Getting started with TBL: An introduction

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Instructors of active learning classes in economics face the challenges of motivating students to prepare before class and engaging fully in class activities. Team-based learning (TBL) pedagogy meets these challenges by (1) placing students in fixed, instructor-created teams that develop the ability to work productively together, (2) holding students accountable to the instructor and their teammates both for their efforts to prepare before class and for their ability to interact constructively with teammates, and (3) presenting learning activities in a highly structured course format that provides students multiple opportunities to express their understanding and receive feedback from peers. This paper describes how the elements of TBL courses work in concert to motivate student out-of-class preparation and in-class engagement to increase student learning of economics.

Keywords: active learning, team-based learning, pedagogy.

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INTRODUCTION

STEM education research provides compelling evidence that active learning classes improve the overall learning of students (Freeman et al. 2014; Wieman 2014) while disproportionately benefiting students from underrepresented groups (Beichner et al. 2007; Horwitz et al. 2009; Freeman et al. 2011; Haak et al. 2011; Eddy and Hogan 2014; Theobald et al. 2020). Yet, instructors often find implementation of active-learning strategies challenging, leading to their underutilization. In particular, instructors teaching with group-based instructional techniques face the twin challenges of: (1) motivating sufficient pre-class student preparation to maximize the benefit from in-class active-learning activities, and (2) achieving a high level of engagement of all students in class-based activities (Davidson, Major, and Michaelsen 2014; Johnson, Johnson, and Smith 2014). Team-Based Learning can help address these pragmatic teaching issues through its attention to team formation, student accountability, and structured course design.

Wallace, Walker, Braseby, and Sweet (2014) argue that a variety of group-based pedagogies such as peer instruction, process-oriented guided-inquiry, case-based learning, and problem-based learning can effectively promote student learning. Team-Based Learning (TBL) (Michaelsen, Bauman Knight, and Fink 2004) provides a distinct, highly-structured, evidence-based framework (see also Michaelson and Fink 2008; Davidson, Major, and Michaelsen 2014) that uniquely promotes and supports a high level of student engagement before and during class through its intentional design. In many disciplines, TBL has led to increases in student learning and engagement (Haidet, Kubitz, and McCormack 2014).

The experience of economics instructors who have adopted TBL suggests the promise of the approach to boost engagement and learning in economics courses. Espey (2012) compares partial with full adoption of TBL in several undergraduate economics

courses and finds that the whole-course approach increases student engagement and improves student learning. Hettler (2015) finds increased learning for low-income and minority students in sections of undergraduate economics principles courses implementing TBL, relative to lecture-based sections. Imazeki (2015) provides an introduction to TBL as implemented in a data analysis course for economics majors and finds evidence that students in the class were more engaged and motivated to work on more difficult problems than were students in the same class taught with other active learning pedagogy.

While previous research on TBL in economics has focused on specific classroom implementations of TBL and their impact on student learning and engagement, a significant contribution of this paper is to illustrate more generally how TBL motivates students to prepare carefully before class and to engage purposefully in face-to-face class-based activities.[1] By focusing on the ways in which TBL promotes these twin goals while also laying out the pragmatic structure of TBL we hope to encourage broader adoption of TBL pedagogy in economics and highlight for instructors key components of its implementation. We argue here that the overall TBL course design and the structured application-oriented exercises at the heart of TBL provide strong incentives for students to engage in meaningful pre-class preparation and in-class participation.

Each section of this paper describes the connection between a key component of TBL and its role in promoting student preparation for class and engagement in class activities. The three essential components of TBL are:

- permanent, instructor-created student groups in TBL that learn how to work effectively together through structured peer interaction;
- a high level of student accountability to instructor and peers for preparation before class and engagement in class activities; and

- a course structure that systematically promotes student preparation and engagement and provides students ample opportunity to express their understanding and receive feedback from instructor and peers.

STUDENT GROUPS IN TBL COURSES – MAXIMIZING LEARNING THROUGH THOUGHTFUL TEAM FORMATION AND DEVELOPMENT

Careful team formation and development comprise the first essential component of TBL pedagogy. In TBL courses, the instructor creates teams with the aims of promoting a diversity of viewpoints within each team and minimizing the likelihood that blocs of friends within teams could limit productive discussion. A variety of methods can be used to achieve this outcome. For example, instructors can survey students during the first class and then use the collected information to create teams with a variety of backgrounds and experiences prior to the next class. Alternatively, instructors can create teams more transparently in class by having students queue first in alphabetical order of college major and then alphabetically by first name (this makes a useful ice-breaking activity as well). Students then count off by the number of teams in the course and join the team with the number they called. While this random approach is less intentional in its structure, it is more likely to achieve the team-formation goals above than letting students create their own teams.[2]

Teams in TBL courses are generally larger than in other collaborative learning settings. Michaelsen, Bauman Knight, and Fink (2004) recommend teams of 5-7 students. Ideally, larger teams that consist of students from different majors and social groups can bring multiple skills and perspectives to bear on the difficult choices posed by the application-based exercises (described later in this paper) that lie at the center of TBL (Michaelsen, Davidson, and Major 2014).Teammates from very different backgrounds disagree more often and the ensuing discussions create opportunities for

peer instruction as each student expresses their understanding and receives immediate feedback that then serves to modify their initial understanding.

Teams are fixed in TBL courses for the duration of the semester because the skills to work effectively in a group take several weeks to develop (Michaelsen, Bauman Knight, and Fink 2004). As in other collaborative learning courses, instructors in TBL courses need to promote student skills at working in groups by means of activities at the very beginning of the course that guide students to reflect on successful group efforts and to create their own ground rules (Balan, Clark, and Restall 2015).[3] Team ground rules almost always include variations on "do the readings and watch the screencasts before class," "everybody share their reasoning before debating the team answer," and "provide constructive feedback."

Regular reminders that the purpose of the group work is to provide every team member speaking opportunities improve team function. While teams are working, the instructor listens in and can provide team-specific guidance as necessary. In classes larger than 48 students – eight, six-student teams – it would be useful to have one or several well-trained teaching assistants to help teams develop skill at working together productively.

Conducting several surveys during the term to collect teammate feedback on each individual's team work and providing that feedback to each student for purely formative purposes further boosts students' skills at working together productively. Team quizzes and the work on other class activities give team members a great deal of evidence on the level of preparation and engagement of their teammates. Students are required to assign numerical ratings evaluating areas of teammate performance such as the level of preparation for and productive participation in group activities and to comment on what each teammate is doing well and how they might improve.

Numerical averages in each category and anonymous comments are provided to each student in the formative exercises, along with a reminder to the class that the purpose of the feedback is to help students develop teamwork skills and that the only peer evaluation that will count toward the grade will be collected with the final exam. Student comments to teammates are typically very direct and helpful. Students usually assign high numerical ratings to teammates who prepare well and come to class. In practice, being absent without providing teammates a good reason results in very low ratings. In our experience, this effect is so large that instructors generally do not need any additional policy to motivate class attendance. (See Hernandez 2002 and Michaelsen, Davidson, and Major 2014 for more detail on using peer feedback to develop students' team-work skills).

Key takeaway: Teams made up of students who bring diverse perspectives to group conversations and who work together during the term to improve students' ability to learn cooperatively create the conditions in which the other two key elements of TBL function to increase student preparation before class and student engagement in class.

STUDENT ACCOUNTABILITY IN TBL COURSES – BUILDING IN INCENTIVES FOR LEARNING BY ALL STUDENTS

The second essential component of TBL consists of built-in incentives for student engagement in the learning process both before and during the class period through student accountability for both individual and team learning outcomes. An important strength of TBL is the high level of accountability for student efforts to prepare outside of class and to contribute productively to team in-class discussions that is designed into the pedagogy.

Graded individual and team quizzes on the reading and other preparatory materials *begin* each section of a TBL-based course and directly motivate individual

preparation. These quizzes, with individual and team scores averaged, typically account for fifteen to twenty percent of students' course grades in a TBL course. Having a significant portion of the grade on the line provides significant impetus for students to prioritize doing the necessary preparation for class. In-class team quizzes give every student the opportunity to participate in team deliberations on each question and make the quality of each student's preparation beforehand clear to teammates. Peer pressure in class and explicit feedback delivered through formative peer evaluations during the semester provide additional strong motivation to prepare prior to class.

In addition to the formative peer feedback that helps develop skill at working effectively in groups, students complete a formal, summative peer evaluation with the final exam in a TBL course. The numerical ratings in the summative teammate assessment administered with the final exam play a role in determining each student's final grade, usually by inflating or deflating the twenty to thirty percent of the grade that results from team quizzes and class activities. Michaelsen, Bauman Knight, and Fink (2004) and Levine (2008) describe several approaches to incorporate peer feedback into course grades. Counting summative peer evaluations toward the course grade is intended to motivate students to address areas of weakness revealed by peer feedback during the semester, increasing their efforts to prepare beforehand, reducing unwarranted absences from class, and elevating their level of engagement in class.

Key takeaway: The individual and team quizzes that are a central feature of TBL (and described in detail in the next section), coupled with a formal summative evaluation of teammates' preparation and engagement contributing to each student's final grade, push students to make an effort to prepare well for each TBL class and to participate actively in class sessions.

TBL CLASS STRUCTURE – INTENTIONALLY MOTIVATING STUDENT PREPARATION AND ENGAGEMENT

The third essential component of TBL consists of the course structure itself – a structure that consistently and intentionally promotes student preparation and engagement throughout the course. Instructors of TBL courses typically divide 15-week semesters into 5-7 approximately two-week modules, with each module broken into two components, a one-class (60-90 minutes) Readiness Assurance Process (RAP) and a series of increasingly challenging application activities during the following classes (3-4 hours), as summarized in Figure 1. Summative assessments such as exams take place at the end of some or all of the modules in a course.

[Insert Figure 1 about here]

Readiness assurance process (RAP)

The Readiness Assurance Process (RAP) is intended to help students develop a foundational understanding of the economic concepts and principles that undergird a particular TBL module. The RAP begins outside of class with students completing preparatory assignments (readings, podcasts, videos) that introduce the concepts studied in the module. Instructors often provide study guides that help students prioritize the most important concepts. Instructors encourage students to take careful notes during their preparation. Students are generally allowed to consult those notes – but not the preparatory materials themselves – during the introductory quizzes that take place during the first class period of each module.

The first class of each module typically begins with a short (10-15 question, approximately thirty minutes) individual readiness assurance test (iRAT), though iRATs can instead be administered online prior to class. Teams then collaborate to take the team readiness assurance test (tRAT) – either the same quiz or one that is very similar

to the iRAT – using an immediate feedback assessment technique (IF-AT) card on which students scratch off the material covering the space for their chosen answer (see figure 2), similar to scratching off spaces on a lottery ticket.[4] If the attempt is correct, there will be a star in the space; otherwise, the team makes another attempt with a portion of the points deducted.[5] Using the IF-AT cards adds an element of fun, promotes within-team sharing of ideas, and ensures that every member of the team simultaneously discovers the correct answer to each question on the quizzes.[6]

[Insert Figure 2 about here]

While the potential for free-riding exists, with one (well-prepared, dominant) team-member scratching off the answers for the team with little team interaction, the instructor (along with TAs in classes larger than eight six-student teams) is typically roaming the room during the tRAT, ready to help improve a team's process if the team's discussion is failing to involve all students. In addition, the tRAT questions are difficult enough that the team must rely on the collective understanding of its members. An incorrect scratch-off by a dominant team member is usually enough to foster increased team interaction and reduce the dominance of a single team member. The team's own ground rules and the frequent peer feedback also encourage full team participation in the tRAT. In our experience, the free-riding common in many group activities is significantly reduced in TBL.

Teams can submit written challenges to questions after handing in the completed tRAT. In a challenge, the team is allowed to consult the preparatory materials in order to make a written argument that a question had zero or multiple correct answers or drew on material that students could not reasonably be expected to have known. Challenges typically occur only a few times per semester. The tRAT and challenge process take approximately 30 minutes of class time.

The RAP class period concludes with explanations by the instructor on the most challenging concepts in the module. Student performance on the iRAT and tRAT informs the instructor of which concepts pose the most difficulty for students and the explanations begin by examining questions that many individuals missed or that one or several teams required multiple attempts to answer correctly.[7] Experienced teachers will usually anticipate the areas of difficulty and can prepare the explanations ahead of time. Instructors can extend the lessons on relatively difficult concepts in the module beyond the time remaining in the single RAP class period by delivering the explanations via short videos that are posted to the course learning management system (LMS). Students view those videos before subsequent classes.

The level of difficulty of iRAT and tRAT questions can be quite high, especially if the quizzes are open-note. Indeed, there need to be at least a few challenging questions on the quizzes in order to engage students in the team conversation during the tRAT.[8] Table 1 provides two examples of RAP quiz questions from the externalities module of an introductory microeconomics course. One requires students to evaluate the surplus that results for two different firms in two scenarios. Students will need to have mastered the definition of social optimality and to be able to effectively analyze tabulated information to answer the question correctly. The other example requires students to identify why compliance costs fall under incentive-based regulation relative to command and control, testing student understanding of one of the most challenging ideas in the externalities unit.

[Insert Table 1 about here]

Typical open-note, closed-book iRAT scores average between 55% and 65%; tRAT scores, however, average between 90% and 95%, almost always well higher than the highest individual iRAT average on every team (Michaelsen, Watson, and

Black1989; Espey 2018). Discussions during the tRAT offer one of the moments of greatest learning in TBL courses and, happily, are usually quite easy to generate. The medium and difficult multiple-choice questions in publishers' test banks include many potentially useful RAP quiz questions. Because of its ability to motivate student preparation outside of class and to generate meaningful group discussion, the tRAT has led to gains in student learning even when implemented without other elements of TBL (Sainsbury and Walker 2008).

Key takeaway: The Readiness Assurance Process (RAP) provides important incentives for students to prepare prior to class at the start of a TBL module. Having a significant portion of one's grade determined by the individual (iRAT) and team (tRAT) quizzes encourages students to come to class prepared in order to perform well on both the iRAT and tRAT. Because the score on the team quiz is averaged with the individual quiz score, team interaction and engagement evaluating the soundness of each choice on tRAT questions is generally quite high, with little free-riding. Instructors circulating among the teams during tRATs further promotes full team interaction.

Application exercises

Application exercises (AEs) follow the Readiness Assurance Process in each module and are intended to promote students' higher-order economic thinking skills – expert-like thinking – through application and synthesis of economic concepts, principles, and models, often linked to real-world settings and challenges. The majority of class time in each module consists of a series of increasingly complex application exercises (AEs) that require students to make a choice among four or five plausible options. Application exercises adhere to the "4S" problem-solving framework (Roberson and Franchini 2014, LearnTBL 2018) that is a hallmark of the TBL learning process:

(1) The exercise should engage students with **significant problems,** i.e. relevant examples and some decision required beyond how to do the often-necessary computational work for the problem,

(2) Teams each work on the **same problem** to make possible a class-wide discussion about the choices posed by the AE,

(3) Each problem poses a **specific choice** to enable direct comparison of different team choices and methodology, and

(4) Team choices must be **simultaneously reported** to ensure that each team makes its choice independently.

While application exercises typically require teams to explicitly use the economic frameworks under study to support their answers, the tasks ultimately call on student groups to select the most plausible explanation of past events, the most reasonable prediction of future effects, or to make a policy recommendation from a discrete set of options (usually 4-5) that ideally includes multiple defensible choices. Missing information or the need to make the choice based on value judgments or additional explicit assumptions results in team discussions that give each team member the opportunity to contribute. The AEs range in time from 20 minutes for a relatively straightforward AE at the beginning of a module in an introductory course to an hour or more for an AE that leads to nuanced understanding of advanced concepts.

In the RAP, students will have studied the textbook chapter(s) or other material presenting the key concepts in the module; the preparation before AE-based classes often consists of instructor explanations in recorded videos or an additional reading, podcast, or newscast to precede a case study or example presented by an upcoming AE. Instructors can guide students in their preparation and provide the incentive to prepare by requiring short essay responses to instructor prompts to be submitted via an online

learning management system or survey tool (such as Google Forms) before class using Just-in-Time Teaaching (JiTT) techniques (Simkins and Maier, 2004). Student responses can be used by the instructor to modify the AE prior to class to address learning gaps identified in the responses or to prepare follow-up questions for the AE report-out period.

The instructor sets up each AE with brief remarks that can highlight the concepts illustrated by the exercise and review the analytical framework necessary to undertake the AE.[9] Student teams then work to apply the framework of analysis to the case and make their choice from the options presented in the AE. While students work in teams to analyze the problem and make their choices, the instructor (and teaching assistants in larger classes) circulate around the room to help teams frame the problem, making sure to avoid biasing groups toward any choice.[10] As teams near the end of their deliberations, the instructor selects the team reporter through a random process.[11]

When cued by the instructor, each team's reporter then simultaneously reveals the choice of their team, usually by holding up a card with a letter that corresponds to the option chosen by their team. Well-written AEs typically result in more than one option being displayed across the teams, which lays the foundation for additional learning.

Following the "team reveal," the instructor facilitates a conversation among team reporters to attempt to come to consensus on the correct answer, if there is just one; when the application offers multiple defensible choices, the conversation has the purpose of identifying the conditions that would make one choice better than the others. Often, the applications require students to manipulate the analytical framework under study before choosing among policy recommendations, explanations of events under study, or predictions regarding subsequent events. In that case, the debriefing

conversation can start with some of the reporters explaining the technical work to establish the appropriate economic analysis of the issue. The second phase of the class discussion would then involve other reporters exploring the team choices pertaining to the controversial element of the application.

Team reporters present the rationale for each choice made, point out any errors of analysis that other teams have made, explain the value judgments underlying the choices, and identify the information that one would need to obtain to be more confident in the choice. The role of the instructor in the debriefing process is that of facilitator, again taking care not to bias the discussion in favor of a preferred choice. The debriefing conversation provides additional opportunities for reporters to express their understanding and to receive feedback from peers and instructor. Facilitation questions should be prepared in advance and can lead the debriefing conversation to emphasize a wide range of important concepts. Even non-reporting students generally are invested in the debriefing of a well-crafted AE because their engagement with the issue in their team just before the class-wide discussion leads to curiosity about other teams' reasoning.

Students are not usually graded on whether the team answer is correct but, rather, on whether the randomly-selected team reporter has prepared to explain the team's reasoning. Instructors might give each student five to ten percent of total course points for engagement in class and include the possibility of deductions for a reporter's failure to make an earnest attempt to explain the team's reasoning. Instructors should make the expectations of reporters clear in the first weeks of the semester and can issue a "warning citation" in class the first time a team's reporter does not attempt an explanation of the logic behind the team's choice. Even though in practice such deductions are almost never made, the incentive effect is quite powerful. When the

points stem from each team member's willingness to try to explain the team's reasoning rather than from whether the team answer is correct, group work consists of a significant effort to make sure that every team member can explain the team's reasoning, thus increasing the opportunity for weaker students to articulate their understanding and receive feedback from peers.

The instructor closes each AE by presenting an expert's approach to the problem, relevant conversations in the professional literature, and key concepts that should guide the analysis of similar problems.

To provide a concrete example in economics, Table 2 presents an AE and facilitation questions from the externalities module of an introductory microeconomics course. In this case, prior to class students watch a 20-minute news story on the issue and compose short-answer responses to instructor prompts. The problem requires students to do the important diagrammatic analysis of the externality issue before making their choice about the best policy choice. In this Des Moines and Raccoon Rivers example, four defensible policy choices are offered. The debrief can begin by asking one or several team reporters to explain the technical analysis. Student reporters then explain the reasoning behind each different option selected by at least one team. Instructor questions then lead reporters to consider the pros and cons of command and control versus incentive-based regulation and whether property rights could be assigned in such a way as to make additional regulation unnecessary.

[Insert Table 2 about here]

Effective AEs are challenging to craft and doing so presents an important hurdle for instructors interested in adopting TBL in their courses. To reduce the start-up costs of incorporating application exercises in economics courses, Simkins, Maier, and Ruder (Starting Point: Teaching and Learning Economics: Team-Based Learning 2018) have

created an extensive library of AEs (primarily for introductory microeconomics and macroeconomics courses).

Key Takeaway: The intentional structure and implementation of 4S AEs provides strong built-in incentives for students to prepare before class and engage in team discussions of AE choices based on economic principles, concepts, and models. The random nature of the reporting-out process requires *all* students in each team to be prepared to explain the reasoning behind the team's selected AE answer and defend it against challenges from other teams.

SUMMARY

This introduction to TBL underscores the key TBL components that systematically promote student preparation to work collaboratively and motivate active engagement with peers in team-based activities. Careful attention to team development, student accountability for learning, and the intentional whole-course TBL design encourage high levels of student effort before and during class.

Team formation and instructor guidance early in the course promote a variety of perspectives and diversity of thought within each team. Subsequent practice and regular formative feedback from peers develop student proficiency at working together, challenging each other's arguments, and developing effective team consensus around choices based on sound economic analysis in both tRATs and AEs. Each team member has a strong incentive to remain continuously engaged in the team's tasks because of the high level of accountability to teammates whose summative ratings at the end of a TBL course count toward the grade.

The overall structure of TBL courses provides an intentional framework that systematically promotes student preparation and engagement throught the course. The TBL process for each module begins with a readiness assurance process (RAP) that

motivates student effort outside of class to master factual information and basic applications of central concepts. Subsequently, a series of application exercises (AEs) engage students in highly-structured, conceptually rich discussions that require students to apply these recently-learned economic concepts, make a team choice, and defend that choice with their peers based on economic reasoning. The RAP-AE process is repeated throughout a TBL course, scaffolding and reinforcing student learning, while providing each student with frequent opportunities to articulate their understanding of course concepts and to receive feedback from peers on their understanding.

In sum, TBL offers a systematic approach to managing active learning classes in a manner that enhances student engagement and learning.

NOTES

[1] Our discussion assumes in-person classroom implementation of TBL but the principles highlighted here are equally applicable in either synchronous or asynchronous online implementations. See Palsolé and Awalt (2008) for a discussion of the latter.

[2] A transparent team formation process is helpful in the event that one or several teams finds it difficult to work together. Students in randomly selected teams (vs. instructor-selected teams) seem less likely to blame the instructor for team problems and more likely to solve problems themselves. Starting Point: Teaching and Learning Economics: Team-Based Learning (2018) and LearnTBL (2018) provide a variety of team-formation strategies

[3] One might have students prepare for such an in-class exercise by reading a synopsis of research findings on effective teams. For example, Duhigg (2016) offers a useful summary of Google's efforts to improve teamwork at the firm.

[4] IF-AT forms are available from Epstein Educational Enterprises (2020).

[5] For example, for a four-choice question, the following scoring scheme might be used: answering the question correctly on the first scratch earns four points, answering correctly on the second scratch earns two points, and answering correctly on the third scratch earns one point. The nonlinear nature of the scoring provides an incentive for the team to correctly answer the question on the first scratch, and also ensures that teams stay engaged with each quiz question even if their first attempt is incorrect.

[6] When students discover the correct answer to each question right away they are more likely to learn from the quiz (Opitz, Ferdinand, and Mecklinger 2011). In very large face-to-face classes and in synchronous online classes, instructors can administer the team quiz in the LMS, changing the default quiz settings to allow multiple attempts and to award decreasing points as the number of attempts increases.

[7] Instructors can quickly evaluate individual in-class quizzes (iRATs) using the Zipgrade (2021) app. The app enables hundreds of iRATs to be scanned in minutes and produces analytics on

individual responses to each question. For team-based quizzes (tRATs) the instructor can quickly scan team IF-AT cards as she collects them from the teams.

[8] The facts that team quiz scores average nearly 100% and that engaged students always get 100% of the points for in-class activities limit student frustration with the difficult questions on the iRATs.

[9] If an extensive set-up is required or if an instructor wishes to address student questions on the technical framework before the AE, the set-up and Q&A can be accomplished via recorded instructor videos and an LMS discussion forum before class in order to preserve class time for team work on AEs.

[10] One instructor can manage classes of up to 50-60 students – ten teams; larger classes require TA support and perhaps a modified debriefing process. Kibble (2016) and LearnTBL (2018) offer guidance for teaching with TBL in larger classes. Larry Michaelson initially developed Team-Based Learning techniques for classes of 120 (Sibley and Ostafichuk 2014).

[11] A predictable rotation of reporters among team members can result in some students disengaging from team deliberations when it is not their turn to report. To reduce this behavior, we suggest picking the student reporter by means of a random process. A "spin the wheel" app is particularly useful for this purpose and adds another element of fun to the process. Bartlett (1995, 139) notes that "adding the element of chance (in group work) … seems to be an acceptable way to have students take more responsibility for their own learning and that of others."

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Table 1. Representative iRAT/tRAT Quiz Question Examples

Example 1. Consider two restaurants located next door to each other: Quick Burger and The Sunshine Café. If Quick Burger opens a drive-through window, the increased traffic and noise will bother customers seated outside at The Sunshine Café. The table below shows the monthly payoffs to Quick Burger and The Sunshine Café when Quick Burger does and does not operate a drive-through window.

	Quick Burger Operates a Drive-Through Window	**Quick Burger Does Not Operate a Drive-Through Window**
Quick Burger	$24,000	$15,000
The Sunshine Café	$11,000	$23,000

Based on the information in the table above, is it socially optimal for Quick Burger to operate a drive-through window?

a. No, because The Sunshine Café's payoff is lower when Quick Burger operates a drive-through window.
b. No, because total payoffs are higher when Quick Burger does not operate a drive-through window.
c. Yes, because total payoffs are higher when Quick Burger operates a drive-through window.
d. Yes, because Quick Burger's payoff is higher when Quick Burger operates a drive-through window.

Example 2. Compared to a fixed percentage reduction (command and control) regulation, a tax on pollution encourages:

a. firms that can more cheaply reduce pollution to make larger reductions.
b. firms to reduce pollution by the same percent.
c. firms to use the same technology to reduce pollution.
d. big firms to make larger reductions because they can more easily afford it.

Source: Frank et al. 2019.

Table 2. Example of a TBL AE and Accompanying Instructor Facilitation Questions

Water Pollution and Drinking Water in Des Moines, IA
Consider the issue of nitrate pollution by farms in Iowa fouling the Raccoon and Des Moines Rivers, the sources of drinking water for the City of Des Moines, IA.
What policy measure should be enacted to remedy the problem?

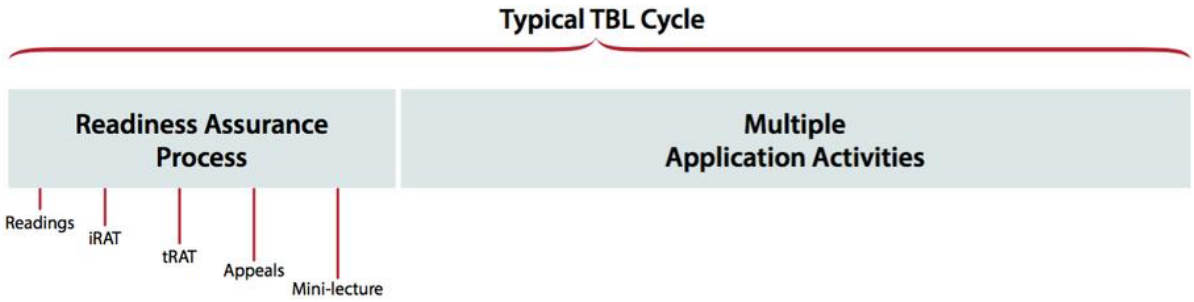
A. Require substantial reductions in nitrate use of all farms.
B. Tax each ton of nitrate applied to farms.
C. Assign property rights over the river water clearly to the City of Des Moines.
D. Assign property rights over the river water clearly to farmers.

(*Note: student reporters should be prepared with the appropriate analysis of this issue using the basic externality framework for this case in their notes.*)

Instructor Facilitation Questions

1. Explain why your team chose your answer. (Ask this of one or two students making each choice.)
2. Why didn't your team choose answer ___?
3. If the property rights are clearly defined, are negotiation costs low enough that we could expect private parties to come to an efficient solution? Why or why not?

Figure 1. The TBL Module Framework



Source: Introduction to Team-Based Learning 2014; used with permission.

Figure 2: The Immediate Feedback Assessment Technique (IF-AT) card.

Source: IF-AT (Immediate Feedback Assessment Technique) Forms 2019