

The readiness assurance process in online team-based learning classrooms

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Abstract

This chapter describes best practices to address the challenges posed for implementing the second stage of team-based learning (TBL), the Readiness Assurance Process (RAP), in online settings, and uses the experience of expert TBL users to suggest strategies for maintaining the essential aspects of the pedagogy.

INTRODUCTION

In response to COVID-19, faculty across the nation were asked to rapidly transfer their classes to an online format, often without adequate preparation. When teaching strategies designed for face-to-face settings were modified to meet online course needs, faculty often felt overwhelmed as they found themselves working harder and longer than they expected. To teach effectively online, faculty cannot merely deliver content, but must also adopt strategies that create social presence, encourage student participation, engagement and interaction, maintain academic rigor and integrity, evaluate outcomes, and manage information and workload (Lynch, 2001).

Implementing effective active learning pedagogies such as team-based learning (TBL) in an online setting poses additional challenges. TBL hinges on a complex rhythm of team activities and decision-making and must, therefore, be reimagined for teaching in an online context. This chapter examines the challenges posed for implementing the second stage of TBL, the Readiness Assurance Process (RAP), in online settings, and uses the

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experience of expert TBL users to suggest strategies for maintaining the essential aspects of the pedagogy.

THE READINESS ASSURANCE PROCESS

RAP is known as “the backbone of team-based learning” because it sets the stage for the rest of the TBL process. The RAP promotes team development by introducing students to course content and holds them accountable for preclass preparation. Additionally, the RAP provides opportunities for team development and interactive peer-driven feedback on important class concepts. The goals of the readiness assurance process are achieved in the five steps described below, as detailed in Michaelsen et al. (2004).

Step 1: Preclass individual preparation

During the first stage of the RAP process, students work individually outside of class to learn the material provided by the instructor. These resources focus on basic course content and fundamental concepts of each unit, such as disciplinary definitions, relevant procedures, issues and ideas, and anything that students need to know to participate effectively in the “hands-on” application exercises to follow. The resources can take any form, such as readings, excerpts, videos, lecture recordings, and websites.

Step 2: Individual readiness assessment test

Each student completes an “individual readiness assessment test” or iRAT which holds them accountable for their out-of-class efforts and allows instructors to assess whether students understand the essential concepts for the unit. iRATs test baseline understanding of the material and focus on foundational skills, such as remembering and understanding, as defined in Bloom’s Taxonomy. There are typically five to fifteen questions per iRAT with true-false or multiple-choice response options that require about 1 min per question to answer.

Step 3: Team readiness assessment test

Next, students take the same test as a team, now called the “team readiness assessment test” or tRAT. Because students share a grade on the assessment, they are strongly motivated to work together to find the correct solution to the problem at hand and valuable peer learning is enhanced when student misconceptions and misunderstandings are clarified by team members through discussion. Deliberating answers as a team provides an opportunity for important social exchange, building confidence and trust between members and molding groups into cohesive and effective learning teams. Results are used by the instructor diagnostically to identify and correct areas of misunderstanding.

Step 4: Appeals

Students can appeal questions that were missed on the tRAT if the team jointly agrees that the missed points were due to the poor quality of the question, inadequacies in the preparatory readings, or support from a credible reference. The appeals process

channelizes student anger and frustration otherwise aimed at the instructor into a positive practice that helps build communication skills. If the instructor approves the appeal, the team gains back points lost on the question, and the instructor can use the student feedback to improve the course by redesigning the question or readings as appropriate, embedding continuous quality improvement into the assessment process.

Step 5: Post-RAT instructor feedback (mini lecture/discussions)

Finally, to wrap up the readiness assurance process, the instructor reviews the tRAT answers with the whole class in a process tailored to student needs as informed by the results of the tRAT. The “mini-lecture” may be a short lecture or a whole class discussion directed by the instructor, asking teams with differing responses to explain their rationale to the entire class in an inter-team dialogue, and providing insights into difficult concepts identified in the tRAT.

Learning opportunities are built into every stage of the RAP process. This includes learning from peers during the tRAT assessment, learning by re-engaging with the readings during the appeals process, and learning from instructors during targeted mini lectures. A well-designed RAP process sets students up for deeper learning in the application exercises that follow.

APPRECIATIVE INQUIRY

The difficulty of translating the layered RAP process into an online environment (especially an asynchronous online one), while remaining faithful to its essence, warranted a novel approach. We utilized Appreciative Inquiry (AI) to support the development of RAP best practices online because it is a strength-based methodology used to solve complex problems by focusing on current assets, positive attributes, and capabilities to envision the future (Bushe & Kassam, 2005). Using the AI process as a guide, the authors conducted a focus group with experienced TBL practitioners to identify the features of the RAP process that they valued most for promoting learning in a face to face environment.

The TBL practitioners answered the following questions:

1. What has been a high-point experience for you in using iRATs and tRATs when you felt most successful and effective in your teaching?
2. What are the core features of iRATs and tRATs that help you to do your best when you are teaching and would make it hard to be successful without including?
3. Imagine it is five years in the future, and your university has asked that all online classes start incorporating the TBL pedagogy.
 - (i) What benefits do you think this would make for your organization?
 - (ii) What changes would have to happen between now and then to help this to happen?
 - (iii) What has stayed the same?

We also gathered essential elements of the RAP process from participants at the workshop on “Using Technology to Enhance TBL” (Leanne Coyne and Jody K. Takemoto of the University of Texas at Tyler Ben and Maytee Fisch College of Pharmacy) at the 16th Annual Team-Based Learning Collaborative meeting in Orlando, Florida, 2017. During the session, the workshop leaders charged participants with imagining and establishing requirements of ideal tools to teach TBL online. The information from both the TBLC session and the research team’s AI process were combined and evaluated for emerging themes. Eight topics stood out as particularly valuable components of RAPs. These are summarized in Figure 1.

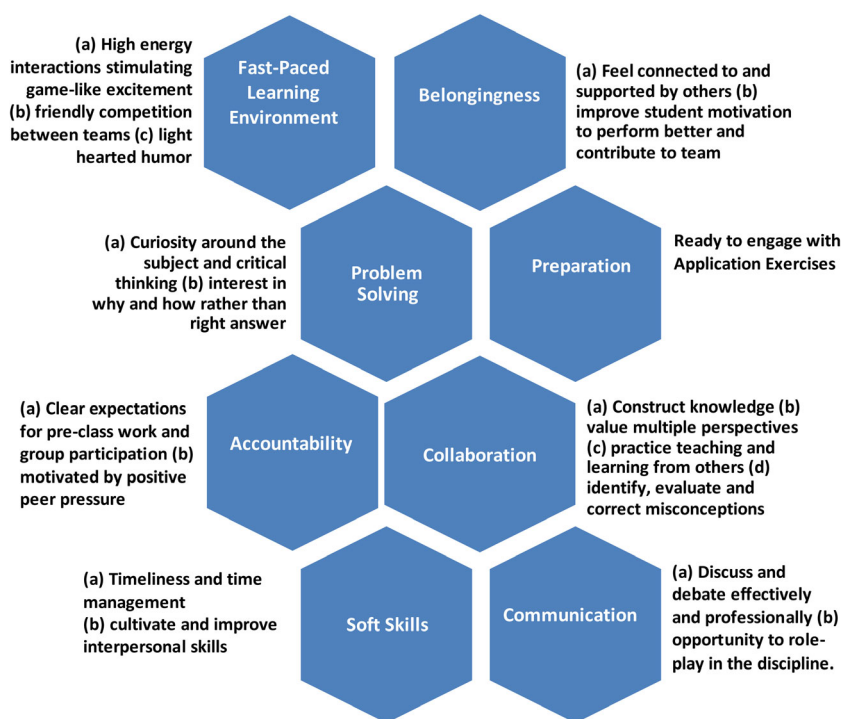


FIGURE 1 Appreciative inquiry results of key elements to retain when converting RAPs to an online environment

TABLE 1 Readiness assurance principles for online TBL aligned with QM Standards for Higher Education

Principle	Online TBL best practice	QM Standards for Higher Education
RA-P 1	Implement a fast paced learning environment	3.1; 3.3; 3.4; 5.2-5.4; 6.3; 6.4
RA-P 2	Develop belongingness and team cohesion	1.9; 3.5; 6.1; 6.2; 8.1; 8.4; 8.5
RA-P 3	Support soft skills, communication and collaboration	1.3; 1.5; 1.6; 1.7; 5.2; 5.4
RA-P 4	Facilitate preparation and accountability	1.1; 1.2; 1.4; 1.8; 4.1; 4.2; 4.4; 4.5; 8.2; 8.3
RA-P 5	Promote problem solving	2.1; 2.2; 2.5; 5.1

The key elements classified in Figure 1 were consolidated and analyzed as five distinct principles of best practice, each with a set of challenges and possible strategies for integration into an online environment. The resulting readiness assurance principles were then aligned with the Quality Matters Standards for Higher Education (see www.qualitymatters.org). These are summarized in Tables 1–6, and elaborated in the discussions that follow.

IMPLEMENT A FAST PACED LEARNING ENVIRONMENT IN ONLINE TBL

A consistent theme that emerged in the appreciative inquiry process was preserving the fast-paced, competitive, game-like excitement during tRATs and the gratification of receiving immediate feedback. In successful TBL exercises, students often find themselves so caught up in the light-hearted humor and fun of the social interaction that they forget they are learning difficult concepts while also surfacing and correcting misconceptions. During

TABLE 2 Readiness Assurance Principle 1: Implement a fast paced learning environment in online TBL**RA-P 1: Implement a fast paced learning environment**

Challenges	Possible strategies
Flexible/self-paced nature of asynchronous online learning	Modified timelines for RAP activities Extended availability of iRATS and tRATs
Geographically dispersed students	Asynchronous modalities for tRAT discussions
Difficulties in coordinating synchronous activities	Allocating extra time for formulating appeals and mini lecture or discussions
Technological limitations to immediate feedback	Reimagining immediate feedback for an online environment Leveraging available technology for team discussion, decision and feedback

TABLE 3 Readiness Assurance Principle 2: Develop belongingness and team cohesion in online TBL**RA-P 2: Develop belongingness and team cohesion**

Challenges	Possible strategies
Overcoming difficulties in creating social bonds online that occur organically in face-to-face environments	Pre-tRAT activities to discover common goals, objectives, strengths, weaknesses Encouraging rich media for self-introductions
Putting a "face" to a person	Low stakes team activities such as creating team contracts, support documents, teamwork strategies, points distribution
Building trust with virtual strangers	
Fears of isolation and not being "heard"	Opportunities for periodic reflection and feedback on team performance
Overcoming differences in language and cultural expressions	

our analysis of the AI results, we concluded that TBL implementation in blended or synchronous online environments is not particularly distinct from face-to-face settings. There it is possible to emulate the traditional RAP process closely, such as described in Bender et al. (2021, this volume). For instance, in synchronous or blended online environments, teams can use classroom response systems such as clickers and other electronic web-based or mobile response technologies, video conferencing with breakout rooms such as Zoom for team decisions, or chat tools to interact, arrive at, and report team decisions simultaneously in real-time.

TABLE 4 Readiness Assurance Principle 3: Encourage soft skills, communication and collaboration in online TBL**RA-P 3: Support soft skills, communication, and collaboration**

Challenges	Possible strategies
Lack of visual and verbal cues inherent in face-to-face communication	Set expectations for participation and rewards for responding in team discussions
Varied levels of participation in tRATs and online behavior such as pedagogical lurking and loafing	Assign rotating team leader to moderate team discussions, submit tRAT Selecting appropriate tools and strategies to promote engagement and decision-making at team and class level
Balancing aggressive vs. reticent students	
Fostering engagement and peer learning	Require outside discussions to be summarized and posted in course platform
Monitoring team chats outside of course delivery platform	
Multiplicity of discussion boards, submissions and deadlines for different parts of the RAP process	Create a culture where appeals are encouraged and rewarded Use principles of online course design to build course and communicate due dates and expectations clearly and often

TABLE 5 Readiness Assurance Principle 4: Facilitate preparation and accountability in online TBL

RA-P 4: Facilitate preparation and accountability	
Challenges	Possible strategies
Change in how instructors need to prepare for teaching online classes	Investing time well in advance to design, plan and prepare the course
Ensuring student accountability in preclass preparation for RAP	Picking level appropriate resources and using rich, varied and interactive media for their delivery
Ensuring RAP process prepares students for problem-solving in application exercises	Careful selection of task-appropriate technology for assignments that actively involve students with the content.
Ensuring academic integrity for RATs	Using quiz timers and deterrent software to dissuade cheating
Ensuring instructor presence and feedback	Rethinking RAT design using open-book tests
Ensuring clear communication of expectations and deadlines	Using online course delivery guidelines for effective ways to create instructor presence, communication, feedback
	Use infrastructural resources such as LMS calendars and checklists for frequent reminders to students

TABLE 6 Readiness Assurance Principle 5: Promote problem solving in online TBL

RA-P 5: Promote problem solving	
Challenges	Possible strategies
Encouraging curiosity around a subject and critical thinking	Implement a RAP design where students/teams have to provide rationales to support their answer choices.
Students only interested in right vs. wrong answer	Instill healthy competition by having teams vote for best answer
Students don't see connections between subject and real life	Use real life examples in prework and RAPS
	Encourage and award more appeals so teams can dig deeper into disciplinary literature and build cogent arguments.
	Model question prompts and discussion starters for team leaders to encourage student engagement

The most significant challenge to implementing a game-like process is in asynchronous online environments. Asynchronous online learning typically attracts nontraditional or working students, students from geographically remote and dispersed areas, and students with physical constraints to participate in the learning process. Accordingly, asynchronous online TBL offerings require flexibility and extended response times, making them incompatible with simultaneous reporting or a fast-paced game-like environment. Thus, moving to an asynchronous online environment necessitates a reimagination of the RAP process to:

- accommodate the different time zones, schedules and login times inherent in a self-paced asynchronous environment
- provide the means and sufficient time for team discussion, team decisions and team reporting
- provide immediate feedback that is essential to effective TBL
- fully address course goals and objectives

Integrating student needs into asynchronous environments requires extended timelines for working through the RAT process. In face-to-face, synchronous online, and blended TBL courses, the RATs are typically conducted on the same class day and each RAT is completed within 15 min (Farland et al., 2013). This is not feasible in an asynchronous online TBL classroom. One of our authors (Gillette) provides flexibility by allowing students between 24–48 h to complete their iRATs and between 48–72 h

for teams to discuss and submit their tRATS with extra time to formulate and submit appeals.

Discussions for team decision-making and reporting often requires adoption of asynchronous modalities such as online discussion boards and chats. (Although students may choose to meet synchronously via phone or video app even if they are in an asynchronous course). Some instructors use emerging software tools designed specifically for TBL (such as Intedashboard (<https://www.intedashboard.com>) and LAMS (<https://www.lamsinternational.com>)) that include chat and group decision features and means for immediate feedback, allocation of partial credit for second choices on tRATs, and functions that allow students to assign different levels of confidence in their answers. Other instructors try to create workarounds with available Learning Management System (LMS) tools such as using LMS testing tools and quiz features and timers to conduct iRATS, team and collaborative functions and discussion threads for tRAT decision-making and feedback. Still others use a combination of different paid and free online tools and social communication platforms like chats and texts to execute their RAPs (Tokimoto, 2018). Where possible, external tools such should be integrated into the LMS with help from institutional technology services to avoid multiple software sign-ups and provide a seamless learning experience for the students and instructor alike. Given that technology is quickly evolving, we focus here on the principles of moving online. We recommend the TBLC Global Newsletter for examples of up-to-date resource for faculty interested in technology options to support immediate feedback, such as accessing Qualtrics and Google Forms within Canvas (see <https://teambasedlearning.site-ym.com/>).

So how do extended timelines (for RAPS and application exercises) impact implementation of the course material? Some faculty prefer to compress an entire module into 1 week to get through the material but as a consequence, students may feel rushed to complete the readings and process the new information leaving little time for meaningful discussions with their team mates. Novice TBL instructors tend to emphasize the RAP process and run out of time to implement important aspects of TBL such as whole class discussion, class decision-making that are integral to the RAP and application exercises. These whole class experiences are valuable in exposing students to alternate perspectives on approaching a problem that is not limited to interaction within their teams. Even traditional face to face TBL recommends about 2-week modules to be able to get to complete the entire cycle (Michaelsen et al., 2004), making 1-week modules even more unrealistic online. Faculty must weigh the value of time constraining strategies to emulate the fast-paced environment, with more established online best practices of expanding the time for online discussions. Such best practices allow for additional time to coordinate team member responses, facilitate peer teaching, and team decision-making (Palsolé & Awalt, 2008).

To optimize courses for Team Based Learning as well as online delivery, perhaps, it is time to re-examine traditional information/topic-based modules and take a backward-design (Sibley et al., 2014; Wiggins & McTighe, 2005) approach to how the course is organized. The backward design process guides instructors to first define what students should be able to DO by the end of the course, and then align the prework, readiness assurance and application exercises to achieve those goals. Redesigning the course to give ample time for all components of the TBL cycle might mean taking a higher view of the curriculum and combining related concepts into at least 2-week modules.

By leveraging available technology, like those described above (e.g., Intedashboard, LAMS, LMS, Qualtrics, and Google forms), faculty can foster an environment of fast-paced

learning activities while maintaining clear criteria and assessment targets. As such, faculty will have an opportunity to strengthen their use of Quality Matters standards related to Assessment and Measurement, Course Activities and Learner Interaction, and Course Technology, as noted in Table 1, RA-P 1.

DEVELOP BELONGINGNESS AND TEAM COHESION IN ONLINE TBL

Promoting feelings of belongingness and team cohesion was a key RAP success factor identified in the appreciative inquiry process. Although a high level of trust with collective accountability tends to build steadily within teams in face-to-face environments, students in asynchronous online courses commonly experience an absence of social bonds and find it challenging to build identity, trust and community. A lack of trust can lead to student anxiety, nervousness and feelings of isolation when grades depend on the performance of teammates.

Fostering a sense of social presence and student-to-student interaction is the most important prerequisite to establishing true communities of inquiry and supports its corollary, cognitive presence. Social presence has been defined as the ability of participants in an online community to project their full personalities (social and emotional) into the online environment and present themselves as "real people" via the medium of communication. These factors mark a qualitative difference between a collaborative community of inquiry and a simple process of downloading information (Garrison et al., 1999). Technology mediated online environments support the creation of social presence, but the process is not automatic. Activities to meet and engage with other team members in a safe and effective way (including how to best communicate, where to meet online, and consideration of language and cultural expression norms) need to be purposefully designed to encourage students to establish their "voice" and develop skills for communicating in the online space (Stein et al., 2009).

The RAP is the first real test of team communication and decision-making. Thus, it is worthwhile to invest time early in the course (pre-RAT) for team-building activities and setting the groundwork and expectations for active team communication, collaboration, and interaction using the course technology (Palsolé & Awalt, 2008; Clark et al., 2021, this volume). Early ice-breaker activities that use rich media such as videos and pictures can help students connect and associate a "face" to their teammates. Instructors can provide guided questions to help students express emotions (e.g., of fears, expectations, goals) and self-disclosure (sharing of personal information, experiences, interests, strengths, weaknesses). Early team activities could include creating team contracts, determining teamwork strategies, deciding how points are distributed and exercises to discover common interests, concerns, and goals, and establish trust and support. Expectations for active textual communication (e.g., responding to team member posts, rejoinders, expressing appreciation, agreement, and encouragement) should also be established early. Such expectations promote mutual awareness and recognition and help counter feelings of isolation and fears of not being "heard" by other students or the instructor. The instructor can help the process of team building and cohesion by providing periodic opportunities for teams to reflect on their performance, share their experiences, and learn successful strategies from each other. These small efforts go a long way in building and sustaining online relationships (Garrison et al., 1999).

In well-functioning teams, students develop a sense of belonging where they become connected and supported by others and increasingly become motivated to perform better because of their contribution to their team. Team members do not want to let their teammates down and are accordingly more motivated to learn and prepare.

This focus on supporting highly accessible, virtual relationships between students and their faculty and creating a classroom context of online learner engagement with multiple opportunities for students to track their progress, is reinforced by the Quality Matters standards related to Course Introduction, Assessment and Measurement, Course Technology, and Accessibility and Usability (see Table 1, RA-P 2).

ENCOURAGE SOFT SKILLS, COMMUNICATION AND COLLABORATION IN ONLINE TBL

The opportunities for students to develop soft skills were some of the most valued aspects of the readiness assurance process that emerged in our appreciative inquiry. Soft skills are a broad range of competencies which include effective time management and interpersonal skills such as the ability to communicate sensitively and professionally, listen respectfully, weigh multiple perspectives, appreciate different skill sets and collaborate successfully. These skills are needed for teams to debate effectively and construct knowledge together. As these skills develop, students are better prepared to complete the RAP process as they practice using discipline-specific language to support their reasoning and identify, evaluate, and correct misconceptions. The soft skills help students cultivate a collaborative mindset that serves them well in their future work environment.

Peer-learning through team collaboration and interaction is essential for success in TBL courses. Garnering participation and engagement in team discussions and decision-making has its own challenges in face to face and synchronous online settings. According to Tuckman (Tuckman & Jensen, 1977), about 40 h of teamwork is needed for group members to go through the four stages of collaboration: forming, storming, norming, and performing. This process is even more challenging in asynchronous online settings. Without the visual cues of looking teammates in the eye and hearing inflection in their voices, the online context can lead to a whole new territory of social behavior where there is less direct accountability. Without these cues, students may find it easier to hide, making behavior such as pedagogical lurking, loafing, and even cyberbullying difficult to manage (Dennen, 2008). It is also difficult to balance proactive or aggressive students vs. reticent ones in an asynchronous online setting. Thus, along with building in flexibility and extra time for team discussions to develop (as discussed above), additional strategies are needed to enhance collaboration.

Some of these challenges can be addressed by adding more structure and accountability. One strategy is to assign each team a leader on a rotating basis. For each module, the team leaders can moderate and summarize the tRAT discussion, encourage teammates to contribute to the team decision promptly, and submit the team decision for the tRAT questions by the given deadline. The team leader can also be responsible for coordinating appeals.

A second strategy to encourage collaboration is the thoughtful use of peer evaluations. Peer evaluations provide valuable peer feedback to teammates on their individual contributions to team performance and suggestions for improvement. Michaelsen recommends two peer evaluations in a face-to-face setting (Michaelsen et al., 2004), one at midterm and one near the end of the course. In an asynchronous online setting, instructors can think about adding an evaluation or two at the initial stages of the course to help in team formation and set the stage for team success. Since team leaders are an important part of the team presence in asynchronous online TBL, instructors can include questions to evaluate team leaders on their role in moderating discussions and honoring submission deadlines. However, to be effective, care should be taken to use peer evaluations judiciously as overuse will lead to evaluation burn-out.

A third strategy to encourage collaboration when moving to an online environment, is to carefully select technological tools that support communication for team and class level discussions and postings. The tools may include discussion boards, chats, video and networking tools that facilitate more student-to-student interaction such as sharing their rationale for an answer on the tRAT. Such interactions promote a sense of community and group presence that support teams to develop to their full potential (Boling et al., 2012; Swan, 2003). Providing a class level discussion forum to share tRAT group summaries and voting along with immediate feedback on correct responses can help bring in more perspectives into the discussion while encouraging healthy inter-team competition that is so valued in face-to-face TBL. Instructors can also reward top vote-earning teams with extra points as an added incentive to participate.

However, using online communication technologies to carry out course discussions introduces another layer of considerations. Contributions made in the class LMS discussion boards allow instructors to monitor for civility and content, provide feedback, assess participation, and identify gaps in learning to address in the mini-lecture. However, students may prefer to carry out discussions in other apps through which they communicate every day but are difficult for the instructor to monitor. Thus, instructors must weigh the pros and cons of whether to allow class conversations outside of the LMS. If the content discussed is sensitive in nature, care should be taken so that discussions are carried out in a safe, encrypted environment.

On the other hand, allowing students to choose the communication technologies that work best to meet the needs and rhythm of their team may facilitate greater coordination, collaboration, and independence. This decision may depend on the experience of students in other TBL classrooms and online, the maturity of students (e.g., freshman or senior), or the subject matter at hand. The difficult choice of whether to permit students to communicate meaningfully outside of the LMS depends on instructor preference. However, if allowed, the instructor could require discussions from external apps to be summarized by the team leaders and posted in the LMS.

The appeals process (as described in Step 4 of TBL outline above) where student teams formally challenge a RAT question can serve as a fourth strategy to encourage collaboration. In face to face TBL, appeals play an important role in motivating students to dive deeper into the content and use disciplinary language and reasoning to make their point. In an asynchronous online environment, appeals can help overcome some of the inherent barriers to participation by providing another opportunity for active collaboration and a fresh, engaging reason for teams to work together for extra points. Students may at first balk at questioning the authority of a teacher, so extra effort may be required to create a culture where appeals are welcomed and rewarded more frequently.

An important, often overlooked aspect of facilitating communication and collaboration in an online course is clear and consistent course design that makes it easy for students to know what is expected of them, where and by when. The multi-layered RAP process provides many opportunities for students and teams to explore content, exchange knowledge, compare performance and solve problems. In a face-to-face class, the instructor can guide the students through the various steps, but in an online environment where students navigate the course on their own and student interaction may happen in many different types of online spaces, the course design needs much thought.

Thus, a final strategy to promote team communication is to use principles of online course design to ensure that the course organization is simple and predictable with an uncluttered course layout, dedicated spaces for team and class level discussions and due dates/expectations conveyed clearly in multiple ways throughout the course (Crawford-Ferre & Wiest, 2012; Swan, 2003). Otherwise, the multiplicity of discussion boards and

technology for different parts of the RAP process can become overwhelming and confusing for students, which can impede the process of communication and collaboration.

Fundamental to healthy collaboration and communication is an understanding of the professional expectations for the course and how students should behave toward one another online. Faculty can promote these soft skills by modeling proper "netiquette" and providing clear and realistic goals regarding how students should communicate, the type of technology they should be able to access, and necessary prerequisite knowledge and competencies that support these efforts, as identified in Quality Matters Standards related to Course Overview and Course Activities and Learner Interaction (see Table 1, RA-P 3).

FACILITATE PREPARATION AND ACCOUNTABILITY IN ONLINE TBL

The appreciative inquiry results revealed that TBL practitioners value the RAP process because it increases student accountability and makes clear expectations for preclass study, preparing students to engage meaningfully with the application exercises. Motivated by positive peer pressure and a desire to not let their teams down, students become eager to complete the preclass prep. In online TBL, the instructor plays a vital role in helping the students to engage in the prework by making it enjoyable and interesting through careful selection of resources and appropriate technology. This means that courses need to be planned well in advanced to get all these systems in place.

Traditionally, TBL prework has largely consisted of readings from book chapters, articles, and other written material. However, in a technology mediated online learning environment, it is possible to provide resources for individual study using varied and rich media that can bring content to life that can reach learners with different abilities and preferences (Burgstahler, 2017). Videos, podcasts, recorded lectures and interviews, screen captures, audio notes for feedback, simulations, games, programs with interactive content authoring and delivery are some of the ways that technology can be leveraged to engage the learner and create new understanding (Seemiller & Grace, 2017). Videos can be made interactive by using video platforms like PlayPosit (<https://go.playposit.com>) where faculty can insert questions and Arc Video (<https://www.youtube.com/watch?v=m7zpXBqgiFM>) where students can write comments or notes along the video timeline. Reading assignments can be made interactive with software such as Perusall where students take notes by highlighting the text and can chat/discuss with their teammates or instructor.

However, the engaging content by itself may not be enough to ensure that students, who are raised in a system predominated by lectures and memorization, are adequately prepared to tackle the problem solving that is integral to TBL. Some TBL practitioners are filling this gap by assigning prework in programs such as ThinkSpace (<https://think.thinkspace.org>) that can break-up a complex problem into small pieces and step students through a scaffolded process with immediate expert feedback (Bender & Danielson, 2011). Supported by Ericsson's work on expertise development (Ericsson, 2014), this approach has yielded significant learning gains (Danielson et al., 2007) and helps bring students up to par and ready to tackle the problem solving in the application exercises. This software makes deliberate practice scalable to large classes, while aiming to minimize instructor workload.

The RAP process holds students accountable for completing their prereadings/prework. In a face-to-face class, most students expect closed book tests and iRATs and instructors try to bring this same strategy to online courses. Many institutions spend a great deal of energy and resources trying to enforce anti-cheating policies through punitive measures, deterrent technology such as lockdown browsers and hiring companies to monitor students through their Webcams. However, it is difficult to ensure that a student will take the

test "closed book" in online courses. Lockdown browsers are easily defeated in an asynchronous online setting as students can look up answers on their now ubiquitous cell-phones and proctoring software adds an extra expense to already stretched academic budgets. Many may also question the intrusive nature of having someone peering through their webcam, conjuring visions of "big brother."

Perhaps it is time to rethink how RATs can be redesigned for use in online courses in a way that supports learning and removes the opportunity for cheating. TBL was created as a teaching strategy 40 years ago when search engines were not yet invented, and information was not as readily available as it is now. Since good instruction is best designed to emulate authentic settings, instructors might consider designing TBL exercises for how students use information in the 2020s and beyond. A small study by Carbrey et.al (2015) concluded that there was no difference in performance in competency tests between medical students who took traditionally administered RATs in the class compared to students who had taken only the iRATs online at home. The at-home iRATs were untimed, open book, allowed multiple attempts and were followed by immediate feedback with explanations and justifications. Students reported that they preferred to take iRATs at home and suggested that it helped them learn course content better. The authors found that at home RATs had the added advantage of saving valuable class time for more application exercises.

Given the level of technology and information now available at our fingertips, faculty could adopt a more practical view of accountability in online TBL classes. Some instructors adopt measures such as using timers that maintain a reasonable level of accountability. For instance, one of the authors of this chapter gives the students 12 min to answer 10 RAT questions, which they would not likely be able to do without having completed the prework. Another author of this chapter requires students to justify their iRAT answers to ensure deeper learning.

Student accountability is also tied to how well the instructors convey deadlines and expectations. To communicate the course expectations clearly, instructors can create a course orientation video and homepage where each module and its steps are laid out clearly along with deadlines for each step. They can also use available technology such as the LMS calendar and create checklists to remind students of next steps. To avoid overwhelming students with course details, instructors can make the syllabus more appealing by posting a graphical syllabus and all this information can be reinforced with a small orientation activity to familiarize students with the navigation and rhythm of the TBL course. It is also advisable to test the course before implementation to receive feedback on the course design.

The instructor also bears responsibility for engaging in a dialogue with students throughout the learning process, serving as an active guide and coach (Lane, 2008). Instructors can close the psychological distance between themselves and their students/student teams by posting voice comments or personal written comments to provide critical feedback at different points during the RAP process. Other ways of letting the students feel the instructor's presence is recording and posting mini-lectures addressing specific difficulties, and engaging in student discussions during the appeal process (Boling et al., 2012; Swan, 2003) for a general discussion of such online practices). The post-RAT instructor feedback (mini-lecture or discussion) requires a quick turnaround to address difficulties while they are still relatively fresh in the students' minds.

A useful guide to instructor communication in online courses can be found here: <https://lib.dr.iastate.edu/materials/11/>.

As noted above, faculty can facilitate student preparation and accountability by creating a learning environment that promotes success. This includes providing clear overviews of

the course's policies, structure and purpose; selecting instructional materials that target learning objectives in current and varied ways; and distributing information and course materials in ways that meet the needs of diverse students, as also recommended in the Quality Matters standards related to Course Overview, Instructional Materials, and Accessibility and Usability (See Table 1, RA-P 4).

PROMOTE PROBLEM SOLVING IN ONLINE TBL

The appreciative inquiry surfaced Problem Solving as another reason why instructors valued the RAP process. Strictly speaking, although problem solving is really operationalized in the application exercises, the RAP process lays the foundation for it by planting curiosity around the subject and making students interested in the why and how of an answer rather than just knowing right or wrong. This process is enhanced when the students learn about the real-world application of the subject through narrative questions (e.g., in one author's course, response options include brief descriptions of people exemplifying the subject compared to those who do not, current news accounts of topical content, et cetera). This transition to active problem solving helps support the development of critical thinking skills.

A well-designed RAP provides a learning environment that promotes student engagement in problem solving. Marks of success include high levels of student engagement evidenced by palpable excitement and high-energy interactions including high fives and big groans. In successful interactions, our respondents noted an increase in student curiosity around the subject, increased critical thinking where students demonstrate interest beyond what is the right answer, into the how and why of answers. This mindset can be cultivated in online RAP by having students and teams support their answer choices by providing a rationale for it and then comparing the rationales in a whole class discussion.

Instructors can promote engagement and a desire to know more about the topic and think more critically about the issues at hand by providing meaningful content to discuss with "real world" applicability. An effective way to engage students in problem solving is to design prework and RAPs around relevant case scenarios where students solve problems in significant real-life situations.

A second strategy for improving critical thinking is for the instructor to encourage appeals to help teams learn to build cogent arguments that will lead to successful results. For example, some instructors will provide a variety of real or example appeals that demonstrate successful and unsuccessful approaches and train students to thoroughly document the problem and solution, requiring critical thinking and promoting adaptability, creativity, and collaboration.

Finally, a strategy seen as helpful by the experts we spoke with was to train students to encourage critical thinking when enacting their role as a weekly leader by demonstrating the use of question prompts, iterative feedback, and providing opportunities for discussion and debate. Students will each have an opportunity to guide their team's discussion and will be able to practice empirically tested approaches to improving problem solving through critical thinking.

Critical thinking can flourish during the Readiness Assurance Process if the course is structured to assess meaningful content that has been clearly demonstrated and is matched to the learner's knowledge level. In these situations, the framework for prework, appeals, and leadership provides opportunities to foster interactive problem solving as supported by Quality Matters standards related to Learning Objectives and Learner Interaction (see Table 1, RA-P 5)

CONCLUSION

There are many aspects of the Readiness Assurance Process that the experts we spoke with valued in face to face classrooms. This chapter outlined several ways the RAP process might be modified to work in an online setting that retained as many of these positive facets as possible. While synchronous online courses can be taught with a similar rhythm and format as a face-to-face course, asynchronous courses are much more difficult to implement when using the TBL approach. However, asynchronous online learning has the advantages of allowing students to participate in the learning process from geographically remote and dispersed areas, as well as nontraditional students, and students with physical constraints. Using the suggestions we provide, we believe both synchronous and asynchronous courses are possible to implement with fidelity to the traditional TBL approach.

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