Journal of Practitioner Research

Volume 6 | Issue 2 Article 5

2021

Cultivating Classroom Interactions Online During COVID-19: A Case for Using Team-Based Learning

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Cover Page Footnote

This work has been partially supported by a seed grant from the Center for Research on Teaching and Learning Excellence at the University of Texas at Arlington. The authors wish to thank the students who participated in the work reported here, especially for their willingness to collaborate with one another and their thoughtful feedback on their learning and experience with team-based learning in their online course.

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Abstract:

Team-based learning, an evidence-based collaborative learning teaching strategy, is a popular instructional model commonly used at the post-secondary level. While this model has shown success in traditional, face-to-face courses, and reports of use in hybrid and asynchronous online settings exist, though are few, no reports of which we are aware account for use in synchronous online teaching and learning. This paper introduces a tool developed to help higher education instructors plan for the implementation of team-based learning in their synchronous online courses along with an illustration of the use of the template planning tool from our own application for a synchronous online education-based research methods graduate course. Recommendations, challenges, and affordances of using team-based learning as a collaborative learning teaching strategy for cultivating classroom interactions online are given, supported by illustrations from our own implementation.

Introduction

Although teaching and learning in remote, online environments is not new in higher education, the COVID-19 pandemic has highlighted both the need for and importance of expanding high quality online instruction. Despite many online resources and tools available, it is well reported that faculty across the United States have struggled to convert their face-to-face instruction to online environments (Lederman, 2020; Rapanta et al., 2020). One challenge is the necessary changes in teaching pedagogy and strategies for online instruction (Henriksen et al., 2020). Personal interactions and conversations are often no longer possible; a typical adjustment made to emphasize mediated communications is using asynchronous online discussion board posts. Further, in online settings, especially synchronous environments, instructors often do not easily receive behavioral cues from their students which would inform instructional decisions, like knowing when students have had enough time interacting with one another during a "turn and talk" (Chapin et al., 2009). Instead, careful planning must be given to implement instructional activities that allow teachers to elicit and interpret student behavioral cues (Rapanta et al., 2020).

Perhaps unsurprisingly, online courses that utilize collaborative learning (Smith & MacGregor, 1992) can support coveted interactions between students, instructors, and the course content (Garrison & Cleveland-Innes, 2016). Multiple

researchers have found that positive interactions between students in higher education can lead to higher quality instruction (Anderson et al., 2001), increased retention (Lee & Choi, 2011), and better academic outcomes (Frisby & Martin, 2010). However, even with current technology options used for synchronous class meetings, such as breakout rooms, online polls, or reaction and engagement emojis found in popular conferencing software, incorporating meaningful online interactions can still be difficult. In online settings, students often need explicit guidance on when and how to interact, which can dehumanize communication and limit organic learning opportunities. When humanized interactions are present in an online classroom, students often develop more effective communication skills, report a heightened feeling of community, and are more motivated to learn (Bickle & Rucker, 2018).

In this paper, we present team-based learning (TBL) as an amenable teaching strategy for synchronous online use that supports humanized interactions. TBL is an evidence-based collaborative learning teaching strategy frequently used at the post-secondary level (Moore et al., 2020; Yuretich & Kanner, 2015). Broadly, TBL has been defined by Hills (2001) as when students team together to demonstrate an increase in capability, meaning the group can complete a task that has not been done before. Further, this teaching strategy must be measurable and observable, which according to Hills (2001) means that, "1) Individuals will have improved their skill, 2) Team performance will be better with less confusion or duplication of effort, 3) People will share information and tasks more willingly as they understand each other better, and 4) The team culture will encourage open and free-flowing information about individual and collective successes and failures" (p. 68).

Although this teaching strategy has been shown to be successful for supporting student achievement through collaborative learning in traditional, face-to-face courses (e.g., Liu & Beaujean, 2017; Michaelsen et al., 2004), and reports of use in hybrid and asynchronous online settings exist, though are few (e.g., Goh et al., 2020; Gomez et al., 2010; Palsolé & Awalt, 2008), no reports of which we are aware account for TBL use in synchronous online teaching and learning. Thus, here we present our Online Team-Based Learning Template (oTBLt) planning tool, developed to guide post-secondary instructors who want to implement TBL in synchronous online courses. To illustrate the use of our planning tool, we report our own application for a synchronous online education-based research methods graduate course. Recommendations, challenges, and affordances of using TBL as a collaborative learning teaching strategy to cultivate classroom interactions online are given.

DOI: https://doi.org/10.5038/2379-9951.6.2.1184

Collaborative Learning and Classroom Interactions

Derived from social and psychological constructivist perspectives and theories of learning (e.g., Vygotsky, 1978), collaborative learning "is an umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together" (Smith & MacGregor, 1992, p. 11). In classrooms using collaborative learning, interactions between students, instructors, and the course content are common. Instructors may still use traditional teaching methods, like lecture, but plan for rich and frequent opportunities for interactions. Studies link students' interactions with each other, the instructor, and the course content (e.g., through an experiment or role play or other carefully designed, active learning strategy), to achievement, course satisfaction, motivation to learn, and more, arguing classroom interactions are key to students' success (e.g., Freeman et al., 2014). For collaborative learning to work as intended, meaning students are engaged in interactions that lead to advanced concept development and achievement, students must be in an environment with and have scaffolding for group activities. Such group activities may range from discussions to debates, presentations, and even assessments; activities which necessitate collaboration and interactions. Thus, at the heart of collaborative learning is *active learning* where students are engaged with the course material through discussions, problem solving and other methods. Active learning often places more responsibility on the student compared to passive instruction like lectures, however, the instructor is still available for guidance (Hood Cattaneo, 2017).

Research indicates collaborative learning is not always associated with student learning if groups are unprepared to work together or the activities for collaboration are inappropriate or insufficient (Zambrano et al., 2019). This stresses the importance of instructor knowledge, the careful selection of collaborative learning teaching strategies, course and activity planning, and adept implementation. We contend TBL can be used to actively engage all students and is accessible to post-secondary instructors at all levels of teaching experience due to its collaborative learning framework and well-defined structure for planning and implementing. This can help instructors use their knowledge to carefully design their courses so that students are prepared to collaborate in effective and efficient ways.

Team-Based Learning

Team-based learning is consistent with a social constructivist perspective (Vygotsky, 1978) and parallels collaborative learning (Smith & MacGregor, 1992).

Michaelsen and colleagues (2009) assert that TBL, as a commonly used post-secondary teaching strategy, "probably relies on small-group interaction more heavily than any other" (p. 7) teaching strategy. The four key elements of TBL (Michaelsen & Sweet, 2011) — (1) strategically formed, permanent teams of students, (2) readiness assurance activities done by individual students and again in student teams, (3) applying course content through application, and (4) giving and receiving feedback — like a blueprint of units or modules of instruction that guide course design. Although student teams (key element 1) are permanent throughout a course, iterations of the remaining three key elements may be made for each unit or module of instruction. Further, the key elements of TBL support classroom interactions, especially student small-group interactions. Specifically, teams of students work together throughout the course with significant time in class used for interactions between students, instructors, and the course content with teaching and learning activities focused on team collaborations that are, "designed and sequenced to both improve learning and promote the development of self-managed learning teams" (Michaelsen, 2007, p. 1).

In **Error! Reference source not found.**, we list the key elements of TBL, defining each, and describing major considerations for planning or implementing drawn from the literature. This table reflects a syntheses of TBL from face-to-face use, that is, what is currently reported in the literature. We further explicate TBL and the key elements for synchronous online use in the following section.

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Table 1

Team-Based Learning Key Elements

	Key Element 1		
	strategically formed, permanent teams		
	heterogeneous teams of students are formed to build trust and communication throughout the entire course		
	Iterative Key Elements 2, 3, and 4		
	readiness assurance	*applying course content through application*	*giving and receiving feedback*
General Description	students complete both individual and team readiness assurance tests	teams complete activities, applying course content to answer problem(s), with specific answers, and then revealing their choices to one another simultaneously	team members provide feedback to one another to promote team development and coherence
Relationship to Other Key Elements	students are better prepared to contribute to team interactions by completing their individual readiness assurance test	in-class instruction focuses on areas not yet mastered, evidenced through the readiness assurance test	class engages in constructive conversation benefitting readiness assurance processes and classroom activities where content is applied
Considerations for Planning or Implementation	course assignments outside of class time are intended to flip instruction and prepare for the readiness assurance	course instruction practices can be varied, even utilizing direct or lecture	teams develop rapport and understand how to give constructive, descriptive feedback
Connections to Theoretical and Conceptual Bases	preparation material is often assigned and reviewed before class using a flipped classroom approach	small-group interactions during team time	instructor fosters a safe classroom environment
	small-group interactions during team readiness assurance tests	group problem solving is active learning, collaborative	instructor supports norms for student to use respectful ways to respond and ways to differ in opinion
	tests provide summative and formative content feedback for instructor, students	whole-class interactions when revealing team problem solving and discussing content application	
		revealing choices provides formative content feedback for instructor, students	
	Additionally, TBL capitalizes on student motivation to receive feedback by providing team assessments. Since teams must reach consensus on assessment items, individual students must provide rationales and confidence levels for their decisions. Hearing explanations from other students is often more effective than the instructor, as students share a similar level of content understanding (Gredler, 2012). This improved understanding of the course content often leads to reduced anxiety and higher academic self-efficacy.		

Integrating Team-Based Learning Online

To meet the challenge of moving a face-to-face education master's-level research methods course online due to the COVID-19 pandemic, with the goal of preserving collaborative, active learning, course content that would have been presented face-to-face with humanized interactions between all students and instructor(s), we decided to use TBL as the primary pedagogical strategy. This course is the second in a series and a required course for students pursuing master's degrees in Curriculum and Instruction, intended to build on introductory research skills for collecting, analyzing, and interpreting different types of data. Learning is grounded in a variety of education research methods by focusing on quantitative data analyses/interpretations (e.g., correlations, t-tests, and regressions), qualitative data analyses/interpretations (e.g., thematic analysis, content analysis, and summative analysis), and mixed methods analyses/interpretations. TBL is especially productive for a research methods course, as elements of team-based collaboration, iterative learning, and problem-solving mimic educational research teams.

Students enrolled in the course were in a synchronous, face-to-face education degree program, where pre-COVID-19, they could have alternatively chosen an equivalent online, asynchronous program. So, with the transition to online teaching for this course, we were especially conscious of student expectations and preferences. That is, for synchronous, face-to-face instruction. By using TBL we sought to meet the challenges of adjusting our teaching pedagogy and strategies for online instruction specifically in ways that would foster community through authentic and humanized student, instructor, and course content interactions, key factors in synchronous, face-to-face learning.

As a result of our implementation, we share three distinct outcomes. First, the development of an Online Team-Based Learning Template planning tool, produced for use by higher education instructors planning for the implementation of TBL in their synchronous online courses. We developed this tool iteratively and in tandem with our implementation of TBL in our synchronous online education master's-level research methods course. Specifically, we did not find an immediately comparable tool particularly for our purpose, but we generally found that teacher planning tools or organizers are especially useful. Our second goal was reporting on our implementation. Recall, no reports of which we are aware describe TBL use in a synchronous online environment. We do such reporting of our implementation through the application of our oTBLt planning tool — thus showing the feasibility of the tool as intended in our first goal. Finally, our third

goal was to provide an example of how to implement TBL in your own online classroom.

The Online Team-Based Learning Template Planning Tool

The oTBLt planning tool, displayed in **Error! Reference source not found.**, is divided into three main sections of planning considerations: (1) Pre-Class Considerations, (2) Small Team Development Considerations, and (3) TBL Application Considerations. Key element one of TBL (**Error! Reference source not found.**) — *strategically formed, permanent teams of students* — is addressed in the Small Team Development Considerations section, while iterative, key elements two through four — *readiness assurance activities done by individual students and again in student teams, applying course content through application, and giving and receiving feedback*—are all found in the TBL Application Considerations section. In each of the main sections are a series of guiding questions (column 1) to initiate conversation and thoughtfulness when planning to implement TBL in a synchronous online course. The oTBLt is explicated thoroughly in the following section. The second column of Table 2 gives example notes from our planning for use of TBL in our course, further explained in the following discussion.

Table 2

Online TBL Template (oTBLt) Planning Tool

Pre-Class Class Considerations	
Template Prompts	**Example Responses**
A. Course Content • What course content will be covered? • What will be the units or modules of instruction?	• *Research methods (specifically quantitative, qualitative, and mixed-methods data analyses and interpretations).*
B. Learning Goals • What are the student learning goals for the course? • How will those learning goals be met by the planned units or modules of instruction?	• *Identify current trends in education research, implications of educational research in teaching and learning, and possible gaps in research.* • *Understand differences between quantitative, qualitative, and mixed-methods research.* • *Use peer-reviewed journal articles and other scholarly literature to make data driven decisions in real-world settings.* • *Identify and interpret scholarly literature to write measurable research questions, ethically collect data, and analyze that data using basic qualitative, quantitative,*

	or mixed methods analyses.
C. Class Size • What is the class size? • What might be the possible group sizes?	• *The class will include 20 students.* • *Estimated group size is approximately 3 students per group.*
D. Class Meetings • How many synchronous class meetings, or what length, will occur?	• *Thirteen synchronous class meetings that are approximately 3 hours each.*
E. Technology • What technology is available (e.g., conferencing software?) • What technology might students need? • What technology might students need training on?	• *Zoom, Canvas, Poll Everywhere, and Microsoft Teams.* • *Students will need to download Zoom and access Canvas and Microsoft Teams through the University.* • *Students may also need a place to collaboratively work through Google Drive or Microsoft OneDrive.* • *Students may need training on specific features in Zoom (i.e., polling, raising hand, mute, reaction emojis, etc.) and how to download files, access assignments, and find course content in Canvas.*

F. Class Norms
• What classroom and interaction norms might be established to support collaborative learning?
• How will respectful ways of interacting, especially when there are differences in opinions be ensured?
	• *Students will…*
	  ○ *Mute oneself unless speaking.*
	  ○ *Use the chat function for questions, comments, thoughts, discussions, etc.*
	  ○ *Use the virtual "raise hand" function when there is a question.*
	  ○ *Explore technology functions (i.e., raise hand, breakout rooms, reaction emojis, polls, etc.).*
	  ○ *Create a safe space where all students and ideas are respected.*
	  ○ *Be encouraged to use their video, although not required.*
	  ○ *Not interrupt colleagues when speaking.*
	  ○ *Provide time for additional rationale to be explained calmly, if there are differing opinions.*

Small Team Considerations	
Template Prompts	**Example Responses**
G. Creation of Small Teams • How will small teams be created? • What should be considered when determining team size?	• *Since our class size is small (20 students), we will opt for more teams with less individuals.* • *More students in a group may highlight diversity of thought, although there is a greater risk of social loafing.*

H. Creation of Heterogeneous Teams • How will the creation of heterogenous teams be ensured?	• *Since we had these students in previous courses, we will make heterogenous teams using our prior knowledge of student characteristics.*
I. Creation of Permanent Teams	• *Students will be given clear instructions on the first day of class that teams are permanent.* • *Students will be given opportunities to anonymously voice team feedback if there are conflicts.* • *Students will have the opportunity to disagree with their team, if a resolution cannot be met, without penalty.*
TBL Application Considerations	
Template Prompts	**Example Responses**
J. Pre-Class Materials • What materials would supplement class instruction? • How do the pre-class materials align with the course objectives and learning goals? • How will in-class materials be linked to pre-course materials?	• *Use of YouTube videos, journal articles, datasets, etc. will supplement the classroom instruction. Materials will be purposefully selected to provide basic knowledge in an easy-to-understand way.* • *Pre-class materials will supplement what is being learned in the classroom, which has been mapped to learning objectives.* • *In class materials will be mapped to the learning objectives to ensure cohesiveness.*
K. Applying Course Content Through Application • What specifically structured activities will be included? • What specific contexts will activities be situated in? • What problems/challenges will teams be asked to resolve?	• *Examples of specifically structured activities will include: developing research questions, conducting specific types of qualitative and quantitative analyses, and providing recommendations based on results.* • *Activities will be structured in a math education context, which matches student experiences and interests.* • *Teams will be asked to solve/answer different research questions in a variety of ways using varying resources (i.e., datasets, videos, transcripts, etc.).*
L. RAT Completion • How will the individual and team RATs be designed to ensure linkage to course objectives and content? • How will the individual and team RAT be the same/similar, so students complete the individual RAT before meeting with their group for the team RAT?	• *Both the individual and team RATs will be designed to mirror in-class activities that have been aligned with the course learning goals and objectives.* • *Team and individuals will be intentionally designed to be the same (i.e., same questions), other than slight wording changes to reflect individuals compared to a team.*

• What safeguards can be implanted to ensure individuals work together on the team RAT?	• *Teams will be given time in-class with the instructors present to ensure teams are working together and not delegating tasks to individuals.*
M. Giving and Receiving Feedback • How and what classroom norms will be established on how students should give and receive constructive feedback?	• *Classroom norms such as respect, muting the microphone, not talking over others, etc. will be implemented so students feel encouraged to give and receive feedback from others.* • *Students will be encouraged to provide descriptive, evaluative feedback versus evaluative feedback.*

Note: RAT means readiness assurance test.

Use of Team-Based Learning and oTBLt Application in an Education Master's-Level Research Methods Course

In what follows, we work through each main section and subsections of the oTBLt, specifically addressing our use and implementation of TBL in an education master's-level research methods course. We note that our research methods course, with whom the oTBLt was developed, is required for all students receiving a master's degree in Curriculum and Instruction, regardless of content area/degree program. Therefore, some students were seeking certification, some students were seeking just a master's degree, and other students were seeking both certification and a master's degree in education.

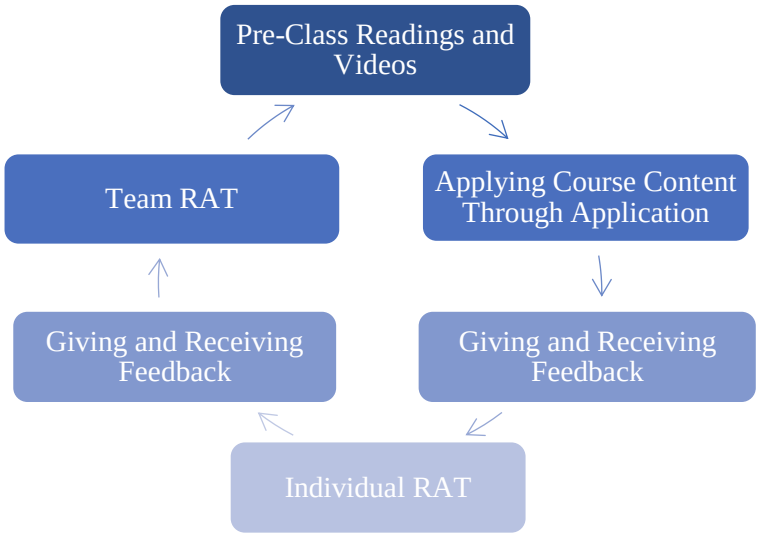
Pre-Class Considerations

(A) Course Content. First it was important to identify our course content. Specifically, what we planned on teaching students and how our course content could be partitioned into units or modules of instruction. We carefully thought about how to align our course content with the core tenants of TBL. To facilitate TBL, and organize content, the units or modules of instruction were identified — three total, each aligning with distinct sections of the course: (1) quantitative data analyses and interpretations, (2) qualitative data analyses and interpretations, and (3) mixed methods data analyses and interpretations.

Informed by the TBL literature (referenced previously, and in Table 1), we created an iterative loop of key elements two through four, that would guide each of the course modules of instruction, displayed in Figure 1. These inputs included pre-class readings and videos, team and individual readiness assurance tests (RATs), application of course content activities, and opportunities to give and receive feedback to and from peers and the instructor.

Figure 1

A Particular Iteration of TBL Key Elements 2-4, Replicated for each Course Module of Instruction



(B) Learning Goals. When we designed this course, it was important to develop learning goals or outcomes. Learning goals should be specific and measurable statements that identify what students will learn (Kennedy, 2006). Four learning goals for this research methods course exist. The first learning goal was: "Identifying current trends in education research, implications of educational research in teaching and learning, and possible gaps in research." The remaining goals can be found in Table 2. Units or modules of instruction may each have their own learning goals, which may also provide a natural partitioning of course content into units or modules of instruction. In our case, learning objectives were incorporated into each module of instruction; students developed full mastery of the learning objectives after the final learning module.

(C) Class Size. Our third pre-class consideration was class size. Typically, in traditional face-to-face settings, class size is an important consideration due to limited space in a physical classroom (Espey, 2008). In online settings, space is not an issue since students work in virtual locations. However, we found class size can determine the number of teams created, as more students typically equals more teams. When implementing TBL in online settings with large classes, not all

students or teams may be able to participate in whole class discussions. Therefore, to ensure all teams had an equal chance of participating and received equal time in large group discussions, we suggest using classroom management tools like classroom timers (https://www.online-stopwatch.com/classroom-timers/) and the Team Picker Wheel (https://pickerwheel.com/). For example, by setting a classroom timer, we could ensure that one group did not dominate large group discussions and by using the Team Picker Wheel, we could randomly select which group would respond to discussion questions. The Team Picker Wheel will also hide choices, or in our case teams, so that once a team was selected, they were not randomly selected multiple times in a row. We found this limited the likelihood that one team consistently participated in classroom discussions, over and above other teams. We note that the technology available (e.g., conferencing software) may limit the ability to create and breakout into teams of preferable sizes.

(D) Class Meetings. We considered the number of class meetings in tandem with our course content and learning goals. We recognized that when there were more class meetings, there were more opportunities to integrate the key elements of TBL. For example, in our research methods class, we specifically planned for three RATs (each to be completed both individually and as a team), one for each of the quantitative, qualitative, and mixed methods learning modules. To meet our learning goals, we spent approximately five class periods on quantitative and qualitative methods, respectively, and approximately three classes on mixed methods. The course met synchronously online once weekly for roughly three hours, a total of 13 times.

(E) Technology. In online settings, we found the technology provided by our institution determined what technology could be used with students and incorporated into course design. When implementing TBL in online, synchronous courses, conferencing software was essential. We chose to use Zoom since it included functionalities that fostered online student engagement such as breakout rooms, a chat function, the ability to raise hands, reaction emojis, and online polling, among others. We also could share screens using Zoom, which was helpful during direct instruction, and teams could share screens during group activities in breakout rooms. However, we recommend having a second conferencing software available in case there are technical difficulties. In our case, we used Microsoft Teams. Our institution also subscribed to the learning management system (LMS) Canvas, which was used to distribute course materials, collect assignments, and track grades. When students were working within their teams, we recommended that they work in a collaborative document in Google Drive or Microsoft OneDrive so every team member could share thoughts in real time.

DOI: https://doi.org/10.5038/2379-9951.6.2.1184

We note that students' familiarity of and expertise with the chosen technology varies. We recommend reviewing commonly used technology and features, including how to find course content, using reactions and chats while conferencing, how to share screens, and how to download or upload a file on the LMS.

(F) Class Norms. Our final pre-course consideration was incorporating classroom norms, specifically how they would be established and negotiated. We recognize that classroom and interaction norms may be dependent on course materials and the instructor's teaching style. However, we offer a few suggestions on common norms that could be implemented in online classrooms regardless of the course content. First, we recommend that non-speakers in large group settings stay muted when not talking. This eliminates any background noise that could distract other students. Second, we encouraged the use of the chat function. This allowed students to make meaningful connections and thoughtful comments to other students and the instructor without disrupting the lesson. Further, we used the chat and reaction emojis as informal formative assessments to monitor student understanding before moving on to new content. Third, we encouraged but did not require students to use their video function. We found that teams established their own norms of showing their videos when working on team activities. However, we also acknowledged screen fatigue and that videos may exacerbate socioeconomic status and gender divides even with virtual backgrounds (Nicandro et al., 2020). Fourth, we expected classroom participation. We found that students were more willing to engage in large group discussions after meeting with their team, possibly because they already shared within the comfort of their learning community (Birmingham & McCord, 2004). Finally, we ensured our classroom was a safe space for all students by specifically addressing how to constructively give and receive feedback when interacting with team members, such as respectful ways to respond and ways to differ in opinion. This was completed by giving examples of effective versus non-effective feedback and by having students reflect on when they may have received feedback that was not constructive and how that felt.

Small Team Development Considerations

(G) Creation of Small Teams. As stated in the TBL literature, optimal team size is between five and seven team members (Michaelsen & Sweet, 2011). However, we also recognize non-TBL literature, specifically in social psychology and management, suggests the optimal team size is three to four individuals (Amir et al., 2018). The consideration of team size is important, as the literature has shown that large teams may ultimately decrease performance and hinder cohesiveness

while encouraging social loafing (Liden et al., 2004). In our research methods course, we decided to create teams of approximately three individuals. Since we only had 20 students enrolled, we thought there would not be an adequate number of teams to highlight the multiple correct ways to analyze data, implement research methods, and study a phenomenon. Further, negotiating interactions online, using conferencing software, is ultimately more challenging with more people, further supporting our choice for smaller teams. We would not suggest teams of less than three students since diversity of thought is important to the collaboration process and may not occur with fewer students.

(H) Creation of Heterogeneous Teams. When forming teams for TBL, it is essential that teams are heterogeneous. According to Michaelsen and Sweet (2011), this means that teams are strategically formed to include individuals with differing course-relevant student characteristics (e.g., intellect, personality, communication skills, experiences, etc.). For our research methods course, we had prior knowledge of student personalities, interests, and achievement since this was the second research methods course in a sequence. Although the students in this course were from one of four previous semesters, this prior knowledge allowed for strategically and thoughtfully formed diverse, heterogenous teams.

We recognize that not all instructors will have the luxury of prior knowledge of their students, therefore, we offer considerations when creating teams. One suggestion is using a personality or problem-solving assessment to screen students. For example, Farland et al. (2019), used the Basadur Creative Problem Solving Profile Inventory (CPSP-2) to ensure that all teams had a variety of problem solving styles. Another suggestion is using stratified systematic sampling to ensure that course-relevant student characteristics are equally distributed across teams (Sweet & Michaelsen, 2007). With this strategy, we recommend that students are organized into larger teams of 5-7 individuals so there is a higher likelihood that all teams contain diverse student characteristics.

(I) Creation of Permanent Teams. Finally, we suggest that teams remain permanent throughout the course. Much of the literature on group dynamics state that newly formed teams act differently when compared to mature teams (Stahl et al., 2010). Specifically, teams who have worked longer together typically exhibit more team trust, greater identification with the team, less decisions made on individual self-interests, better understanding of team skills, stronger communication and willingness to disagree, and the ability to complete more intellectually difficult tasks (Birmingham & McCord, 2004).

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To build comradery among team members, we provided information on TBL, including the reasons why TBL was selected as a teaching strategy. We also provided frequent surveys to allow students to anonymously convey feelings about their team to us, their instructors. Instead of reporting conflicts, we found students had a general concern for the welfare of their teammates. For example, teams automatically kept teammates informed when there were unavoidable absences. These communications often occurred without major interventions from us, the instructors, which was different than other online classes where students become autonomous and independent.

TBL Application Considerations (See Figure 1)

(J) Pre-class Materials. To help facilitate classroom discussions and ensure time for in class teamwork, we thought it was important that students had a basic understanding of the content before coming to class. Therefore, we adopted a flipped classroom approach, so students could have more time to engage in active learning experiences during class (Long et al., 2017). Examples of pre-class materials included watching YouTube videos; reading journal articles; experimenting with R, a statistical software; and developing and/or implementing inductive and/or deductive qualitative codes. All pre-class materials were specifically selected to align with the course objectives and learning goals for the class. To ensure alignment, we meticulously mapped the course learning goals with each activity planned. Further, in-class materials were linked to the out of class materials. Often the pre-course materials gave a general, inviting, and easy to understand overview of the content to be learned during that specific class period. Throughout the synchronous class meetings, students and teams were challenged to make additional connections between the pre-class materials and content learned in class.

(K) Applying Course Content Through Application. Applying course content in varying situations has been found to help facilitate the learning process by determining what students know and understand (Smith, 2000). When designing this course, we specifically included real-world applications. For example, we used the Trends in International Mathematics and Science Study (TIMSS) and situated our context in mathematics teaching and learning, of which all students in the course were familiar. In the quantitative learning module, students used the large-scale TIMSS dataset to develop research questions and run varying analyses. In the qualitative learning module, students used the TIMSS videos to create inductive coding schemes to answer research questions. In the mixed methods learning module, students were asked to use both the large-scale TIMSS dataset and the TIMSS videos to develop research questions, analyze data, and make conclusions

situated within the literature. These practical applications helped students connect how to use research methods in their future careers (e.g., academics, curriculum specialists, teachers, etc.).

(L) Readiness Assurance Test (RAT) Completion. There were two different types of RATs implemented in this course, individual and team RATs, respectively. Individual RATs were completed by the student and Team RATs were completed by the team, together (Michaelsen & Sweet, 2011). As suggested by the TBL literature, it was important that individual RATs and team RATs were similar for a learning module, so all students on the team completed the assignment individually before meeting and negotiating group or final answers for the team RAT.

In the research methods course, we designed the individual and team RATs to be similar to each other and to the in-class activities. By aligning the RATs with class activities, we could ensure strong linkage to student learning objectives and course content. For RATs, students were often given a research question and were asked to answer that question using different qualitative and quantitative research methods. Although individual RATs were completed outside of class, we conducted team RATs during class time. This allowed us to be available if there were questions and ensured that teams worked on their RATs together. If we did not provide class time for team RATs, we wondered whether students would schedule time outside of class to work together or would instead delegate tasks to individuals, defeating the purpose of TBL.

(M) Giving and Receiving Feedback. Research has demonstrated that both giving and receiving feedback is beneficial for student learning (Ion et al., 2018). When students receive feedback, they can identify areas of improvement and when students give feedback, they often become more involved in their own learning and critical of their work. Further, as suggested by Michaelsen and Schultheiss (1988), feedback should be descriptive and not evaluative. In our research methods course, we were able to create safe environments for students to collaboratively give and receive feedback by encouraging the use of specific, descriptive words. For example, the phrase, “I believe a t-test would be a better analysis plan, since we are looking at the mean difference between two groups,” is more descriptive, constructive, and specific than, “I think you’re wrong. That’s a bad idea.” We found when students gave constructive, descriptive, and non-evaluative feedback, students were more accepting of the suggestions and comments leading to more cohesive teams.

An Example of Implementing TBL in the Classroom

DOI: https://doi.org/10.5038/2379-9951.6.2.1184

After completing the oTBLt to prepare for your course, it is important to understand how to implement TBL in your classroom. Using the research methods course as the example class and our completed oTBLt as an exemplar (see Table 2), we will provide a broad overview of what a class module could consist of. Throughout this class we used the public use 1999 Trends in International Mathematics and Science Study (TIMSS; https://nces.ed.gov/timss/index.asp) as these data have both educational videos of classrooms, used in the qualitative module, in addition to datasets, used in the quantitative module. In this example, we will walk you through the qualitative learning module, where students learned how to code and analyze classroom videos from the TIMSS repository.

Implementing a flipped classroom approach (see Figure 1), we would first have students complete purposely selected pre-course readings, videos, and short coding activities. This allowed students to have baseline knowledge of the subject matter before coming to class. We would then begin the class with a short lecture that would review pre-course materials and allow students to ask questions and solidify their knowledge. Next, students would apply their knowledge in a scaffolded environment. For example, we would provide a research question and a researcher developed coding scheme. Then students would code 20 minutes of the selected TIMSS video with their team in a Zoom breakout room. When in their breakout room, we recommended that one student share their screen, so the team could work collaboratively in a shared document like Google Drive or Microsoft OneDrive. We would then bring students back to the large group and discuss what they observed when coding the TIMSS video using the research developed coding scheme. Specifically, as a class we would go through each interaction in the TIMSS video and ask for team responses on how that interaction was coded. If there was disagreement, teams negotiated with each other, received feedback, and came to agreement. Since this was a semester long class, we had multiple classes that followed this cycle (i.e., pre-class assignments, short in-class lectures, team activity, and large group discussion).

As we advanced through the qualitative module, for the individual RAT, we eventually asked teams to develop their own research questions and coding schemes based on what they had learned throughout the module. We also asked that students provided a visual synthesis, such as a table or figure, of their coding and findings, in addition to providing potential recommendations to teachers, administrators, and/or policy makers. In the individual RAT, we also prompted students to think about what important concepts should be discussed during the team RAT.

Then the day the individual RAT was due, the students would complete the team RAT in class. Since some of our students were working professionals, we wanted to give students time in class to complete the team RAT. This also ensured that students were completing the assignment as a team, versus delegating specific tasks to individuals without meeting. Students would answer many of the same questions asked on the individual RAT (e.g., providing a visual synthesis) in the team RAT, which was purposeful, so all students would already have answers and could contribute. However, the team RAT furthered the individual RAT by asking students to negotiate with their team when there was disagreement among codes. This means that team members would collaboratively provide feedback to each other on their individual RATs to complete the team RAT. Each team would then upload one assignment for grading and would share the grade on that assignment. We provided students the option to dissent from their team, but throughout our two semesters teaching the course in this format, we did not have any students who chose to do this.

Conclusion

The quick and seemingly universal movement made from face-to-face instruction as a response to the global pandemic has posed unique challenges and opportunities in post-secondary teaching and learning (Moore et al., 2020; Yuretich & Kanner, 2015). Due to the benefits of TBL, specifically the implementation of collaborative learning (Michaelsen et al., 2004), active learning (Freeman et al., 2014), and increased feelings of community (Bickle & Rucker, 2018), we believe TBL is an amenable teaching strategy for synchronous online learning as it supports collaboration and humanized interactions between all students, instructor(s), and the course content.

We have presented, in this paper, our oTBLt planning tool and have described our use of TBL in an education master's-level research methods course held synchronously online. We found that TBL was especially productive for our research methods course, as the elements of team-based collaboration, iterative learning, and the problem solving-focus from the TBL teaching strategy mimics education research teams. Although we note that many universities may discontinue online learning after the COVID-19 pandemic subsides, we believe that there will still be opportunities to implement this effective teaching strategy in hybrid and online programs, which many universities provided even before the pandemic. Therefore, given our rationale for using TBL to cultivate classroom interactions, any instructor looking to create an active, collaborative learning environment in a synchronous online setting may find TBL useful and should consider implementing this dynamic teaching practice.

DOI: https://doi.org/10.5038/2379-9951.6.2.1184

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