, A, B, C, and D. One of those answers will be correct, so they will receive 25 percent of a point for that question.

If you have ten questions on your IRAT, it will take up 40 lines on the Scantron form.

On the right-hand side of the page is the paper/pencil form. The Scantron form is easier to grade--you can run it through a scanning machine—but the paper/pencil form is simpler, if you have a small class.

Here you can see question numbers one through 25 down the first column, and then answer options A through E (I always include E, in case there's a question with five answer options.)

As on the Scantron form, on the first question the student is 100% confident that the answer is B, so they place the number "4" under option B by line one. They're putting all of their eggs in one basket. If they are correct they'll receive four points for that question.

For the second question they believe that option C is probably the correct answer, but it could be option D, just as with the Scantron. So they put "3" under option C and "1" under option D.

For question three, as in question three on the Scantron form, they weren't certain of the answer at all so they put "1" under each of options A through D. So the most they can receive is one point, and so on.

I present this kind of testing it to students as a way to demonstrate their knowledge even if they're not 100% correct all the time.

The TRAT

Immediately following the individual IRAT and the completion of the confidence testing forms, the students come together in their teams, and will remain in their teams for the remainder of the Team-Based Learning module.

The teams are given the same multiple choice question test as they already completed in the IRAT. However, this time, rather than using individual confidence testing forms, we use a very powerful immediate feedback assessment technique, a form produced by Epstein Enterprises. (See Appendix B) Each team receives one of these forms, basically a scratch-and-win type scoring sheet. It will serve to enhance and increase the quality of intra-team discussion while solving these problems.

You can see that the form has four options, A through D. Next to each question, the form that is shown has ten question options. (They're available with 25 question options, and 50 question options, and they're available with A through D and A through E answer options.)

The students will discuss within their team what they think the best answer to the question is. They will make a determination, and one team member will scratch the latex covering the correct answer. If the students uncover a star, their answer is correct. The first line in your example shows that the students were correct on their first choice, so they get four points.

On the second question, you can see that the students first choice, C, did not reveal a star. They would then need to return to their teams and discuss further. You can see that the further discussion enabled them to decide on the correct choice and they revealed a star on their second attempt. They receive two points.

On the fourth question the team uncovered two incorrect options before they uncovered the star, so they receive only one point.

If the students uncover all the choices before uncovering the star, then it is like the "no idea" option on the confidence-testing forms.

These are very powerful tools, and the students, in some cases, get really anxious about whether or not they're going to uncover the stars. Students will be leaning over watching to see what is uncovered.

Finally, after the TRAT is completed, the teams will have ability to appeal any questions that they answered incorrectly. Appeals are only accepted from teams, not individuals.
An appeal that is granted will not change any individual scores.

There are examples of appeal forms in Getting Started with Team-Based Learning. You can create your own appeal forms, but remember that it must require that students make an argument that there was ambiguity in a question or in the assigned readings.

If a question is ambiguous, they need to describe the source of the ambiguity and rewrite the question to eliminate ambiguity. If it was the reading that was ambiguous, the team needs to describe the source of the ambiguity, and provide a reference to the readings (with page numbers, quotes, and figure numbers).

The instructor decision can be made either at the end of class period or the next day. Most instructors wait until after class period to avoid other teams getting into second-guessing about why they didn't appeal.

Only the team that appealed can receive credit if the appeal is granted. During the appeals process, the students can use a textbook to reference for their appeal.

Finally, after the appeals process, the teacher may want to clarify content. It may not be necessary--the students often spot their misconceptions through discussion during the TRAT. But if you feel it is indicated, a short focused mini lecture will help to clarify any of the Readiness Assurance concepts that appear to be muddy for the students. After the clarification of content, you can move on to the application activity.

APPENDIX A: TEAM FORMATION

- It is very important in TBL to purposefully and properly "team" the students. Spread assets and liabilities as fairly as possible across teams. Make this process visible to the students. The variables that can be used to determine team formation might include: have students line up according to categories that are important to the success of the teams (previous degrees, previous health care experience(?), etc). Have the students count off by the number of teams you want (not by the number of students you want in the teams).

Once team formation is completed the only reason to move students from one team to another is to provide equitable distribution of gender.

- TBL teams are larger than other forms of group work (should have 5- 7 per team). Teams remain permanent throughout the course so that students have multiple chances to work together and actually become successful teams! After all, it takes time for a 'group' to become a 'team'.
- If the physical space does not seem amenable to team work, think of ways to have students sit face-to-face. We want team members to be able to communicate easily and comfortably.
- Groups are different than teams. Please see the video clip by Dr. Larry Michaelsen: http://www.youtube.com/watch?v=VSWHuqmNiWQ

TBL TEAM FORMATION

TBL teams should be:
- Large (5-7or 8 students)
- Diverse
- Inclusive
- Instructor selected
- Transparently formed
- Criterion based
- Permanent

TBL teams should not be:
- Student selected
- Small (<5 students)
- Exclusive
- Temporary
- Homogenous

STEPS IN TBL TEAM FORMATION

1. **Determine number of teams based on enrollment**
   o Teams should have no fewer than 5 students; larger is better (up to 7 or 8 students)
2. **Select criteria**
   o Previous exposure to course content
   o Time since previous exposure
   o Time since completion of prerequisite
   o Work experience
   o Language expertise
   o Other ?
3. **Prioritize criteria**
   o Which criterion will provide the most benefit to teams?; which will provide the least benefit to teams?
   • Ask students to line up in one long line around the room based on criteria
   o Example:
   • Which students completed the prerequisite last semester? (MOST BENEFICIAL) — line up first
   • Which students completed the prerequisite two semesters ago? — line up next
   • .... Three semesters? – line up; ...... four semesters? (LEAST BENEFICIAL) — line up; etc. until all students form a continuous line.
4. **Explain criteria and have students line up by criterion in the order of priority.**
5. **Have students count off by the total number of teams you want**
   o If there are 40 students there could be six teams
   o Students would count off from 1 to 6
   o This would result in 4 teams of 7 students & 2 teams of 6 students.

TEAM FOLDERS

You can save a lot of time, especially when teaching very large classes, by loading team folders with handouts, activities, RATs, and application exercises for each TBL module prior to the start. Team folders are a good way of demonstrating to the students that the days are organized and meaningful.

PEER EVALUATION

Peer evaluation is still a controversial topic in TBL. Examples of different versions of peer evaluations that have been used can be found in the TBL books listed in the resources. Some faculty prefers to design their own evaluations or to allow students to produce a team contract which can then provide a basis for an evaluation instrument for each team.

Appendix B: Peer Evaluation Form

Assessment of Contributions of Group Members

It is necessary for all members of this class to assess the contributions that each member of the group made to the work of the group. This contribution should presumably reflect your judgment of such things as:

Preparation — was the person prepared when she/he came to class?
Contribution — did the person contribute productively to group discussion and work?
Respect for others' ideas — did the person encourage others to contribute their ideas and
did they respect other points of view once presented?
Flexibility — was the person flexible when disagreements occurred?

It is important that you raise the evaluation of people who truly worked hard for the good of the group and lower the evaluation of those you perceived not to be working as hard on group tasks. Those who contributed should receive the full worth (%) of the group's grade; those who did not contribute fully should only receive partial credit. Your assessment will be used mathematically to determine the proportion of the group's points that each member receives.

Evaluate the contributions of each person in your group **except yourself**, by distributing 100 points among them. **Include comments for each person** (These comments will be distributed to individual students but your name will not be!)

Group # _____   Points awarded

1. Name: _____   _____
   Comments:

2. Name: _____   _____
   Comments:

3. Name: _____   _____
   Comments:

4. Name: _____   _____
   Comments:

5. Name: _____   _____

Comments:

Your name: _____   Total: 100 points

APPENDIX C: CALCULATING STUDENTS' GRADES FOR GROUP WORK

Percent of Total Group Grade – Student Receives (column XX)

	Student A	Student B	Student C	Student D	Student E	XX	
Student A	**	10	25	15	25	75	
Student B	15	**	25	20	25	85	
Student C	25	20	**	30	25	100	
Student D	30	35	25	**	25	115	
Student E	30	35	25	35	**	125	
	100	100	100	100	100		

Appendix D: Application Activities

Introduce the Task

If team folders are not used, the application activity typically begins with the distribution of the worksheets and problems. It is important to remind students of the applicable knowledge they bring to the problem and the length of time teams will be given to discuss and solve the problem within their team before reporting their decisions. If there are any written artifacts (worksheets, rationales, or other) that need to be generated then students should be reminded of this.

Intra-team Discussion

Once properly tasked the students are given time to discuss the questions and arrive at a team decision.

As a faculty member you should circulate around the room to listen to the conversations. Two important things can be accomplished with this listening: 1) you send the message that what the students are saying is important enough that the instructor will listen, and 2) if mis-conceptions or mis-understanding are preventing student progressing then you can intervene and provide some expert clarification or guidined questioning either at the team level or whole class level. The important part is to encourage student to student discussion.

Simultaneous Reporting

When you sense that discussion is nearing completion, it is good to check in with the teams and announce that either more time will be allotted for discussions or teams should get ready for report.

Once the teams are ready, you ask them to hold up the voting card that indicates their team's answer to a particular question. By having teams hold up cards, both you and the students can see student thinking and contrasts in student thinking. These contrasts provide rich starting points for student discussions.

Other Reporting Strategies:

In selecting a strategy for simultaneous reporting, it is important to keep in mind that the strategy needs to allow students to simply report their team choice in such a way that the choices, and therefore thought processes, of all teams are visible to the entire class.
- Whiteboards
- Poster boards
- Google docs
- Excel charts
- Maps and pushpins
- Stacked overheads

Inter-team Discussion

The discussion between teams allows students to challenge each other's decisions, defend their own thinking and thoughtfully examine other teams' as well as their own decision making process. The discussion often focuses on the thinking behind the decisions, rather than the correctness of a given choice.

The instructor needs to facilitate this discussion to make sure all voices are heard and the decisions are well examined. When you create a good activity that divides the class the hardest part, for many instructors, is to get out of the way and let the students discuss it. The instructor serves to facilitate the discussion between students and should intervene only to guide, not to answer.

Closure

It can be important for the instructor to properly close an activity. Reminding students of the salient points, general rules that may have emerged, points of view that were not considered and any questions that might still be outstanding is important for reinforcing what has been learned.

Appendix E: Useful Resources

The Team-Based Learning Collaborative (TBLC) is a group dedicated to supporting educators and trainers from a variety of educational & professional development settings that have implemented or wish to implement team-based learning (TBL). *Membership Information and Resources* provided by Team-Based Learning Collaborative are available at the TBLC Home Page. Please click on the links and review the basic TBL resources available.
http://www.teambasedlearning.org/; http://www.teambasedlearning.org/membership

Epstein, M.L. (2000). **A testing/teaching multiple-choice answer form**. (Immediate Feedback Assessment Technique—"IF-AT" Answer sheets—scratch forms used in today's session). www.epsteineducation.com .

Testmaker for IF-AT – this testmaker is free and allows users to build RATs (or other assessments). The assessments are stored on the site and faculty simply retrieve the test, copy it if necessary, make modifications, etc, and once ready to print simply enter the code for the IF-AT form that will be used. The assessment is formatted for the form and can be downloaded as an RTF or PDF document. Access the testmaker here: http://if-at.com/home/testmaker/default.aspx

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Michaelsen, L.K. & Sweet, M., (Eds) (2012). *Team-based learning in the social sciences and humanities: Group work that works to generate critical thinking and engagement*. Sterling, VA: Stylus Publishing.

Sibley, J. & Ostafichuk, P. (Eds) (2014). *Getting started with team-based learning*. Sterling, VA: Stylus Publishing.

Bibliographic References – Backward Course Design/Course Design:

Fink, L.D. (2003). *Creating significant learning experiences: An integrated approach to designing college courses.* San Francisco, CA. Jossey-Bass.

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Wiggins, G. and J McTighe (2005) *Understanding by Design.* Saddle River, NJ. ASCD Pearson:Merrill Prentice-Hall

Wiggins, G. and J McTighe (2011) *The Understanding by Design Guide to Creating High Quality Units.* Alexandria, VA. ASCD.

Wiggins, G. and J McTighe (2012) *The Understanding by Design Guide to Advanced Concepts in Creating and Reviewing Units.* Alexandria, VA

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HTTPS://WWW.SURVEYMONKEY.COM/R/IntroTBL

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