Effective Task Design for the TBL Classroom

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Group and team tasks are the culminating outputs of student learning in team and collaborative learning environments. How they are conceived and designed, therefore, can directly determine the success of the pedagogical strategy. A key design issue for creating effective tasks is how best to focus student knowledge, observation, and analysis toward a concrete action that makes thinking visible. Actions in the shape of clear decisions applied to complex scenarios, within a restricted framework of options, are most likely to channel student thinking toward higher-level goals. The authors provide principles and examples for designing group tasks in any discipline.

Introduction

Effective task design and management are at the heart of team-based learning (TBL). Whether or not the Readiness Assurance Process (the TBL process of testing students on their attempt to cover a unit of content on their own) is successful in preparing students to apply what they know, it is the collective decision making required by team tasks that truly focuses student learning, provides traction in the learning process, induces team cohesion, and stimulates general student enthusiasm. If the tasks are not carefully conceived and challenging in the right way, student focus drifts, classroom energy falls off, and teams fail to cohere. For this reason, task design should be a first concern for an instructor transitioning from more traditional teaching to TBL. Effective design and implementation of tasks can offset many problems, and can even carry to partial success an otherwise flawed TBL implementation. The purpose of this article is to

frame the challenge of task design conceptually, extract some principles based on that conceptualization, and offer examples showing how the principles can be put into practice in a range of disciplines.

Tasks Make Learning Visible

A central tenet of TBL is that student learning is driven through frequent and, whenever possible, immediate feedback. In order for this to happen, student learning and consequent use of that learning in their thinking have to be made visible—to students themselves as well as to the instructor. Students, therefore, need to be required to *act* frequently in ways that generate consequences that provoke reflection and demonstrate visibly their thinking. The more focused and concrete the action, the more visible will be the thinking and the learning—and the more immediately useful will be the feedback.

Recent findings in neuroscience, cognitive science and psychology can help us visualize this key role of action in the learning process. Bransford (2000), for example, emphasizes the essential difference between understanding and memorization, citing numerous studies showing that simple rote learning does not lead to transfer of knowledge. Cognitive psychologist Willingham (2009) argues that "Memory is the residue of thought" (p. 54), meaning that thoughts are made manifest by actions, and only acting on information can transfer it from working memory to long-term memory. The work of neuroscientist Zull (2002 and 2011) reinforces these findings, showing that learning that has not been put into the service of action tends to remain dormant and through disuse becomes less retrievable from storage in the brain's neuronal networks.

Much of this work builds on earlier studies in psychology, namely Kolb's theory of experiential learning, depicted in Figure 1. This idea of the learning cycle is a useful guide in thinking about the process we are trying to foster in our students' cognitive functioning. The conception of learning as a cycle helps us to envision how our knowledge of the brain can be translated into successful classroom practice. In Kolb's description, the experience of an action leads to observing and reflecting on its consequences. This reflection is the first step in abstracting from the experience a conceptual understanding of what happened and what it might have meant. As abstract theorizing develops, opportunities for experimentation with the use of that knowledge should follow so that students can put their abstract understanding to the test. It is this ongoing interplay between abstract conceptualization and active, concrete experience that creates the possibility of storing learning and applying it to new situations.

Figure 1
The Kolb Experiential Learning Cycle
(from McLeod, 2010)
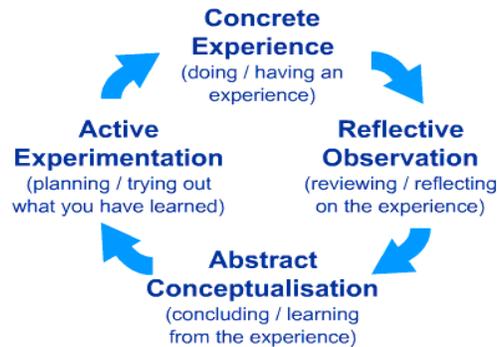
In the college classroom, one of the instructor's most important jobs is to design and *stage* opportunities for students to undergo this cyclical action-reflection-conceptualization-action process so that relevant information and ideas become fully networked in the brain. A comparable level of fully networked understanding is extremely difficult to build through less-active means—by sitting through a lecture, for example, or watching a video or reading a text. Our students need to construct their own conceptual understanding within the framework of active individual experience. Each action we ask them to take leads to reflection and greater awareness, which, in turn, leads to receptiveness to new information, integration of that information, and planning for new, more informed actions. In essence, we are helping our students work toward becoming more intentional and more expert in their thinking and actions, particularly with respect to our discipline. The assigned tasks that induce these actions drive learning. They, therefore, need to be integrally connected to the larger, overarching strategy of the course and directly tied to course learning goals.

Course Design, Task Design, and Disciplinary Thinking

More traditional, instructor-centric teaching practices tend to shape courses and curricula around disciplinary content. Syllabi are routinely

structured as sequences of topics that will be covered from week to week, and often track to textbooks with similar patterns. This approach to content can sometimes be a barrier to deep learning, as it does not capture the full scope of what it means to work and think within a discipline. The signature of a discipline, whether in the humanities, sciences, social sciences, or professional fields, is less its content (which might be shared among several disciplines) than its actions. Historians are historians not just because they deal with historical texts and artifacts, but because they use historical resources to inform actions that are typical of historians, such as reconstruction of a past event, evaluation of the influence of a particular person, and the like. Sociologists might (and often do) use those very same historical resources to inform a different set of actions, such as in the analysis of a contemporary sociological condition or the determination of how a social injustice came to exist. An economist might use the same resources yet again to inform her construction of a predictive model of behavior in a given set of market conditions.

A bit further afield, but no less relevant, an epidemiologist, trying to track the evolution of a virus over time, might have reason to explore these same historical resources because they contain evidence of behavior and circumstances related to the emergence of a pandemic. Specific information ("content") does not suffice to define a discipline. Disciplines are more clearly defined by how those working within the discipline collect, organize, assess, and use information.

The real difference, therefore, between novice and expert thinkers in our disciplines is not determined by the amount of information they have covered or even mastered, but rather by their relative ability to interact with that information. Course and task design need to be pointing students not toward simply knowing more, but ultimately toward more refined, more expert ways of responding to and using information. If we want our students to become more expert in our disciplines, we need to structure their encounters with content in ways that change what they can *do* with knowledge.

Implications for Task Design

The most clarifying action a student can take is to make a decision. Requiring collective decision-making provides an opportunity for students to practice the kind of thinking we want to promote in our courses and disciplines and is the starting point for effective overall TBL course design. A well-constructed decision-based task integrates components of higher-order thinking: analysis of the particular situation to deter-

mine competing priorities and values; various lines of reasoning; use of relevant concepts, principles, laws, or other abstractions at play in the situation; reflective, critical thinking *(Are we sure of these facts? Are we sure we understand?);* and, ultimately, a judgment that is expressed in a visible, concrete action/outcome that can be evaluated. Effective team tasks point students consistently toward making decisions that reveal reasoning and understanding in service of a judgment. The judgment students make ideally will replicate as much as possible the kinds of judgments made by disciplinary thinkers.

In order to put students on this track, we first need to identify and characterize the kinds of actions and decisions that thinkers in our disciplines execute frequently. Then we can reverse engineer situations where students practice doing these very things. In this way, we ensure that students also practice using the targeted disciplinary content of the course. Here are some key questions that can help us begin the process:

- What do people in your discipline do with the information they collect and/or use? What kinds of problems do they try to solve?

- What is characteristic about the way practitioners of your discipline think—that is, how do they approach and enter problem-solving? How do they reason?

- What kinds of judgments do experts in your discipline have to make?

- What assumptions consistently inform their decisions and other actions?

- What are the discipline-specific actions and types of decisions that a successful student will be ready to carry out as a result of your course?

Jotting down several items for each of these questions will help instructors characterize and eventually locate or invent the types of tasks that will be relevant to the learning targets of their course. What follows are a few basic examples of decision-making in various disciplines.

- *Economics*: Decide which patterns of buyer behavior can be determined from a given set of consumer data.

- *Sociology*: Decide what might be the implications of a new data set for understanding a specific social phenomenon.

- *Philosophy*: Decide whether a given action is just or rational, according to specific criteria or values.

- *Business*: Decide which marketing strategy to use, given background data and consumer circumstances.

- *Literature*: Decide what patterns an author has constructed to influence reader perceptions.

- *Writing and Rhetoric*: Decide which evidence would work best to support a given thesis.

- *History*: Decide which account of an historical event is most convincing, given competing perspectives and evidence.

- *Biology*: Decide (predict) which environmental conditions will most alter an organism's DNA.

- *Chemistry*: Decide (predict) how a given molecular structure will be changed by contact with other specific types of molecules.

- *Math*: Decide which variables are significant or which calculation strategy will produce the most valid or accurate result.

From this macro perspective, in which we identify globally what students need to be doing daily in order to practice disciplinary thinking, we are ready to move to the micro-level and look at more specific elements of task design. The most successful TBL courses are those in which the instructor maintains the macro-micro perspectival exchange throughout the course. Keeping an eye trained on the macro while working on the micro will also facilitate the selection of material and formats for team tasks and other assignments. The daily, specific team tasks need to inform and align with the bigger actions (such as major graded assignments)—and vice versa.

Situating Team Tasks in a Learning Sequence

For tasks to be perceived as authentic and valuable learning opportunities, students need a clear sense that they are serving the stated learning goals and disciplinary thinking goals considered above. This is particularly true when we want to challenge students at a high level, such as by asking them to make decisions that they perceive to be above their current level

of expertise. If they do not value the kind of thinking we are asking them to practice, they may be resistant to the challenge. In this context, tasks serve various tactical purposes at different times.

Before the RAP: Use Naïve Tasks to Launch a Learning Sequence

A common source of pushback early in a TBL course is students' mistaken belief (sometimes unintentionally reinforced by a "helpful" instructor) that they cannot do the reading on their own. In the face of resistance, many instructors will instinctually move toward one of two problematic practices: (1) giving students a highly detailed reading guide or set of questions to answer or (2) lecturing before the I-RAT. Either of these will undermine the goals of TBL. One way to avert this situation is the use of *naïve* tasks.

Naïve tasks occur at the very beginning of a learning sequence—even before the reading assignment—and are designed to induce an attitude of inquiry. When designed and managed appropriately, they serve to challenge students to test their preconceptions and practice their reasoning before being exposed to the targeted unit of content. In this way, naïve tasks serve to surface pre-existing errors in student thinking. More important, though, making and defending a decision before having access to key information promotes the perception that the information, when it is eventually provided, will be a valuable tool or resource. Consequently, students will be more likely to undertake the reading assignment with greater enthusiasm because the readings are no longer a mere requirement. They are, instead, perceived by students as being useful for the purpose of assessing and improving their own thinking.

Naïve tasks provoke curiosity and function as a kind of reading guide without becoming a crutch that reinforces students' learned helplessness the way more direct instruction can do. Reading with a specific, self-corrective purpose also replicates the way actual experts (and our brains in general) approach and respond to new information. The naïve task strategy therefore supports the long-term goal for students to begin honing their intuitions about thinking in the discipline. The example below is a naïve task from a course in economics. It can be used to introduce the fundamental concept of "elasticity" or as practice to develop deeper understanding after a general conceptual introduction. This task can be set up using a graph and a brief explanation of how the axes and curves show schematically the supply and demand relation to price within any given market. For example, Figure 2 illustrates elasticity as a concept used for measuring how likely change in a given market factor (for instance, quantity/supply) might influence another factor (for instance, demand/price).

Figure 2
Elasticity

Q (Quantity)
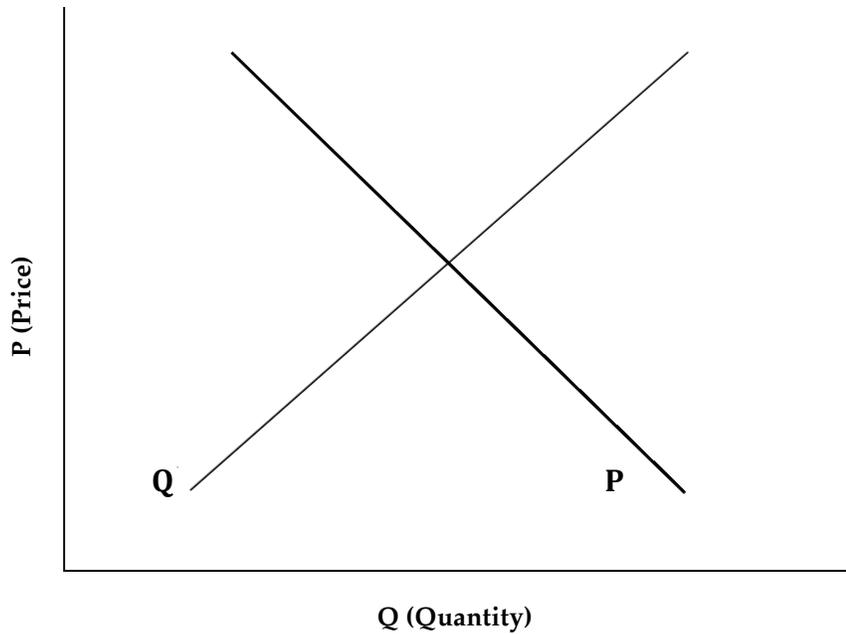
Students are then asked to choose an answer to the following:

Which of the following will NOT cause a shift in the demand curve for ice cream?

A. The government gives every family $500 tax rebates.

B. The price of frozen yogurt doubles.

C. There is report that milk products used to produce ice cream have special health benefits.

D. The price increases by $1.

E. None of the above—these all cause shifts in demand.

(example supplied by Shawn Bushway, Criminal Justice, University at Albany)

After students have proposed and debated possible answers to this question with their teams in class, they are ready to tackle the reading, which is a more systematic presentation of market forces. Because the naïve task has already driven students to grapple with the concepts presented in the reading, they will now read actively, with an eye toward the kinds of judgments and decisions they will be able to make, once they have understood the new information.

Here are some sample naïve tasks from other disciplines:

- *History*: Read this paragraph (from an unknown source). In which decade do you think it was written? Why?

- *Anatomy*: Look at this photo of a liver. What does it suggest about the health condition of the person it belongs to? Why?

- *Literature*: Read this paragraph. Predict the actions and fate of the character you see described, based on the limited information provided (and be ready to say why.)

- *Engineering*: Look at this design of a bridge. In an earthquake, which element is most at risk of failure? Why?

- *Computer Science*: Look at this sequence of code. Which series of actions is it designed to execute in the robot? Why?

- Various disciplines: Read this specific claim/statement. Which of the following theories does it appear to represent/support?

While naïve team tasks can be used at the very beginning of the RAP before students have read, they can also be used during the "informed" application task phase of a sequence. In the latter case, naïve tasks prepare students for new concepts that build on those already encountered in the core readings (discussed below).

Finding the appropriate level of difficulty for naive tasks is essential to their success: The tasks need to require a real judgment and a concrete decision based on that judgment rather than merely ask students to supply or apply basic knowledge. By asking students to act in the face of "insufficient information," naïve tasks validate the role of information when it finally lands. In order to create room for information, a naïve task needs to be difficult enough that most teams will struggle and likely arrive at the wrong answer at first.

Beyond the level of difficulty of the task, cultivating an atmosphere of playfulness is essential to encourage teams to persist in the face of this difficulty. Students have to feel an intrinsic reward for "playing along" and even getting the wrong answer. Handling wrong answers is also a crucial moment for instructors—we need to acknowledge their errors in thinking while demonstrating that with more information, the challenge we have presented is surmountable. Finally, a publicly reported team decision is essential so that students are held accountable for their current thinking (like experts and professionals) and have an opportunity to re-examine their position in light of other students' responses to the same challenge.

Because naive tasks are intended to induce reflection and surface common student misconceptions rather than evaluate students' final level of learning, and because students need encouragement to take risks in their thinking, the stakes for naïve tasks should remain low. This means that they will most likely be ungraded, or at most be good for bonus points, in order to minimize the perceived cost of error. The psychological support of the team is also a fundamental component of naïve tasks. The team structure allows students to be less self-conscious about errors than when they feel they are individually accountable.

After the RAP: "Informed" Tasks That Put Knowledge to Use

An essential difference between a traditional course and one designed for TBL is the role of content. In a TBL course, acquisition of course content/knowledge is not the primary learning goal, but it is the vehicle for students to practice specific ways of thinking and acting. "Informed" tasks, as opposed to naïve ones, ask students to convert their reading, understanding, and reasoning into judgments and clear decisions that make the learning and thought process visible.

There are multiple levels of informed tasks, and one of the first challenges facing new TBL adopters is creating lower-level tasks that require real judgments and authentic decisions rather than simple plug-in responses. It is important to keep in mind that the Readiness Assurance Process has confirmed basic understanding, and this does not need to be repeated. Tasks that aim too low and ask only for basic recall/recognition/rote memorization create little opportunity for meaningful struggle. These tasks will often lead the most diligent students on the team to dominate the conversations because they can simply rely on their memory or superior reading skills, and less diligent students will learn that they can freeload. This will not only undercut intellectual development, but will also compromise team cohesion.

Assessing basic understanding is typically best suited for individuals (in a homework task, for example). However, if the instructor does decide to review basic understanding of concepts using team tasks, these should minimally ask students to *interpret* or *translate* ideas and information so as to demonstrate understanding rather than recall. Lower-level application tasks, which ask students to *transfer* conceptual knowledge to concrete situations and specific examples, also can be used to review and/or confirm basic understanding.

Bloom's Taxonomy (1956) is the best-known model for classifying learning objectives by level of intellectual challenge. The simplified version in Figure 3 is a useful distillation of the taxonomy into three basic cognitive levels and suggests some types of tasks that will lead to actions corresponding to each category.

What follows are some elaborated suggestions for framing tasks that address skills at the various levels.

Knowledge/Comprehension (framed as interpretation, transfer, and simple application):

- Rank the following statements from most to least effective in summarizing the author's argument about X. (interpretation)

- Assign the following new statement to one of the three categories identified by the author. (transfer, simple application)

- According to the chapter, which of the following (new statements) would be an acceptable definition of X? (interpretation)

- According to the reading, which of the following (new items) would be the best example of concept X? (transfer, simple application)

- *Physics*: According to the reading, which kind of stress is most likely to be at work when force is applied at point A in the following (new) diagram? (transfer, simple application)

- *History*: Now that you know the definition of "dynasty" from the readings, which of the following (new) examples from history is most representative of the concept? (transfer, simple application)

Figure 3 **Bloom's Taxonomy (Simplified)**	
Synthesis/Evaluation	• Predict consequences • Predict patterns • Make judgments
Application/Analysis	• Find causes • Find patterns •Conduct comparisons
Knowledge/Comprehension	• Recall information • Restate accurately • Translate into new language

- *Social Work*: Which theory covered in the reading provides the best explanation of what occurred in this (new) case of child abuse? (transfer, simple application)

Analysis (framed as comparison, contrast, analytical differentiation):

- Which factor in the given list below would you weigh most heavily in a diagnosis of X (a new case)?

- Which of the following theories (that you just read about) would be most useful in predicting the outcomes of this (new) process?

- Which of the following (new) statements is consistent/not consistent with the writer's perspective?

- Which of the following claims about X phenomenon could be explained/defended/refuted by an application of Y theory?

The highest-level tasks require more complex processing and use of knowledge. They target broader judgments that reference multiple factors and thereby call for expert-like decision-making:

Advanced Analysis, Synthesis, and Evaluation (framed as expert-like judgments that integrate understanding for complex decisions):

- Rank the following strategies / recommendations / explanations in terms of which would be the most effective, in light of the theories we just read about.

- Given the facts of this scenario, and the competing priorities, decide upon which of the following recommendations you would make first.

- Analyze this new data set: Based on the theories covered in the reading, and given what you now know about X, which of the following explanatory hypotheses has the most credibility?

- Based on the facts as you now interpret them, evaluate the relative truth of the following claims by ranking them.

As most of these latter examples show, one reliable technique for writing higher-level tasks is to think in terms of situations, scenarios and cases that are typically encountered in the discipline. Brookfield (2011) provides an effective overview, with examples, of "Scenario Analysis" techniques, in *Teaching for Critical Thinking*. Scenarios allow you to embed many variables that can be used to introduce multiple concepts, theories and perspectives into students' discussion, as well as to complicate the task, if desired, through a mix of relevant factors and red herrings.

Promoting Critical Thinking Through Task Design

Critical thinking is a productive consequence of intellectual frustration. It begins to occur at that moment where knowledge, insight, reasoning, and other assets prove to be inadequate for addressing with complete confidence the problem at hand: Students are forced to make a decision that stretches them. This is the moment where they will finally adopt a critical thinking attitude and ask themselves, "What are we really sure of? Are we making the right assumptions? Are we overlooking something because we are biased? Have we exhausted all possibilities? Do we have access to any additional information? What does our best judgment tell us? What are the potential consequences of any of our possible actions? Which of those consequences are we most willing to accept?"

The emergence of critical thinking in the TBL classroom is closely interwoven with the building of team coherence. Team coherence and critical thinking both develop when students are forced to consider, respect, evaluate, and respond to the positions and ideas of other team members. This rarely occurs when the task is open-ended, such as in a brainstorm

or other "generate solutions" assignments. As long is as it is possible to believe that "one idea is just as good as another—we don't need to evaluate and prioritize," many students (and most humans!) will shy away from the hard work of real thinking.

The function of the collective decision task, therefore, is to place a restrictive frame around the team's action. This restriction forces the team to evaluate, integrate and, if needed, respectfully discount a team member's inputs *en route* to a judgment and a focused decision. A sound idea, a persuasive line of reasoning or a convincing argument will eventually emerge when it withstands the critique of all team members. As the team's coherence develops, so do the comfort, freedom and willingness of individual members of the team to speak frankly about the value of any other team member's idea.

A secondary but nevertheless important dimension of this centripetal pressure on teams is time limitation. As long as students have the impression that a decision can be deferred or deflected ("we don't have enough time, so we give up"; "we need more information, so we won't respond") critical thinking will not readily occur. Time limits on tasks and the expectation that reporting will happen, finished or not, are therefore essential.

Finally, a crucial element of the critical-thinking process is making mistakes: if students are to develop an attitude of persistence in the face of difficulty, they must become experienced in confronting and reflecting candidly on the errors in their thinking. This means that it is essential for teachers to balance the pressures created by forced decisions and time limits with a healthy respect for honest, thoughtful mistakes. In fact, instructors must force students to make errors that will create opportunities for careful consideration of where their prior knowledge and ways of thinking are insufficient. Creating this atmosphere requires a mix of graded and ungraded team tasks, careful attention to team-building, and strategic debriefing of tasks to induce productive reflection. The 4-S principles of task design are essential to fostering this environment.

Principles of Task Design:
Elaboration on Michaelsen's 4 S's

We begin this section by referencing the original framework for TBL task design, conceived first by Michaelsen, Knight, and Fink (2004) as the 3-S's, then later revised by Michaelsen and Sweet (2008) to become the 4-S's:

- Significant problem

- Specific choice

- Same problem

- Simultaneous report

The longer we have worked with these principles, the more relevant and empowering they have proven to be. Each of the S's captures a necessary dimension of task design and management. "Significant problem" and "specific choice" establish how the task will be drawn from content and structured for student action. "Same problem" and "simultaneous report" address how the task will be administered and managed. In the following paragraphs, we seek to build out from these principles, by elaborating on their original rationale and by supplying some examples of how they can be operationalized.

1. Significant Problem: Selecting Content for a Task

What is truly problematic in your field and in the content you are teaching? What is difficult to understand fully and to resolve? In order for students to engage with your content at a high level, they have to believe that what they are struggling to do really matters. Tasks, therefore, need to address questions that are compelling in your discipline. The best tasks ask students to make judgments and decisions that parallel those of experts exposed to similar (or, at least, parallel, analogous) circumstances, conditions and information. A truly *significant problem* is, ideally, one where the teams' responses may not fully resolve the issue; they serve mainly as the pretext and entry point for inquiry and reflection. In fact, the very best problems (which may or may not be within the scope of your particular course) point toward disagreements among experts in the field—problems where different paths can lead to credible and defensible solutions.

When the problem is significant, real learning occurs during the debriefing of the task. If the debriefing discussion ends shortly after students show their answers, the challenge may not have been sufficiently problematic or, therefore, truly significant. In the best of cases, there will be substantial disagreement among the teams, but even when all teams have chosen the "correct" or "best" answer, a truly significant problem can still lead to a lively discussion in the debrief, as students will still need to explain and justify their thought processes, which may vary across teams.

Tasks that can be accomplished by applying simple knowledge in a single-step reasoning process to arrive at an answer are unlikely to challenge students meaningfully. Similarly, tasks that simply elicit an opinion, impression, or personal perspective will fall short of the mark. Tasks that allow students to stumble upon a correct answer without having engaged

in a rigorous thought process are destined to be trivial. *To be effective and authentically significant a task has to lead students to a decision point that invites—and may even demand—the question "Why?"* "Why?" is the doorway to course content and disciplinary thinking—and to meaningful inter-team conversations.

## 2. Specific Choice: Delimiting Student Action

Our instincts sometimes tell us that the best way to lead students toward a full exploration of multiple perspectives is to start discussions with a wide-ranging question or set of questions that will open several possible avenues of inquiry. Whenever we tell students to "discuss," we envision that they will use the collective wisdom of their group to converge toward meaningful possibilities. The problem with this approach among relative novices is that they often take the conversation in directions that may not be highly productive. Contrary to our instincts, we need to shape and stage student conversations around tasks that more carefully direct them toward a productive outcome, a *specific choice*. Figure 4 uses the image of a tunnel to communicate the dynamic of an effective discussion. At the outset of the process is the frame that establishes the field of action. The format of the question structures the discussion and sets expectations for how it will be reported. At the other end of the process is the moment of public accountability, in the form of the proposed solution (product or decision) that emerges from the team discussion. Between these two moments, the teams experience a sense of relative autonomy. They are free to exploit any means at their disposal to find and evaluate all relevant possibilities in the process of reaching the conclusion supported by all team members.

Tasks that direct students toward a specific choice do not stifle student thinking but concentrate it so that feedback on the task can be directed at specific, anticipated discoveries and realizations. Restricted decision making allows the instructor to ensure the terms of the whole class debrief. The forced compare-and-select approach means that students will be engaged in very specific points of analysis during the team decision-making process. A broader-ranging discussion can follow during the task debrief, after students have begun to sort through the possibilities that the instructor has provided.

What follows is an example of how a typical discussion prompt becomes a TBL question. Consider a typical group discussion prompt (from a course in sociology):

> Discuss the factors that Karlsen, writing in *The Devil in the Shape of the Woman*, argues are relevant in an accusation of witchcraft. What seems to be important?"

Figure 4
The Shape of the Learning Process in a TBL Course
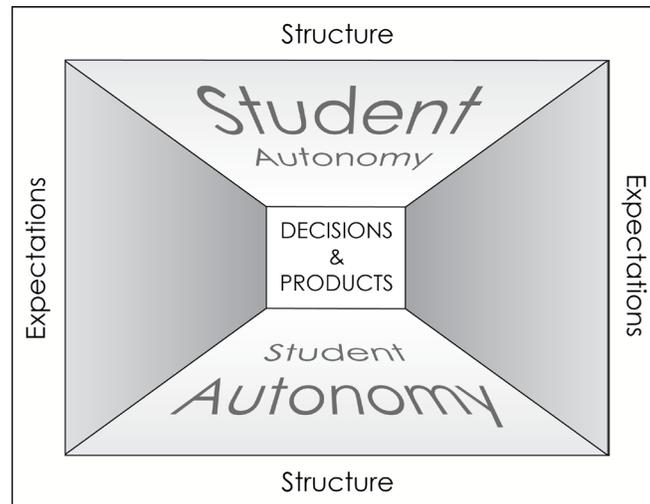
A TBL decision task prompt could read as follows:

> Based on your reading in Carol Karlsen's *The Devil in the Shape of the Woman*, which of the following would she consider the most relevant factor in an accusation of witchcraft?
>
> A. Accuser's concern with maleficium
>
> B. Accuser's gender
>
> C. Accuser's relationship with clergy
>
> D. Accused's relationship with clergy
>
> E. Accused's age

Here we have pointed the teams' conversations to a limited set of possibilities, and in doing so we have ensured that students will weigh exactly the factors we want them to weigh. If there are other issues that are important, we will have the opportunity to bring those out in the debrief of the team answers.

The example above demonstrates one obvious strategy for creating specific choice tasks: multiple-choice questions. Below are several other

formats that can also lead to simultaneously reportable, focused choices.

Ranking: Rank the following solutions in order of their plausibility (Debrief: Report highest or lowest).

Sorting: In the envelope on your table are strips of paper, each listing a statement about X phenomenon. Sort them according to the 4 theories we have been studying (Debrief: Report whole solutions on poster; or, ask students to announce by show of cards how they categorized an individual item).

Scoring: Read the following excerpt. On a scale of 1-4, assign a score that indicates how successfully this writer has applied X principle.

Sequencing (chronological; procedural; logical; narrative): Place the following events from American history in chronological order; or place the following steps in the order that represents the most effective procedure for solving X problem.

True/False: Evaluate the following statements and decide as a team whether they are true or false. Be prepared to explain and defend your team's answers:

- Humans are more highly evolved than ants.

- Over time, species evolve into better or more highly evolved species.

 (*example supplied by Kristina Spaulding, Psychology, University at Albany*)

What does not belong? Look at this slide (not shown) that lists nine consumer behaviors. With your team, select the five (or three, etc.) behaviors that research has shown to be most greatly affected by an economic downturn.

Matching: Figure 5 provides an example of a task based on matching.

3. Same Problem: Strategic Task Administration

Same problem can be one of the least intuitive elements of 4-S design, because it runs counter to many traditional beliefs about teaching. As information in the disciplines continues to expand, we feel increasing pressure to "cover" as much content as we possibly can in any given class period. Well-meaning instructors may believe that one way to achieve this coverage—and to remove ourselves from the center of our classrooms—is to create situations where students "teach" each other. To achieve this,

Figure 5
Matching

Match the claims in list 1 with the correct causal mechanisms in list 2.

List 1: Claim

A. Farm subsidies increase production.

B. Market concentration in food production and distribution leads to increased subsidies.

C. High corn yields cause negative externalities, such as pollution runoff.

D. E coli infections have increased dramatically.

E. Corn subsidies increase child obesity.

List 2: Causal Mechanism

1. Slaughterhouses have become fewer and larger.

2. The policy lowers the cost per unit, which leads to an increase in demand for the good.

3. HFCS lowers the cost of soda, which increases consumption.

4. Fertilizers and pesticides increase production per acre.

5. Many former executives served in the USDA and FDA.

(*Example supplied by David Rousseau, Rockefeller College of Public Affairs & Policy, University at Albany*)

we divvy up tasks, asking each group to be responsible for one element of the content and then to share their findings with the rest of the class. But when it comes time to report and "teach" the others, there is little intrinsic motivation for students to care or listen. Rather than inspiring curiosity about what the other groups have to say, the divide-and-conquer approach actually quells it. Students are forced to sit through reports and discussions that have no immediate relevance to them.

Students *are* interested in what their peers have to say when they themselves have a stake in the conversation. If all teams are at work on the same task, the learning moment will be the debriefing of team responses, which begins with comparison of those responses across teams. When a team can see that "We were sure we were right, but our answer is different from everyone else's!" they are ready to listen to their peers and participate in a learning conversation. Their egos and emotions are engaged. They have an authentic desire to know: "How did you arrive at that answer? What about X? Why didn't you consider Y?"

4. Simultaneous Report

Now that all teams are working on the same task, the logic of a dramatic, *simultaneous report* becomes evident. It is useful for the instructor to adopt a visualization method that works well consistently: cards, posters, personal response systems (clickers), whiteboard "reveal," or other mechanism. Experience has convinced us that cards or other visual tools work better than clickers for this purpose. While clickers can be used to simultaneously report team decisions, they fail to provide the crucial sense of immediacy and dramatic ownership that comes when students hold up cards or sheets showing how they decided, *vis à vis* the other teams.

Aside from the theatrical flourish that brings energy to the classroom, simultaneous report has a more fundamental function in the learning process: public, highly visible accountability that levels the playing field for all students in the room. Students need to see how their thinking compares to that of others in order to reflect candidly and self-assess. If teams are asked to report their responses sequentially, rather than simultaneously, students can fall into the trap of self-deception: their ideas can conveniently and comfortably morph to those that belong to whichever group's report seems most convincing or most admired by the instructor. In this case, the opportunity for real self-assessment is lost. Sequential reporting also introduces the risk that students will begin off-task side conversations and fail to pay attention to or participate in the whole class discussion.

Consistently creating tasks that allow for simultaneous report is a chal-

lenge for instructors new to TBL. In some cases (for example, multiple choice questions), report-out strategies are relatively simple to devise. With more complex tasks, a little more creativity is sometimes required. For example, if students are asked to create a ranked list, a simultaneous report can begin by asking teams to show (on a card, for example) their top one or two—or bottom one or two—choices.

Beyond the 4-S's: Other Principles of Task Design

4S+1: Focus Tasks on Concrete Actions

Too often, we initiate discussions with students by directly referencing abstractions they have read about, such as definitions, systems, principles, taxonomies. A prevailing assumption is that once students master the language of a definition or schema, they will then be able to use those tools in their thinking and decision making. When we begin with abstractions, however, we frequently find that students can mimic understanding by identifying or even reciting formal definitions but may not really grasp the implications of what they are able to recognize—and even repeat accurately.

Students' passive familiarity with abstract concepts will be converted to active understanding only when it is applied and tested at the level of concrete, specific scenarios that evoke the abstractions without necessarily citing them. The economics example above of teaching "elasticity" by means of a question about the price of ice cream is a case in point. The earlier in the process students can be confronted with specific situations, the more quickly they will gain traction with the abstractions.

To illustrate further, let us consider a classic approach in which an instructor asks students to check their understanding using a multiple choice format and bases the task on statements written in language close to that of the textbook.

Original question:

> By what mechanism does dopamine cause behavior to increase or strengthen?
>
> A. Dopamine causes pleasure.
>
> B. Dopamine motivates willingness to work for reinforcement.
>
> C. Dopamine predicts the arrival of a reinforcer.
>
> D. None of the above

A student responding to this question is likely to recognize a correct answer that echoes the language of the reading ("reinforce"), but familiarity with the language does not indicate that students can apply the concept. To do so, the task would need to be more concretely situated:

Revised question:

> Sara finds that she cannot stop eating chocolate. Which of the following explanations is the most credible?
>
> A. It causes Sarah to feel pleasure.
>
> B. It increases Sarah's motivation to seek out and eat chocolate.
>
> C. It creates a sense of anticipation for something good (chocolate).
>
> D. None of the above
>
> (*example supplied by Kristina Spaulding, Psychology, University at Albany*)

Students who can answer this question accurately are likely to have demonstrated an understanding of how dopamine works, because they cannot slide by with simply parroting textbook language.

What we know about the nature of learning is that students gain deeper traction, faster, with course content if their first encounters with it include concrete experiences framed by and informed by the abstractions. As we move through a learning sequence or cycle, tasks may eventually become more abstract, but students need to start with decisions that make real and visible the significance and implications of targeted concepts.

4S+2: Worksheets Are for Individuals; Decisions Are for Teams

In the interests of efficiency, we may be tempted to present a sequence of small tasks all at once. Designing tasks that lead students through a complete thought process is an essential strategy, but giving teams several tasks at the same time on a single handout or a worksheet will lead to behaviors that TBL is specifically designed to prevent (for example, a dominant student taking over or a "divide and conquer" approach).

Teams are effective when their tasks drive them to converge collectively on a single decision. If we really want teams to work through a suite of tasks, we will need to isolate each one as a separate decision, with

simultaneous report at each step of the way. In this case, they should be scaffolded, one upon the other, each leading to decisions with greater complexity and integration of learning.

If the suite of ideas cannot be represented as a sequence of discrete team decisions, consider assigning the earlier parts of the sequence to individuals to work on separately before assigning teams a decision-making task. This approach works well in courses that require students to practice quantitative calculations. Students work through the necessary calculations individually, then convene as a group to make a broader, more conceptual judgment that is based on the collective understanding gained from individual work.

4S+3: Plan the Debrief When You Plan the Task

The design of a task is ultimately only as good as its execution and management. If you have not anticipated what students' responses to the task will be, you may not be ready to debrief their decisions effectively. What if everybody agrees or gets it right? What if everyone gets it wrong? A task that adheres to 4-S design and works well on paper can be completely derailed in the classroom by the unexpected. Having some strategies in mind can help to avoid this problem.

Have a concrete plan for simultaneous report—and make sure not to follow a simultaneous report with a sequential report of each team explaining its answer. Cluster answers during the debrief: "I see that several of you said 'A.' Team 2, what was your reasoning for 'A'? Ok, did any teams have a different reason for answer 'A'? Team 4, you said 'B'; why?" While it is important to bring to the surface the different reasons for why teams arrived at their answers, polling each team in sequence undermines the purpose of simultaneous report. If every team gets the correct or best answer, the debrief of team answers will proceed very differently than a situation where there is a wide variation in answers. An instructor must assess where a deeper analysis of multiple team answers is required and where it is superfluous or repetitive.

Defer the reveal of a correct or best answer, if there is one, until you have debriefed the teams' responses—"as if" all responses are possible. In some cases, you may even want to leave the problem unresolved, so you can send students back into their teams (or back to the texts) to reconsider their thinking via a new question. Once the instructor has stepped in and offered the "correct" answer, meaningful discussion has ended because the expert has spoken. There is an essential difference between asking student teams how they arrived at an answer that might be right, and asking them how they arrived at their answer if they already know it is wrong.

Know where students are likely to struggle with a task, but be flexible when your prediction isn't on target. Out of respect for students, you may have to let them go a ways down the wrong path before you redirect them to more productive territory. As instructors, we are often made uncomfortable by student errors, and we feel responsible for immediately correcting them. However, intervening too early can diminish a team's sense of ownership of their own responses.

4S+4: Logistics and Management Matter

The problems of typical "group-work" are much more likely to arise if students are unclear about what is expected of them. We have found that some basic logistical strategies are useful in keeping teams focused and engaged.

Give clear directions for each task in writing (ideally projected on the classroom screen). If there is to be a series of tasks, show directions for each separate step/sub-task on a separate slide. Keep directions visible while students are working. This serves several purposes: First, writing out each step of the directions in advance forces you to think through the process in which you want students to engage; second, you don't have to remember all the steps in class because they are right in front of you; third, teams are now able to work autonomously (and you don't have to repeat the directions individually to each of them). Students will quickly learn that they, not the instructor, are responsible for keeping their teams on task.

Use time limits—and make them visible. If students feel that a conversation can continue *ad infinitum*, especially with a complex question, they will defer making a decision (and spend a lot of time trying to convince you that they *can't* reach a decision). Requiring teams to produce an answer—publicly—within a given time helps them maintain focus and also sends the message that "we can't" isn't an option. To create an even greater sense of urgency, always allow less time than you think they really need to answer a given question. The energy that is created by a good task can quickly be depleted by lag time when teams finish before time is up. Finally, this is also a strategy for encouraging teams' autonomy and accountability. Rather than depending on you to remind them of how much time remains to complete a task, students learn that they need to track their team's progress and arrive at answers in the given amount of time.

Practice team tasks from day one. There are several good reasons to have students engaging with challenging team tasks from the first day of class, but one of them is to get them accustomed to the level of autonomy and accountability they will be facing in a TBL classroom. For many

students, this is an adjustment, and there will be some growing pains associated with the process. Starting right away with content-driven, meaningful tasks (even before you discuss the syllabus!) will help to demonstrate not only *why* you have structured your course in the ways you have but also *how* students are expected to handle the process. Naïve tasks work especially well on Day One.

4S+5: Use Non-4 S Tasks Sparingly, but Strategically

A key function of 4 S design is building team cohesion. After teams have begun to perform effectively (often around or after the midpoint of a semester), you may find it possible to mix in tasks that ask for a more complex product. You should continue using 4 S tasks frequently to continue team building, but pushing teams to engage in more synthesis/creation tasks may require more flexibility with task design. For this purpose, we propose a few practices that, when teams are already functioning at a high level, can work with some consistency. Note that many of these examples still allow for and suggest using simultaneous report; keep this in mind any time you diverge from a strict 4 S structure. Having the opportunity to compare products across teams remains powerful, even when those products are complex.

Limited Word Task: Teams are asked to distill a complex idea or set of ideas into a single word or limited number of words (1, 2 or 3)

> *Example:* Given the situation described in the case study you just read, use 3 words to summarize the first actions a therapist would need to address in responding to this patient. When prompted, send a team member to the board to write your 3 words.

Single Claim Task: Similar to the single word task, teams are asked to summarize an argument in a single clause sentence/thesis.

> *Example:* Read the paragraph on the handout and, as a team, summarize its primary argument in a single sentence. When prompted, send a team member to the board to write your sentence.

Construct a Thesis: Teams are given a context and asked to take a stance on an issue and construct a thesis statement that they would use to make a written argument.

> *Example:* Using the example of *one* character in the novel, write a thesis statement to defend or refute the following claim: "In James Baldwin's novel *Go Tell it on the Mountain*, the Church is ultimately a positive force in the characters' lives because it provides an empowering community and a place where individuals can express themselves." When prompted, send a team member to the board to write your thesis.

Framing an Argument: Adapted from Bean's (2001) frame paragraph exercise, this is an expansion of the "construct a thesis" exercise where in addition to creating their thesis, teams are asked to identify the sub-arguments they would use to flesh out their argument.

> *Example:* After you have created your thesis statement, list four arguments (in the form of a topic sentence) in support of your thesis statement with at least one specific piece of evidence from the text, with page number, which you would use to support each.

Diagram or Image Task: Teams are asked to distill and represent a complex set of relationships into a single image, diagram, or flow chart, which is drawn on a large sheet of poster paper. Using a pre-established cue, all the posters go up at the same moment for simultaneous report. Debriefing can be traditional (instructor asks teams to explain their representation), or can be adapted to practices where students comment on each other's works (e.g., gallery walk) using stickers or other tools.

> *Example:* Design a flow chart predicting the sequence of physical and mental actions of children solving the following problem. . . .

Reports and Debriefs for Non-4-S Tasks

Tasks with more elaborated products may require some invention when it comes to having teams report and compare their answers. Rather than have students report sequentially, there are other strategies available for reporting that retain the energy and focus of simultaneous reporting. One of these is the technique known as the "Gallery Walk," in which teams write their products on large sheets of paper and attach them to the wall in the manner of an art gallery. Students (either in teams or as individuals) then pass around the room and record their evaluation or comments for each product. Numbers or other mechanisms can be used to rank products

according to various criteria. In this way, the assessments of the products can be reported simultaneously, for example:

> • Hold up a card/number for the poster that represents _____ most clearly.

> • Hold up a card for the poster that is most/least _____.

Another approach is for students to attach colored stickers to posters according to given criteria. The reporting then follows from identifying the posters with the most stickers of a given color. Other excellent techniques for reporting and assessing complex team tasks, such as "Stacked Transparencies," "Hot Seat," "Best Solution Tournament," can be found in Appendix 2 of Sibley and Ostafichuk's *Teamwork That Works: Guide to Implementing Team-Based Learning* (2013).

Conclusions

Effective task design can be daunting and time-consuming because it requires a new perspective on both student activity and the content of your course. For this reason, it is important to enter TBL with an attitude of exploration and reflection: Tasks that "don't work" are often very valuable as they give you the opportunity to re-consider your goals and your approach. Just as we advocate for creating a classroom atmosphere where students come to recognize the role of errors in the learning process, we believe that instructors must enter their own TBL courses with the expectation that there is room to learn and grow.

Thinking analytically about what you expect a task to accomplish, the kinds of thinking it is seeking to promote, how it is constructed to induce student action, and the responses you expect from students—these are not only crucial to success in the classroom, but are also key to becoming more facile with the process of task design. After you have experimented with different task structures, based on the principles and strategies discussed in this chapter, you will discover what works for your classroom, your students, and your content. Experience will also help you hone your instincts about where modifications will make tasks more successful. Having just a few of these formats under your belt will ultimately make task design more navigable with each successive implementation.

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