LEVERAGING SYNCHRONOUS ENGAGEMENT AND ASYNCHRONOUS FLEXIBILITY WITHIN AN INTEGRATED ONLINE MODEL FOR TEAM-BASED LEARNING

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ABSTRACT

The Integrated Online Team-Based Learning (IO-TBL) model is an innovative framework for applying team-based learning to an online course. Team-based learning (TBL) is an effective instructional strategy that engages and motivates students through a specific sequence of individual testing, team testing, immediate feedback, and team problem solving. With TBL, students are accountable for coming to class prepared and contributing to discussions as they work together to apply content to solve real-life problems. This article describes previous efforts for transitioning TBL to online environments and why there is a need for a different approach. The IO-TBL model combines the flexibility of asynchronous engagement with the connectedness offered through synchronous meetings. The IO-TBL model uses a rapid prototyping approach to achieve the goals of TBL and to meet many of the challenges faced by instructors and students in online courses. This article describes the initial implementation and makes suggestions for empirically testing the IO-TBL model.

Keywords: team-based learning, asynchronous engagement, synchronous engagement, online education, rapid prototyping

INTRODUCTION

Student enrollment in online courses has steadily increased since 2002, with even greater growth since 2012 (Seaman, Allen, & Seaman, 2018). Currently, 6,359,121 students—31.6% of all students enrolled in an institution of higher education—are taking at least one online course (Seaman et al., 2018, p. 6). Online courses are often attractive to students because they provide flexibility in time and location, access for diverse learners, flexible options for degree completion, and interaction with digital learning objects (Clark et al., 2018; Nguyen, 2015; Rovai, 2002). Despite these benefits, students face several challenges. Students may struggle to adapt to course designs that rely heavily on text-based learning activities and large amounts of objective tests delivered through a learning management system (LMS). Students often struggle with persistence, time management, and self-motivation given the expectations of them for independent learning. Students may also have difficulty developing a sense of community within the course, which leads to higher dropout rates (Clark et al., 2018; Nguyen, 2015; Rovai, 2002). When student engagement in online courses declines, the amount of significant learning and the
development of higher order thinking skills may also diminish. These challenges disproportionately impact the underrepresented minority and first-generation college students (Xu & Jaggars, 2014), who comprise a large percentage of the student population of our public, southern university.

Efforts have been made to create high-quality, online learning experiences. Quality Matters develops research-supported and practice-based standards to emphasize the alignment of learning activities, assessments, and outcomes (https://www.qualitymatters.org/about). Hall (2010) empirically researched the impact of the Quality Matters rubric on teaching and social presence for online courses and found that implementing the Quality Matters rubric increased teacher and teaching presences (defined in the following section). When direct instructor interactions are increased in online activities, such as discussion forums, students did not rely solely on other students to understand content and complete assignments. While reducing this student self-management indirectly caused lower student social presence, implementing the Quality Matters rubric positively affected overall course satisfaction.

The Community of Inquiry Model, with its focus on cognitive presence, social presence, and teaching presence, provides a helpful way to design online learning experiences that are effective (Garrison et al., 2000). The Community of Inquiry Model highlights the need for learners to be engaged on social and emotional levels to achieve their desired educational outcomes. Some indications of high social presence in course design are group collaborations, clear guidelines for open communication among students and with the instructor, and the freedom to explore creative solutions to solve problems or analyze content. Educational developers working with online courses can use the elements of the Community of Inquiry and Quality Matters frameworks to maintain focus on continually improving these learning experiences.

Relevant and meaningful learner-to-learner, learner-to-content, and learner-to-instructor interactions foster a sense of community for online learners. Strategies to foster teaching presence, as the Community of Inquiry framework suggests, include establishing clear methods for student and instructor communication, providing clear course directions and reminders, and delivering course information through multiple methods. It is essential to provide timely feedback to students about performance and interactions. Related to student motivation, Briggs (2015) suggests that online instructors chunk content, send reminders such as checklists to help students stay on track, and use multiple modalities and multimedia to help students stay engaged throughout the flow of the course. While these models and general strategies are helpful, they often lack specificity and are frequently implemented in a piecemeal fashion. Instructors often incorporate these course elements without having a holistic course model that engages students from the start of the course through its completion.

A common struggle for online instructors is to keep students motivated because they must self-regulate their learning and be self-directed to complete their required activities. Instructors use course activities that often focus on remembering, understanding, and applying, without incorporating higher level online activities in which students apply content to real-world scenarios, solve complex problems, analyze theories, create new ideas, and justify their decisions. The purpose of this article is to describe a novel approach to online learning that addresses many of these challenges. The Integrated Online Team-Based Learning (IO-TBL) model is an instructional framework that incorporates a variety of strategies and techniques to improve online learning quality and increase social presence. In the following sections, we describe team-based learning (TBL) and the initial efforts to implement TBL within online or blended courses. We describe the IO-TBL model and the use of rapid prototyping to design and improve this instructional framework and conclude with a reflection on initial implementation and the technology needed to implement the IO-TBL model.

**TEAM-BASED LEARNING AS A POSSIBLE SOLUTION**

**What is Team-Based Learning?**

One solution to these challenges in online learning is Team-Based Learning—a distinct form of active, collaborative learning (Michaelsen, 1983; Michaelsen & Black, 1994; Michaelsen, Knight, & Fink, 2004). TBL has been used as an evidence-based instructional strategy in higher education classes for decades and is emerging as an effective
approach to online instruction. TBL is differentiated from other approaches in several key aspects. First, TBL is an instructional strategy consisting of a specific sequence of individual and team learning activities rather than independent small group activities within a course. Each content module within a TBL course follows a specific sequence of structured learning elements. Preparation is the first element of a TBL module, and students prepare for a module by individually reading, viewing videos, or completing other activities. Then, the students complete the Readiness Assurance Process, which includes the individual Readiness Assurance Test (iRAT), a team Readiness Assurance Test (tRAT), immediate feedback, appeals, and corrective instruction. Through individual preparation and the Readiness Assurance Process students are prepared to answer questions and solve problems through Application Activities. During Application Activities, permanent teams of students use their knowledge of the content to solve problems, create explanations, or make predictions. A 4S structure describes key components of team Application Activities: 1) activities focus on a significant problem that is meaningful and relevant to students, 2) the same problem is presented to all teams, 3) the teams solve the problem by making a specific choice, and 4) the teams simultaneously report their choices. Application Activities increasingly advance to higher-order learning across the content module. This structure promotes active student engagement and reduces a “divide and conquer approach.” Permanent diverse teams, accountability for individual and team performance, frequent immediate feedback, and carefully crafted 4S Application Activities are essential to TBL (Michaelsen & Sweet, 2008). Combining these key elements, the instructor facilitates understanding the course content, and students achieve higher levels of learning, such as analysis, evaluation, and creation while also developing teamwork.

Outcomes of Team-Based Learning

Team-based learning is a robust method of instruction that incorporates theoretical principles of learning and pedagogical techniques known to benefit students (e.g., immediate feedback, active learning, collaborative learning, interleaving, peer instruction, activation of prior knowledge, and self-directed learning) (Ambrose et al., 2010). Two meta-analysis studies examined the overall outcomes of TBL. Haidet et al. (2014) analyzed 40 articles on the effectiveness of TBL and described several patterns that emerged. Team performance was consistently better than individual performance, and communication and student participation was improved with TBL. Though the results for student enjoyment were reportedly lower for TBL, student perceptions of self-efficacy and interest were higher. The two studies showed successful transfer of TBL to job performance. One key finding across multiple studies was that while all students reaped benefits with TBL, students at the low end of performance in the class showed the greatest benefit. Liu and Beaupre (2017) found similar results in a meta-analysis of 38 studies. TBL positively impacted learning outcomes by approximately .5 of a standard deviation compared to other methods of instruction, with varying effect sizes across studies. Though TBL is a proven pedagogical strategy, it requires specialized training for instructors and may increase initial instructional design time.

How Team-Based Learning Has Been Applied Online

To meet challenges often associated with online courses and to implement evidence-based strategies for quality course design, educators have begun to implement TBL within online courses; even so, the related literature is primarily expository (Clark et al., 2018; Palsole & Awtal, 2008). Several models of the online use of TBL have been presented, including synchronous, asynchronous, and blended.

Synchronous

Synchronous courses extend classroom lectures and other activities to students at remote sites in real-time (Sener, 2015). To apply TBL in a synchronous online course, essential TBL components and sequence must match face-to-face TBL courses and occur simultaneously; however, the context is a virtual classroom rather than a collocated space. Research on synchronous TBL is limited. A single, 2-hour TBL module was designed and implemented in pharmacokinetics courses to compare synchronous and face-to-face TBL courses and occur simultaneously; however, the context is a virtual classroom rather than a collocated space. Research on synchronous TBL is limited. A single, 2-hour TBL module was designed and implemented in pharmacokinetics courses to compare synchronous and face-to-face class settings (Franklin et al., 2016). The module included preparation, iRAT, tRAT, and an application activity. There were 70 face-to-face learners across two sessions and 222 online learners across 11 sessions. Student achievement
across both settings was similar, as measured using the RAT assessments and a perceived understanding evaluation survey; however, online students evaluated their perceptions of teamwork, interdependence, and the team-experience lower than face-to-face students. Module facilitators found that designing and implementing the module online was resource and time intensive. Although additional time is needed, Franklin and colleagues (2016) posit that TBL remains an effective instructional approach for synchronous online learning.

**Asynchronous**

In an asynchronous course, all course activities are completed remotely with no required face-to-face sessions in real time and no requirements for on-campus activity (Sener, 2015). With asynchronous TBL, the timing across the sequence of activities is extended. The Readiness Assurance Process may take three to five days, with 24 to 48 hours to complete the iRAT followed by 36 to 72 hours to discuss as a team and reach consensus on each of the tRAT questions (Clark et al., 2018).

Asynchronous application activities typically include multiple, predetermined deadlines. The application activity is first released to all students and time is provided for individual contributions and team discussion. Once all teams have submitted decisions, the instructor simultaneously reports the answer choices of all teams. Then, the whole class discusses answers, with teams providing rationales and arguments across several days. Although the translation of TBL to asynchronous contexts can be challenging, Samuel and Hinson (2010) identified teams having the time to carefully consider their responses and justify their reasoning as a benefit of asynchronous TBL. They also appreciated that the learning process for all teams is easily viewed by the instructor.

Palsolé and Awall (2008) developed and implemented a fully asynchronous online TBL model. In examining the student learning outcomes, a clear majority of teams met or exceeded each standard. They identified a relationship between team performance and the frequency in which those team members engaged in intra- and interteam discussions. The course maintained a 90% retention rate, which Pasole and Awall (2008) reported as higher than in their traditional online courses. When students were asked to compare their satisfaction with teamwork to other classes that used teams, their levels of satisfaction were significantly higher for this TBL course. The positive course outcomes were attributed to exercises that build team cohesion and team competitions to promote interteam excitement.

**Blended**

Blended online courses are structured with most course activities online but some face-to-face instructional activities in person (Sener, 2015). The goals and context of blended courses influence which aspects of TBL are completed within the face-to-face sessions and which aspects are completed online. Within one blended model, in-class activities included the tRAT and application activities, and the online activities included the iRAT, additional application activities, and module assessments (Gomez et al., 2010). Application activities spanned both learning environments and were often started in-class with the critique and review of team-created online “deliverables.” Gomez et al. (2010) found that students perceived increased motivation, enjoyment, and learning with blended TBL.

**IO-TBL AS A NOVEL SOLUTION**

While TBL has been used in asynchronous and synchronous online settings, the IO-TBL is novel in that it is designed to combine the flexibility of asynchronous engagement with the connectedness offered through synchronous class meetings. The IO-TBL model utilizes both asynchronous and synchronous modes of engagement within each module of instruction. The readiness assurance process and one or more 4S application activities are completed in synchronous sessions. During synchronous sessions, interactions among the students and instructor vary between whole class interactions and team interactions. Additional 4S application activities and peer evaluation are completed through asynchronous engagement. An overview of the components of an IO-TBL instructional module are presented in Figure 1.

**Orientation**

When implementing the IO-TBL model, detailed information and opportunities for practice should be provided both before the first day of class and during the first synchronous meeting. Prior to the first day of the semester, communicate with the students to introduce the course format, provide
a list of required synchronous meeting dates, and direct them to read the syllabus and TBL overview on the LMS course site. Also, create and administer a brief, electronic team-development survey to determine the students’ backgrounds and any other factors important for creating diverse teams within the course.

The first synchronous session of the course is an orientation for teams to begin establishing cohesion while familiarizing the students with the required technology, expectations, and flow of the course. Synchronous orientation tasks include selecting a team-leader and team name, practicing an iRAT and tRAT, and discussing grade weights and peer-evaluation criteria. Students practice using the TBL management system and web-conferencing technology, including entering and exiting breakout rooms, with support from the instructor. An online Frequently Asked Questions (FAQs) section of the course site is also recommended. Sample FAQs may include, “What do I do if I cannot login or face technology issues?” and “Do I have to keep my webcam on during the live session?”

### Readiness Assurance Process

The Readiness Assurance Process within IO-TBL has been adapted so that phases of each module (iRAT, tRAT, clarifying lecture, and appeal) occur just before, during, and after the synchronous class session. The iRAT may occur asynchronously or synchronously and depends on how the course instructor wishes to use their time within the synchronous meeting. When students complete the iRAT asynchronously, the instructor identifies a time for students to complete the assessment just prior to the synchronous session beginning. For example, if class begins at 9:00 a.m., the instructor may open the iRAT from 8:40 a.m. to 8:55 a.m. We suggest providing a small break between the conclusion of the scheduled iRAT and the synchronous session to ensure that students have adequate time to join the synchronous session and organize their materials for class. A benefit of having students complete the iRAT asynchronously is to provide more time within the scheduled synchronous session.

When students complete the iRAT synchronously, students begin the assessment shortly after the synchronous session begins. A benefit of having students complete the iRAT synchronously is allowing time for questions about the preparation materials prior to the readiness assurance process beginning. Also, the instructor may monitor students during the iRAT to reduce cheating.

The tRAT within the IO-TBL model always occurs during a synchronous session, and teams work together on the tRAT within breakout rooms (an essential feature of the web conferencing software). The team leaders are then responsible for sharing their screens and indicating the team’s responses within a TBL management system. This TBL management system provides teams with immediate feedback on their tRAT performance.
Following the tRAT, a clarifying lecture takes place, much like in a face-to-face setting. The technology used to implement the RATs provides instructors real-time access to those questions both individuals and teams struggled to answer correctly. Asynchronous opportunities for teams to submit appeals following the class session are provided through an online survey. The link to the appeal is posted within the LMS; likewise, instructions for completing the appeal are included within the survey.

**Application Exercises**

The 4S application activities within the IO-TBL model are completed synchronously and asynchronously. For example, if a module includes four application activities, it might be possible to complete the first two application activities synchronously, while the latter two are planned and organized to be completed asynchronously. For synchronous application activities, all teams are introduced to the same, significant problem. The instructor provides real-time instructions on how to submit their specific choice and then invites students to join their team breakout rooms. The breakout rooms provide teams a private opportunity to engage in intrateam discussion and to submit their agreed-upon choice within a specified technology platform (e.g., electronic survey, quiz, or through TBL management software). To maintain the integrity of the simultaneous report, it is important the specific choice be submitted versus being entered within a platform or webpage easily accessible by other teams. Once teams return to the whole-class session, the instructor may share his or her screen to simultaneously report the teams’ selections and to prompt interteam discussion. A key we have found to promote student-to-student discourse within the main session is to implement ‘Wait Time 2’—a three to five second pause following—not preceding—student contributions (Walsh & Sattes, 2005). Wait Time 2 becomes important as it accommodates potential lags in the video-conferencing software, and it provides opportunities for students who may be hesitant to initiate discussion to ensure that a peer is not also about to speak.

Time should be reserved within the synchronous session to introduce and review the application activities to be completed by teams asynchronously. To ensure that the application activities include opportunities for intrateam discussion, simultaneous report, and interteam discussion, we recommend using the same three deadlines within each module. To align with this three-deadline approach, application activities were consistently designed in two ways. One design requires students to individually complete the application activity by the first deadline, then share their individual decisions with their team, reach consensus on a specific choice, and then report their team decision prior to the second deadline. The instructor then simultaneously reports teams’ selections and requires students to individually engage in interteam discussion. For example, students may be asked first to individually identify the depth of knowledge (DOK) level for a set of questions. Next, teams would discuss their individual selections and come to agreement on a DOK level for each of the questions. Finally, team responses would be revealed and interteam discussion around the assigned DOK levels would be prompted.

The second design requires teams to first create a product prior to the first deadline. Teams next engage in a gallery-walk to examine other teams’ created products and submit a related team decision prior to the second deadline. Last, teams’ selections are simultaneously reported and interteam discussions are prompted. To demonstrate, teams may be asked first to create and share a plan to establish group norms. Teams would then engage in a gallery walk, possibly identifying the plan with the greatest room for improvement and the plan most likely to succeed. Last, teams’ selections would be revealed, and interteam discussion would be prompted around those selections. For this specific course, modules spanned two weeks, the synchronous class session met on a Monday, and the three deadlines for asynchronous work were Saturday-Wednesday-Saturday (see Figure 2).

The design of the IO-TBL model allows teams to simultaneously engage in multiple application activities during the asynchronous portion of the module. Clear instructions, explicating who, what, and where each phase of the activity is, are planned by the instructor and provided to the students. We recommend providing a module assignment sheet organized by either due date or application activity to ensure that students and teams are consistently provided clear instructions for asynchronous
engagement. The outline of a sample module assignment sheet is provided in Figure 3.

To complete the application activities beyond the scheduled synchronous class sessions, teams within the IO-TBL model should be provided both asynchronous and synchronous options to complete the activities. Asynchronous options include forums within an LMS and synchronous options include video conferencing software, such as Skype, Zoom, or BigBlueButton. By offering both asynchronous and synchronous mechanisms for collaboration, teams can effectively complete application activities regardless of team member availability and preferences.

**Peer Evaluation**

Peer evaluation within the IO-TBL model is completed asynchronously at midsemester and the end of the semester. Instructions on how and where to complete the evaluation are easily added to the module assignment sheet. In reference to the module deadlines, we recommend the evaluation be opened after the second deadline and closed at the third deadline. Delaying opening the evaluation until after the second deadline ensures the peer evaluation includes the team engagement within that current module. Options to complete the evaluation may include an online survey, online form, or a TBL management system.

**DESIGN, DEVELOPMENT, AND IMPLEMENTATION**

Some instructional contexts necessitate efficient, rapid solutions that are nimble for educational developers and instructors to make design changes to the learning environment based on formative feedback from learners. This context was true in the development of the IO-TBL model in which we used rapid prototyping as the instructional design framework to help mitigate the previously acknowledged challenges for online learners. As described by Tripp and Bichelmeyer (1990), the major steps in the rapid prototyping approach are to assess needs and analyze content, set objectives, construct a prototype (design), utilize the prototype (research), and install and maintain the system.

<table>
<thead>
<tr>
<th>Application Activity 1</th>
<th>Activities Open</th>
<th>Simultaneous Report</th>
<th>Activities Close</th>
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<tbody>
<tr>
<td></td>
<td>Individual work</td>
<td>Intra-team Discussion and Submit Specific Choice</td>
<td>Inter-team discussion (completed individually)</td>
</tr>
<tr>
<td>Application Activity 2</td>
<td>Intra-Team Discussion and Product Creation</td>
<td>Intra-Team Discussion, Gallery Walk, Submit Specific Choice</td>
<td>Inter-team discussion (completed individually)</td>
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**Figure 2.**

<table>
<thead>
<tr>
<th>Deadline #1</th>
<th>Deadline #2</th>
<th>Deadline #3</th>
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**Module 1 - Assignment Sheet**

1. **Saturday, January 27 (by midnight)**
   - Application Activity 3 (1.2 Depth of Knowledge)
     - Individually, complete...
   - Application Activity 4 (1.3 Depth of Knowledge Question Creation)
     - As a team, create...

2. **Wednesday, January 31 (by midnight)**
   - Application Activity 3 (1.2 Depth of Knowledge)
     - As a team, complete...
   - Application Activity 4 (1.3 Depth of Knowledge Question Creation)
     - As a team, complete the gallery walk...

3. **Saturday, February 3 (by midnight)**
   - Application Activity 3 (1.2 Depth of Knowledge)
     - Individually, respond to the prompt in...
   - Application Activity 4 (1.3 Depth of Knowledge Question Creation)
     - Individually, respond to the prompt in...

**Figure 3.** Sample Module Assignment Sheets. Details were left within the Assignment Sheet to Allow Readers to See the Model in Context
Design happens concurrently and expeditiously, whereas in some traditional instructional design models design decisions are often constrained by evaluation data not yet obtained. Nixon and Lee (2001) argued that some instructional design models do not lead to sufficient feedback and revision to enhance the quality of the design. The growing impact of constructivist learning theories on instructional design has caused an emergence of rapid prototyping as designers work with learners directly. Learners and designers provide real-time feedback during the utilization of instructional activities and then participate in the identification and solutions of problems aimed to enhance instructional quality.

Batane’s (2010) Rapid Prototyping Instructional Design model has demonstrated the effectiveness of developing units or lessons individually and uses evaluation and feedback data from users to inform the development of subsequent lessons. Batane’s model of rapid prototyping asserted that learning tasks should be sequenced in order of complexity with the simplest methods first. As more stages are designed, then the context and learning activities will become more meaningful and engaging to learners. This rapid prototyping approach was applied in the concurrent development and implementation of the IO-TBL model as learners were introduced to collaborative technology tools used in the course in increasing complexity to complete the TBL modules for the course. The formal processes by which students engaged with each other in synchronous sessions and in between these sessions to complete TBL activities was adapted and modified as feedback gathered from students, the instructor, and members of the design team was analyzed.

**Initial Implementation of the IO-TBL Model**

Initial implementation of the IO-TBL model was motivated by previous experience teaching an asynchronous online course that the instructor perceived as poorly designed with primarily text-based instruction and limited interactions. The course also received negative feedback from students. There was a reported sense of disconnectedness between instructor and students within the course. Efforts to promote collaboration within the course were perceived by both the instructor and the students as disingenuous. Specifically, requiring forum postings was used to ensure discussion among students, but they often completed the bare minimum and provided surface-level interactions. Also, student errors on assignments likely resulted from course design and not from reduced student ability. In contrast to the online course, the face-to-face courses taught by the same instructor often included collaborative opportunities for students to engage in rigorous tasks, namely through TBL. Given the instructor’s previous experience with TBL and the need for this course to remain online, a prototype for the IO-TBL model was developed and then refined with feedback from design team members and students.

The design of the IO-TBL model began with considerations of how aspects of TBL within the face-to-face setting could be applied to an online course. A first consideration was the use of a gallery walk in an online setting. In a face-to-face course, gallery walks typically require teams to create a product or respond to a prompt on either chart paper or whiteboard. Gallery walks allow for more complex responses such as decision trees, lesson plans, or prioritized lists. Teams then rotate and provide targeted feedback to each team. To adapt the gallery walk to the IO-TBL model, we tested multiple platforms and ended up selecting Google Slides as we felt it would allow teams greater formatting flexibility in creating or designing products for application activities. To implement, each team was instructed to complete the application activity on an assigned slide within a larger class presentation. Teams then viewed each of the other teams’ slides and left comments or feedback as requested. Upon implementation with students, student feedback about the platform was satisfactory, thus confirming our decision. Google Slides also improved team-to-team feedback as students were able to quickly and easily view other teams’ slides within the same presentation and to leave the requested feedback or comments.

Once IO-TBL was implemented, the first shift in course design related to how teams were required to engage outside of the synchronous course sessions. Initially, teams were required to complete asynchronous application activities through discussions on the LMS forums. Following the first module, teams of four and five students had accumulated upwards of 40 to 50 forum postings per application activity. Although the frequency of communication was high, teams reported
during a midsemester feedback opportunity that communicating through forums was slow and not always effective. In response, the option of video conferencing through an embedded LMS application was added as an additional method of team communication. Teams were now provided either option of how to communicate. Interestingly, the selection of communication methods varied from module to module and from team to team.

A second shift in the course design was implemented to aid teams in maximizing the efficiency of their asynchronous team application activities. Initially, whole-group synchronous sessions concluded with an overview of the out-of-class team assignments. During a midsemester feedback focus group session, students requested an opportunity to meet with their team immediately following the synchronous class session to discuss and schedule plans with their team. In response, following the overview of out-of-class team assignments, all teams were released to their breakout rooms to discuss for as long as each team needed.

Additional end-of-semester feedback validated the inclusion of asynchronous and synchronous modes of engagement within each module. As designed, the IO-TBL model includes multiple deadlines across a single module and thus frequent engagement with team members and the course content. For example, following a synchronous whole-class meeting on a Monday, individual and/or team assignments would be due that Saturday, the next Wednesday, and the following Saturday. At midsemester, some student feedback indicated that the course was a lot of work and time consuming. To determine if the out-of-class team engagement was valued, we asked teams at the end of the semester if they would have preferred meeting synchronously every week—as a class—and thus eliminate the various deadlines, or did they prefer the current course design. Four of the teams preferred meeting every other week while two teams would have preferred meeting every week. As the content of the course was subsequently redesigned the same semester as IO-TBL implementation, the instructor also recognized that comments about workload were potentially reflective of the assignments and not the IO-TBL model. The team’s preference for frequent interactions outside of the scheduled sessions also highlighted how the social presence developed during synchronous sessions extends students’ collaboration and engagement to asynchronous application activities.

We recognize that the IO-TBL model might be challenging in some instructional contexts and with some student populations. For example, students who reside in multiple time zones might find the heightened team interactions and required synchronous meetings challenging. Although the IO-TBL model was implemented in a course of 20 or fewer students, we believe the model will be scalable to much larger courses. Within a TBL course, students spend most of their time engaged in team activities (e.g., tRAT and application activities). Because of this, large class sizes may be successfully adapted to the IO-TBL model. However, scaling to larger classes is limited by the technological capacity for team breakout rooms and learning management system support. Overall, these challenges mirror those of large online courses in general.

**Technology Selection**

The IO-TBL model requires access to technologies with various functionalities. We first describe the general functionality of each needed technology and follow with examples of the technology used during our initial implementation. The IO-TBL model requires video conferencing software to host the synchronous session for each module. A key consideration in making this software selection is the ability to manually assign breakout rooms, as teams will need opportunities to collaborate during tRATs and application activities. For video-conferencing software, we used Zoom to host the synchronous class sessions and made both BigBlueButton and Zoom available for teams to schedule and host their meetings between synchronous class sessions. An LMS is needed for various aspects of the IO-TBL model, such as organizing preparation materials, hosting forums for discussions, and submitting assignments. A helpful feature within an LMS is the ability to assign teams within the course for private collaboration. Our institutional LMS was Sakai, which allowed us to group students into teams and design the course shell in a manner that permitted team-specific collaborations and assignments.

The IO-TBL model requires iRAT and tRAT quizzes to be completely synchronously. In selecting this technology, the ability to assign teams is required and the ability for students to spread
points on the iRAT is also important for alignment with TBL best practices. InteDashboard, a web-based TBL management system, was used to host the iRAT and tRAT quizzes. It provides immediate feedback to the students on the tRAT, and the instructor may view student answers in real-time during the iRAT and tRAT. Last, collaborative tools are needed for teams to engage in application activities. These tools should allow teams a platform to make specific choices within application activities and/or a space to create a product, if needed. It is helpful if individual students can view the application activity and selection choices from their own devices, rather than being able to access or view the activity only on a single device. Many of our team application activities were hosted within Google Drive (e.g., Docs and Slides) and InteDashboard. A key consideration for future semesters is including efforts to streamline students’ access to each of the required platforms; we are hopeful that many of these technologies will soon integrate within our LMS.

CONCLUSION

The IO-TBL model was designed to combine the benefits of team-based learning with effective instructional technology to maximize social presence, cognitive presence, and teaching presence in an online learning environment. Given the impact of TBL on student learning and performance outcomes within face-to-face settings (Haidet et al., 2014; Liu & Beaujen, 2017), we are hopeful the IO-TBL model will promote the transfer of these positive outcomes to online learning environments.

The IO-TBL model is valuable for online instructors and educational developers who support the development of online instructors. The asynchronous components of the model maintain the flexibility of online courses while the synchronous components promote connectedness between learners and the instructor. The IO-TBL model provides new directions for faculty development with respect to online course design. IO-TBL offers a structure that supports faculty in creating and implementing a course aligned with Quality Matters peer review expectations. For example, implementing the interacting components of IO-TBL provides evidence of meeting the essential criteria for Standard 5: Learning Activities and Learner Interaction (https://www.qualitymatters.org/about). The IO-TBL model provides a holistic course design for which instructors might be trained, rather than the piecemeal, and often inconsistent, application of various best practices.

Following two semesters of rapid prototyping to design and improve the IO-TBL model, empirical evidence examining the effectiveness and impact of the model is now needed. In alignment with the Community of Inquiry Model, our initial research will examine in which ways the IO-TBL model increases social presence, cognitive presence, and teaching presence in online environments. Also, given students enrolled in traditional, asynchronous online courses often struggle to develop a sense of community (Clark et al., 2018; Nguyen, 2015; Rovai, 2002), we will additionally examine how students’ sense of connectedness is impacted within a course implementing the IO-TBL model. Last, we will compare the impact on student learning outcomes between the IO-TBL model and TBL implemented within a face-to-face course.
REFERENCES


