Students' Perceptions of Team Learning Across Teaching Frameworks and Settings

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Abstract: The benefits of team learning include increased achievement, increased motivation, and greater retention of concepts learned. While team learning has been implemented since the early 20th century, instructors in higher education settings may still experience challenges managing implementation, such as unmotivated students and a lack of accountability among group members. One team learning pedagogy is team-based learning (TBL), a structured course design that combines individual preparation with collaborative problem-solving. Given the benefits of TBL in face-to-face settings, including student learning and improved attitudes, educators have also adapted TBL to online settings. This embedded mixed-method study examined students' perceptions of TBL in face-to-face and online teacher education courses. We found that students in TBL courses, regardless of delivery method, reported positive perceptions of TBL, and commonly identified the *course structure* and *teams* as the most effective aspects of the course.

Introduction

Faculty and educational developers have been faced with the need to implement innovative teaching strategies to foster active, collaborative learning. Some of these innovative strategies incorporate students working together to complete an assignment or task, which has been referred to as cooperative learning (Bruffee, 1995; Johnson & Johnson, 1978, 2009); collaborative learning (Dillenbourg, 1999; Gokhale, 1995; Meijer et al., 2020; Panitz, 1999; Vygotsky, 1980); problem-based learning (Hmelo-Silver, 2004); and team-based learning (Michaelsen, 1983; Michaelsen & Black, 1994)—which are collectively hereafter referred to as team learning. The idea of students working together and learning from each other was first introduced by Dewey (1940), who believed that learning should be an interactive and dynamic

process that allows students to interact with their classmates (Gillies & Ashman, 2003). As a result, students learn "socially appropriate behaviors and they understand what is involved in cooperating and working together" (Dewey, 1940, 1966, as cited in Gillies & Ashman, 2003, p. 1). Generally, there are benefits when students work together in learning environments, including increased achievement and motivation, greater retention of concepts learned, and social development (Johnson et al., 2000). A foundational theory in team learning is Vygotsky's (1980) social constructivism, which suggests that students construct new knowledge from prior experiences and while working with peers and teachers. He stressed the importance of social interaction and community of students in the process of learning and cognitive development.

While team learning has been around since the early twentieth century, instructors in higher education settings may still experience challenges managing implementation, such as unmotivated students (i.e., social loafing), difficulty with communication among the group, and a lack of accountability among group members (Hall & Buzwell, 2013; Kerr, 1983; Koh & Hill, 2009; Meyer et al., 2016; Mulvey & Klein, 1998). In addition to implementing team learning in face-to-face settings, enrollment in online courses has consistently increased, with even faster growth in recent years (Seaman et al., 2018). Furthermore, universities—nationally and internationally—have transitioned instruction to online settings for the safety of students and faculty as it relates to COVID-19. Given these shifts to online instruction, ways in which to implement successful team learning in online courses is of need.

One specific team learning pedagogy is team-based learning (TBL), which is a structured, collaborative learning framework that combines individual preparation and accountability with team problem solving, and the application of course content. TBL has primarily been implemented in face-to-face settings (e.g., Clark et al., 2008; Lewis et al., 2019), with fewer reports detailing the implementation or effectiveness of TBL in online settings (e.g., Franklin et al., 2016; Parrish, Guffey, & Williams, 2021; Parrish, Guffey, Williams, Estis, & Lewis, 2021; Parrish, Williams, & Estis, 2021). Although TBL was first developed and implemented by Michaelsen in a college of business (Sibley & Ostafichuk, 2014), TBL is commonly implemented and studied in medicine, nursing, pharmacy, and some STEM disciplines (Haidet et al., 2014). In these settings, TBL has been shown to improve students' content knowledge, attitudes, and team interdependence (Fatmi et al., 2013; Haidet et al., 2014; Liu & Beaujean, 2017). The examination of TBL in teacher education is sparse (Nicoll-Senft, 2009; Parrish, Guffey, Williams, Estis, & Lewis, 2021; Parrish, Williams, & Estis, 2021). As such, the purpose of this study is to examine students' perceptions of TBL in face-to-face and online teacher education courses. We more specifically examine two research questions:

1) What are the effects of course delivery in face-to-face and online TBL teacher education courses on students' perceptions of TBL?
2) What do students identify as most effective and least effective in face-to-face and online TBL teacher education courses?

Conceptual Framework

In the sections that follow, we discuss our conceptual framework for the study, beginning with a discussion of team learning pedagogies and the benefits and challenges of team learning, in both face-to-face and online settings. We conclude with an overview and evidence of TBL as an effective team learning framework.

Team Learning Pedagogies

Team learning pedagogies in higher education often range from students informally working in a team to students having defined roles within the team to solve open-ended, inquiry-based problems (Blumenfeld et al., 1996; Tadesse & Gillies, 2015). While there is no prescriptive outline for the various team learning pedagogies, an overview of cooperative learning, collaborative learning, and problem-based learning are discussed in this section. An additional team learning pedagogy, TBL, is discussed in a separate section as it is the focus of this study.

The main goal of cooperative and collaborative learning is to help students successfully work together to learn new information (Bruffee, 1995). Although the two terms are often used interchangeably by instructors, a main difference is that cooperative learning was developed for teaching students in primary schools or novice learners and collaborative learning was developed for teaching adolescents and adults or learners with more content knowledge (Bruffee, 1995; Panitz, 1999). Additionally, while there has been extensive research on both cooperative and collaborative learning, it's important to note that both have theoretical underpinnings of social constructivism. In social constructivism, learning is dependent upon students engaging in content specific discussions with one another (Kalina & Powell, 2009; Krahenbuhl, 2016; Prawat, 1992; Vygotsky, 1980).

Given the context of the study is higher education, we focus our discussion on collaborative learning. Collaborative learning is defined as "a situation in which two or more people learn or attempt to learn something together" (Dillenbourg, 1999, p. 1). Students are grouped in teams to solve problems or achieve an academic goal (Gokhale, 1995). As students communicate with each other during the problem-solving process, they are "exposed to and draw on the expertise" of their team members (Blumenfeld et al., 1996). Additionally, it's important for learners to build consensus through the cooperation of group members (Panitz, 1999).

Problem-based learning (PBL) is an instructional method where students work together in collaborative groups to solve problems that do not have one correct answer, through self-directed learning (SDL; Hmelo-Silver, 2004). The teacher acts as a facilitator, providing scaffolds for students rather than providing knowledge through direct instruction (Hmelo-Silver, 2004). Although students are working in teams in this experiential learning process, team members do not have identified roles. The main goals of PBL are to help "students develop: a) problem-solving skills; b) SDL skills; and c) flexible knowledge" (Hmelo-Silver, 2004, p. 235).

Benefits of Team Learning

Since Dewey's (1940) research on teamwork, many scholars have studied the benefits and challenges of students working with each other to learn. Studies have found that group work allows learners to develop higher order- and critical thinking- skills while building content knowledge (Conrad & Donaldson, 2004; Palloff & Pratt, 2005). Davies (2009) also found that teamwork "promotes deep as opposed to surface learning and active as opposed to passive learning." Additionally, he found there were several practical advantages for instructors such as: a) reduced time in grading; b) ways to manage large numbers of students; c) ways to help students develop 21st century skills for the workforce (teamwork, leadership, project management, communication skills); d) foster social membership in large enrollment environments which can be alienating and confusing for students; and e) provide an informal forum in which new ideas can be discussed and assimilated (Davies, 2009). While there are

many benefits to team learning, studies reporting the specific examination of team learning in teacher education are sparse.

Challenges of Team Learning

Alternatively, if not implemented effectively, group work can be challenging for students and instructors (Bravo, 2019; Davies, 2009), particularly regarding the motivation of participants (Kerr, 1983; Morgan, 2002). Some students may be reluctant to participate in their group and apathetic to the goals or objectives of the group and class assignments (Kerr, 1983; Morgan, 2002). Examples of motivational issues have been referred to as "social loafing" and "free riding," which means the group member does not contribute or participate in group assignments (Hall & Buzwell, 2013; Jones, 1984; Latane et al., 1979; Meyer et al., 2016; Ruel et al., 2003; Strong & Anderson, 1990; Watkins, 2004). As a result of "social loafing" and "free riding," capable individuals may take on the role of the "sucker effect," which is identified as capable students minimizing their effort in group assignment or projects (Kerr, 1983; Meyer et al., 2016; Mulvey & Klein, 1998). These students would rather fail as a group than to be a sucker and complete the work individually (Kerr, 1983; Meyer et al., 2016). Alternatively, there are motivated team members who successfully encourage their less motivated peers to engage in and contribute to team assignments by planning and coordinating activities (Curseu & Pluut, 2013). However, there are instances where the motivated team members are also highly competent in academic settings and when grouped with team members that are viewed as less competent, the highly competent student doesn't accept or rely on information from that person or persons (Andrews & Rapp, 2014). Managing the social aspects of small group learning is also challenging. Students with dominant personalities may steamroll discussions, pressure group members to agree with their perspective, or force decisions on the group (Blumenfeld et al., 1996; Curseu et al., 2019). Other students may purposefully dismiss group members or disregard their contributions, which may cause the rejected students to withdraw or feel embarrassed (Blumenfeld et al., 1996).

As one aspect of our study examined team learning in online courses, it's important to expand on the general challenges with team learning and specifically highlight challenges in online courses. Studies have found that when working in teams in online courses, students have difficulty communicating with their team members and understanding group assignments and course objectives (Abdous, 2019; Koh & Hill, 2009; Phirangee, 2016). Students also experience feelings of isolation or a lack of community and feel there is a lack of accountability among team members (Phirangee & Malec, 2017; Roberts & McInnerney, 2007). In online courses that utilize team learning, students work with many technologies such as learning management systems and video conferencing platforms for synchronous meetings. Students have reported experiencing feelings of frustration when managing the various technologies (Gillett-Swan, 2017).

Each of the team-learning pedagogies described above provide flexibility in when and how often team activities are completed within the course. As such, the frequency in which team learning is implemented in higher education courses—as well as the associated benefits of team learning—likely varies from course-to-course. In contrast, TBL is a structured course design that embeds team learning in a consistent and regular manner.

Team-Based Learning

The TBL course design combines individual preparation with collaborative problem-solving. At the start of the course, students are assigned to permanent, diverse teams of three to

seven students. Each module then consists of the same sequence of instruction: (a) individual preparation, (b) readiness assurance process (RAP), and (c) team application of course content (Michaelson & Sweet, 2008, 2011).

Each module begins with individual preparation, where students engage with various module specific learning materials, such as readings or videos, to gain the foundational or prerequisite knowledge needed to successfully complete problem-solving activities later in the module (Michaelsen et al., 2004). Instructors often provide preparation learning objectives that detail what students should know and understand following engagement with the learning materials, and in turn, helps guide students reading or viewing.

The RAP is designed to gauge students' levels of preparation for the module and includes four parts: the *Individual Readiness Assurance Test* (iRAT), the team readiness assurance test (tRAT), appeals, and the clarifying lecture. Students begin by individually taking the iRAT, a short, multiple-choice, formative assessment on the content of the preparation materials. Following, they take the same assessment, the tRAT, but as a team, thus requiring students to engage in discussion and to reach consensus for each answer choice. The tRAT also provides teams with immediate feedback for each question, allowing teams to continue discussions until the correct answer is reached. Discussions during the tRAT have been identified as key learning opportunities as peer instruction often includes language more accessible to students than that of their instructors. If teams get a problem incorrect on the tRAT and believe there was ambiguity in the reading or question, a team may submit an appeal. An appeal includes declaring the source of ambiguity in the reading or question, as well as a justification and evidence from the preparation materials. The instructor reserves the right to grant or deny team appeals. The RAP concludes with a clarifying lecture by the instructor and targets the content of those questions missed on the readiness assurance test (RAT).

The majority of class time is spent with students engaged in application activities. Within the TBL framework, application activities must follow a 4S format. The 4S format includes: application activities that are a [S]ignificant problem, teams are required to make a [S]pecific choice (among clear alternatives), all teams work on the [S]ame problem, and teams' choices are [S]imultaneously reported. Once teams have reported their choices, inter-team discussion ensues as teams justify their reasoning. The number of implemented application activities will vary by course and module.

Peer evaluation is often completed at mid- and end-of-semester and provides students an opportunity to evaluate each of their team members' contributions within the course. Opportunities to evaluate peers is particularly important as TBL includes multiple team activities and provides accountability amongst team members, especially as peer evaluation is calculated in students' course grade. In completing peer evaluation, students assign their teammates numerical scores, as well as comment on each student's strengths and areas for improvement. There are multiple methods for conducting peer evaluations, some which force students to rank or assign varying levels of points to each team member (e.g., Michaelsen method). For an overview of various peer evaluation methods, see Sibley and Ostafichuk (2014) and Szatkowski and Brannan (2019).

Research Related to TBL

In considering the effectiveness of TBL across all post-secondary fields, authors of systematic reviews of literature and meta-analyses report that TBL has been shown to improve content knowledge, team communication and awareness, course participation, attitudes and self-

efficacy, and transfer of learning to job performance (Fatmi et al., 2013; Haidet et al., 2014; Swanson et al., 2019). While TBL has been shown to positively benefit all students, it is those students at the lower-end of performance that have been shown to consistently benefit the most (Haidet et al., 2014). In a meta-analysis of 38 studies examining the course learning outcomes, Liu and Beaujean (2017) found that the academic outcomes of students participating in TBL courses was almost 0.5 standard deviations higher than other methods of instruction. Similarly, Swanson et al. (2019) conducted a meta-analysis of 17 studies reporting the effects of TBL on content-knowledge outcomes. The researchers reported a mean effect size of 0.55 ($p<0.001$), indicating a positive, moderate effect of TBL on post-secondary students' content-knowledge.

Specific to teacher education, Nicoll-Senft (2009) conducted a study examining the effectiveness of TBL in the context of a graduate-level, special education course. It was found that within the course, students often scored higher on their tRAT (98.21%) than their iRAT (90.95%). In comparing student achievement on quizzes between students participating in TBL and students which completed the course in a previous semester in which TBL was not used, students in the TBL course scored significantly higher on individual and team quizzes than those students who completed the non-TBL course. Nicoll-Senft (2009) concluded that TBL, "increased student learning, enhanced student-to-student discourse, and an overall improvement in students' self-directed learning" (p. 37). Brannan and colleagues (2019) also posited that TBL would provide regular opportunities for preservice teachers to engage in and develop critical thinking skills, an important characteristic for the in-the-moment decision-making required in teaching (Griffith & Lacina, 2017). The authors noted that the demand associated with diverse teams having to consistently make a specific choice (e.g., tRAT and application exercises) would provide regular opportunities for preservice teachers to engage in critical thinking as varying perspectives and justifications would be shared in the process of reaching a negotiated decision.

Team-Based Learning in Online Settings

Given the benefits of TBL in face-to-face settings on both student learning and attitudes, instructors have begun to adapt and implement TBL in online settings. Past efforts to adapt TBL to online settings have remained primarily either fully asynchronous or fully synchronous (Clark, et al., 2018; Franklin et al., 2016; Palsolé & Awalt, 2008). Given asynchronous courses lack real-time interactions, the TBL components often completed in a single class session are stretched over multiple days. For example, students are provided between 1-2 days to complete the iRAT, followed by 2-3 days for teams to complete the tRAT. A similar structure is provided for teams to complete the application activities, with multiple deadlines across multiple days. Palsolé and Awalt (2008) found that in implementing TBL asynchronously, student learning outcomes were similar to those of TBL in face-to-face courses, and that students perceived a significant satisfaction with teamwork when compared to their other courses that implemented team learning in a less structured manner. Although activities are extended in time, the course maintains the flexibility students desire within an online course, and students still perform similar to those in face-to-face TBL courses.

TBL has also been adapted to synchronous settings, where students experience real-time interactions, but do so remotely. In a synchronous setting, TBL is implemented using the traditional TBL methodology, but through video-conferencing platforms (Clark et al., 2018; Franklin et al., 2016). For example, students participate in class sessions using web-conferencing software that allows for whole-group meetings and the use of breakout rooms. Breakout rooms provide opportunities for teams to collaborate on various activities, such as the tRAT and

application activities. Students participating in a single synchronous TBL module reported positive team competencies and interdependence (Franklin et al., 2016).

More recently, the integrated online–team-based learning (IO-TBL) model was developed to include elements of both asynchronous and synchronous engagement (Parrish, Guffey, & Williams, 2021; Parrish, Guffey, Williams, Estis, & Lewis, 2021; Parrish, Williams, & Estis, 2021). The goal of the IO-TBL model is to maintain the flexibility desired in online courses, while also providing the connectedness available in synchronous meetings. Each module begins with a synchronous session that includes the iRAT, tRAT, clarifying lecture, and one or more application activities. Following, teams spend the remainder of the module—the next two to three weeks—engaged in one or more application activities, as well as an opportunity to submit appeals from the tRAT. If two application activities are to be implemented outside of the synchronous sessions, the application activities are completed concurrently, with multiple deadlines across the weeks. For example, teams may be given four days to create a product or deliverable, another three days to view the other teams' products, leave feedback, and to make a specific choice. Following, teams' choices are revealed, and students are provided two to three days to individually share justifications and defend their team's selected choice. To complete these application activities, teams are provided both asynchronous and synchronous means of collaborating to ensure the flexibility of an online course remains. IO-TBL was the model of online TBL examined within this study.

Parrish, Guffey, Williams, Estis, and Lewis (2021) used mid- and end-of-semester feedback to examine students' perceptions of IO-TBL through the Community of Inquiry framework. Effective aspects of the course included synchronous meetings, increased learning, teamwork, and the instructor; ineffective aspects included a heavy workload and a significant time requirement. In considering the Community of Inquiry framework, effective and ineffective course aspects most commonly aligned with the teaching presence, followed by social presence and cognitive presence (Parrish, Guffey, Williams, Estis, & Lewis, 2021).

While team learning has been implemented in higher education for decades, and with numerous benefits to the learner, a number of challenges still exist. Namely, social loafing, a lack of accountability amongst group members, and within online settings, an absence of community. Likewise, without a prescriptive framework for when and how often instructors should implement team learning, the associated affordances will also likely vary across courses and students. Given the affordances of TBL in face-to-face and in online courses, TBL may serve as one team-learning course framework to meet many of these challenges. Lastly, as studies examining the implementation of team learning pedagogies, as well as TBL, in teacher education are sparse, understanding students' perceptions of TBL in teacher education courses is of particular need.

Method

As the purpose of this study was to examine students' perceptions on TBL in face-to-face and online TBL teacher education courses, an embedded mixed method design was employed. Qualitative data was used to further explain and interpret the quantitative data collected through the *Team-Based Learning Student Assessment Instrument, TBL-SAI* (Mennenga, 2012). The collection and analysis of complementary quantitative and qualitative data allowed us to make sense of these students' perceptions (Creswell & Clark, 2017). This section provides an overview of the participants, followed by a description of both the quantitative and qualitative data collection and analysis.

Participants

Two sampling procedures were used to identify participants from a mid-size regional public university for the study. First, convenience sampling was used to identify TBL courses within the college of education—*face-to-face TBL* and *online TBL*. All instructors in the college were sent a survey that stated the purpose of our study, asked if TBL was used within each course, how the course was offered (e.g., face-to-face, online), and for a roster of each course in which they would allow us to conduct the study. Instructors were encouraged to send as many of their TBL courses as they deemed appropriate.

Students in TBL courses, both face-to-face and online, were emailed the link for the *TBL-SAI* survey (Mennenga, 2012) during the last two weeks of the course, with a follow-up reminder emailed a few days later. For each semester of data collection, students were incentivized to complete the survey with a drawing for one of four gift cards to the university bookstore. This sampling procedure was completed for three consecutive semesters (Fall 2018, Spring 2019, and Summer 2019); note that online TBL was not offered Fall 2018 and only those students in online TBL were surveyed in Summer 2019. Also note that IO-TBL was the sole model used for online TBL courses.

Across all three semesters, we had a student response rate of 16.4%, with 28 of 171 students completing the survey; see Table 1 for an overview of courses and students surveyed for each semester. The gender of the participants were 79% female and 21% male. The race of participants were 93% White, 4% African American/Black, 3% from multiple races. The majority of participants were between the ages 21 and 29 (70%), followed by ages 30 to 39 (19%), ages 40 to 49 (7%), and ages 50 to 59 (4%). With regard to the degree sought, 50% of participants were seeking an undergraduate degree and 50% were seeking a graduate degree.

Table 1
Number of Students Surveyed, Responded, Course Type, and Semester

	Face-to-Face TBL			Online TBL		
	Courses	Students	Response	Courses	Students	Response
FA '18	3	45	6			
SP '19	4	91	6	2	26	11
SU '19				1	9	5
Totals	7	136	12	3	35	16

Note. Online TBL was not offered Fall 2018 and only those students in online TBL were surveyed in Summer 2019.

Quantitative Data

Data Collection

The *Team-Based Learning Student Assessment Instrument, TBL-SAI* (Mennenga, 2012) was administered online and accessed by participants through Qualtrics. The 32-question *TBL-SAI* measured three subscales: (a) accountability; (b) preference for lecture or team-based learning and (c) student satisfaction. The instrument included a five-point Likert scale with responses of strongly disagree, disagree, neutral, agree, and strongly agree. The total scores of the *TBL-SAI* ranged from 33 - 165. Mennenga (2012) defined neutral scores as follows:

accountability, 24; preference for lecture or TBL, 48; student satisfaction, 27; and total score, 99. Scores that fall above neutral scores are categorized as positive experiences or attitudes.

The accountability subscale had eight questions with scores ranging from 8-40 and addressed students' preparedness for class and/or contributions to their team members (Mennenga, 2012). The preference for lecture or TBL subscale had 16 questions with scores ranging from 16-80 and addressed students' preference for TBL or lecture, with an above neutral score indicating a student's preference for TBL (Mennenga, 2012). The student satisfaction subscale had eight questions with scores ranging from 8 - 40 and "included positive feelings toward either TBL activities or traditional lecture" (Mennenga, 2012, p. 169); an above neutral score indicated positive feelings towards TBL.

Data Analysis

A Cronbach's analysis to measure the reliability of the instruments and a correlation analysis between the three subscales was conducted (Field, 2013; Huck, 2012). Descriptive statistics were calculated for the two student groups: face-to-face TBL and online TBL (Johnson & Christensen, 2019). Levene's test was used to test the assumption of homogeneity of variances (Field, 2013; Huck, 2012). To compare the mean scores of the two student groups, an independent samples *t*-test, was conducted (Field, 2013; Huck, 2012). A one-way *t*-test was conducted to determine if the mean scores of each group were significantly different from the neutral score for the *TBL-SAI* (Mennenga, 2012), as well as the neutral score of the subscales (Field, 2013; Huck, 2012; Johnson & Christensen, 2019).

Qualitative Data

Data Collection

Students were asked three open-ended questions at the conclusion of the survey: (1) What did you feel were the most effective aspects of this course; (2) What did you feel were the least effective aspects of this course; and (3) Do you have any other comments or thoughts about this course? Data was organized into data sets, effective course aspects and least effective course aspects. For the third open-ended survey question—other comments—responses were assigned by the first two authors to either the effective course aspects data set, or the least effective course aspects data set, as determined by the nature of the comment.

Data Analysis

All responses within each data set—effective course aspects and ineffective course aspects—were independently open-coded by each of the first two authors (Corbin & Strauss, 2008). Following, the first two authors met to discuss and compare their open-codes and inductively developed themes for each data set, effective course aspects (see Table 2) and ineffective course aspects (see Table 3). The authors then recoded each data set, assigning one or more corresponding themes to each unit of analysis; each student response was considered a unit of analysis. Lastly, the authors met to compare how themes were assigned and were able to reach a consensus in all instances of disagreement.

Table 2
Themes for Effective Course Aspects

Theme	Description
Assessments	Responses relate to assessments, assessment strategies, or means of assessment (e.g., online).
Assignments	Responses relate to assignments and assignment details, such as resubmissions, student-led presentations, lecture-assignment alignment, and extra credit.
Course Content	Responses relate to the content of the course, such as reading materials and access to in-class presentations.
Course Structure	Responses relate to the organization, inclusion and sequencing of course elements, such as team-based learning, lecture followed by group activities, synchronous meetings, and course schedule.
Teams	Responses relate to teams and team organization within the course, such as permanent teams, group assignments, diverse teams, and peer relationships.
Instructor	Responses relate to the characteristics of the instructor (e.g., flexible, understanding, personable, etc.,) and timeliness of instructor feedback.
Lecture/Instruction	Responses relate to techniques included within- or elements of lecture and instruction, such as teacher questioning, instructor explanations, application of content.
Student Perceptions	Responses include students' perception of the course (e.g., enjoyable, applicable learning, etc.,).
Technology	Responses relate to the technology used to facilitate learning within the course (e.g., zoom, peardeck, Intedashboard, etc.,).

Table 3

Themes for Ineffective Course Aspects

Theme	Description
Assessments	Responses relate to assessments within the course, such as Readiness Assurance Tests (RATs), accessibility of assessments, final exams, or quizzes.
Assignments	Responses relate to specific assignments, assignment feedback, assignment alignment, assignment frequency, or out-of-class assignments.
Course Organization and Expectations	Responses relate to unclear deadlines, confusion of expectations, content alignment, class length, course difficulty, workload as related to course credit hours.
Teams	Responses relate to team assignments, peer review, group make-up (differing content areas within the same team), unmotivated group members, or out-of-class group meetings.
Instructor	Responses relate to the instructor's lack of feedback, lack of instruction, inability to provide explanations, or management of in-class discussions.
Lecture/Instruction	Responses relate to the PowerPoints, presentations, and synchronous lectures.
Nothing	Responses indicate "nothing" (theme was not applied for a no answer).

Findings

Our results are reported in two sections. We first report the results of the *TBL-SAI* with respect to method of delivery (face-to-face or online). Second, we report what students identified as effective and least effective course aspects, also by method of course delivery.

Quantitative: Students' Perceptions of Team-Based Learning

A Cronbach's analysis was conducted to determine reliability on the *TBL-SAI* and the three subscales (*accountability, preference for lecture or TBL, and student satisfaction*). It was found that the scale's alpha levels were .745, .824, .914, and .900, respectively, which indicates that the scale and three subscales had an adequate level of inter-item reliability. A correlation analysis was conducted between the *TBL-SAI* subscales. It was found that the *preference* subscale was positively correlated with the *satisfaction* subscale, $r(22) = .760$, $p < .01$. Additionally, it was found that each subscale (*Accountability, Preference for lecture or TBL, and Student satisfaction)* was positively correlated with the *TBL-SAI* in its entirety, $r(22) = .445$, $p < .05$; $r(22) = .946$, $p < .005$; $r(22) = .829$, $p < .005$. The descriptive statistics associated with the *TBL-SAI* and subscales for the face-to-face and online TBL courses (*Accountability, Preference for lecture or TBL, and student Satisfaction*) are reported in Table 4.

Table 4

Means, Standard Deviations, and Standard Error Means on the TBL-SAI and Subscales

Measure	Group	Mean	SD	SE
TBL-SAI	Face-to-Face TBL (*n* = 11)	133.73	13.02	3.92
	Online TBL (*n* = 11)	125.45	13.32	4.02
Accountability	Face-to-Face TBL (*n* = 12)	35.17	4.06	1.17
	Online TBL (*n* = 16)	34.56	3.945	.987
Preference for Lecture or TBL	Face-to-Face TBL (*n* = 12)	58.50	7.47	2.16
	Online TBL (*n* = 16)	55.94	7.07	1.78
Student Satisfaction	Face-to-Face TBL (*n* = 11)	39.45	5.39	1.63
	Online TBL (*n* = 11)	34.00	5.24	1.58

The independent samples *t*-test results associated with the *TBL-SAI* and individual subscales (*Accountability, Preference for lecture or TBL, and student Satisfaction*) are reported in Table 5. Results showed that the effect of course delivery on the *TBL-SAI* was not significant, $F(2, 20) = -1.473$, $p = .156$. The assumption of homogeneity of variances was tested and met using Levene's Test, $F(2, 20) = .001$, $p = .970$. There was not a significant difference in the *Accountability* subscale mean scores for face-to-face and online TBL courses, $t(26) = -.396$, $p = .696$. The assumption of homogeneity of variance was tested and was not violated using Levene's Test, $F(2, 26) = .032$, $p > .05$. There was also not a significant difference in the *Preference for lecture or TBL* subscale scores for face-to-face and online TBL courses, $t(26) = -.927$, $p = .362$. The assumption of homogeneity of variance was tested and was not violated using Levene's Test, $F(2, 26) = .151$, $p > .05$. There was a significant difference in the *Student satisfaction* subscale scores for face-to-face and online TBL courses, $t(20) = -2.407$, $p = .026$. The assumption of homogeneity of variance was tested and was not violated using Levene's Test, $F(2, 20) = .066$, $p > .05$.

Table 5

Independent Samples t-Test Comparing TBL-SAI Mean Scores of Face-to-Face and Online TBL

						95% CI of Difference	
Measure	*t*	df	*p*	MD	SED	Lower	Upper
TBL-SAI	-1.473	20	.156	-8.273	5.616	-19.98	3.441
Accountability	-.396	26	.696	-.6042	1.527	-3.742	2.534
Preference for Lecture or TBL	-.927	26	.362	-2.563	2.764	-8.244	3.119
Student Satisfaction	-2.407	20	.026*	-5.454	2.266	-10.18	-.7282

*p < .05

Comparison of the groups' mean scores to the neutral scores are reported in Table 6. The one-way *t*-test results show that the face-to-face and online TBL means scores on the *TBL-SAI* and its subscales were significantly higher than the neutral scores.

Table 6

One-Way t-Test Comparing TBL-SAI Mean Scores and Neutral Scores

Measure	Group	Mean	Neutral Score	*p*
TBL SAI	Face-to-Face TBL (*n* = 11)	133.73	99	.003
	Online TBL (*n* = 11)	125.45	99	.003
Accountability	Face-to-Face TBL (*n* = 12)	35.17	24	.002
	Online TBL (*n* = 16)	34.56	24	.000
Preference	Face-to-Face TBL (*n* = 12)	58.50	48	.002
	Online TBL (*n* = 16)	55.94	48	.002
Satisfaction	Face-to-Face TBL (*n* = 11)	39.45	27	.003
	Online TBL (*n* = 11)	34.00	27	.007

Qualitative: Students' Perceptions of Team-Based Learning

To report students' perceptions of instruction across and within each course delivery method, themes specific to effective and least effective aspects are shared. For each theme, the percentage of participants within each course delivery method that discussed that theme is also reported.

Effective Course Aspects

The themes, theme frequencies within each method of course delivery, and representative quotes specific to effective aspects are reported in Table 7 and include: *assessments*, *assignments*, *course content*, *course structure*, *teams*, *instructor*, *lecture/instruction*, *student perceptions*, and *technology*. When considering how students' discussion of effective aspects were similar across the delivery methods, almost half of the students in each type of TBL course discussed *course structure* and *teams*. Discussions of *course structure*—face-to-face (46%) and online (48%)—related to how elements of the course were organized or sequenced, and in many cases, students explicitly mentioned the TBL framework; "I really enjoyed TBL to learn materials!" (Spring 2019, face-to-face TBL). In other cases, students described specific elements of the TBL framework, such as: "meeting face-to-face [synchronously], challenging team tasks aligned with course objectives, working with the same group all semester, diverse team member specialties" (Spring 2019, online TBL). Additional aspects of the course structure included opportunities to engage with the course content during the time typically reserved for lecture; "I liked the scenario questions for the lecture and having my team to discuss what we should do next" (Spring 2019, face-to-face TBL). A last aspect of course structure was specific to online-TBL as students valued that the synchronous meetings allowed them regular opportunities to engage with their instructor and peers. For example, one student stated the following: "It was my first TBL class and I was surprised how much I learned from it! Definitely liked the zoom meeting layout" (Spring 2019, online TBL). In this particular course, Zoom™ was the web conferencing platform used to host synchronous meetings.

The theme *teams*–face-to-face (38%) and online (48%)–related to the benefits of working with other students. Across students' responses, it became clear that the permanence of teams in a TBL course provided students the opportunity to establish trust and comfort with the students on their team: "Working with the same group all semester made me comfortable to ask questions to peers" (Fall 2018, face-to-face TBL). Further, students reported multiple benefits of getting to work with a team, such as seeing others' opinions and ideas, opportunities to leverage the strengths of teammates, and increased learning. For example, consider each of these students' comments: "Building relationships with colleagues and leveraging each other's strengths to be successful" (Spring 2019, face-to-face TBL) and "If I couldn't remember something from the material or discussion, one of my teammates usually did and that made working on assignments easier. It also helped me remember the material later because I could recall who knew it" (Spring 2019, online TBL). A last element of *teams* was the effect of accountability in promoting course engagement as students perceived that their team was counting on them; "Team-based learning provided me ways to see others' opinions. It also encouraged me to do more because I had a team counting on me" (Fall 2018, face-to-face TBL).

In considering where students in face-to-face and online TBL courses differed in what they perceived as effective aspects, students in online TBL (33%) discussed assignments more often than those in face-to-face TBL (7%). Students in online TBL courses stated that they enjoyed writing lesson plans, as well as completing the classroom management plan, as a team.

There were also effective aspects discussed in both face-to-face and online TBL course settings–*assessments*, *course content*, *instructor*, *lecture/instruction*, *student perceptions*, and *technology*–but by only one or two students. See Table 7 for a representative quote within each of these aspects.

Table 7

Themes Identified as Effective Aspects for Each Course Delivery Method

Theme	Course modality	N	Representative quote
Assessments	Face-to-Face TBL	15% (2)	"I think the trats following the irats helped me personally to understand and get explanations for any mistakes made or misconceptions had" (Spring 2019, online TBL).
	Online TBL	14% (3)	
Assignments	Face-to-Face TBL	7% (1)	"I liked doing the lesson plans and management as groups before we did them on our own. Working in a team helped me remember what to do on my own" (Spring 2019, online TBL).
	Online TBL	33% (7)	
Course Content	Face-to-Face TBL	7% (1)	"…I also found information read before class and the iRATs were great resources for the future" (Spring 2019, face-to-face TBL).
	Online TBL	0% (0)	
Course Structure	Face-to-Face TBL	46% (6)	"The team-based learning made my learning and retention of information better! I loved getting to work with peers to find out solutions and effective ways to teach social studies" (Spring 2019, face-to-face TBL).
	Online TBL	48% (10)	
Teams	Face-to-Face TBL	38% (5)	"I liked doing the lesson plans and management [plan] as groups before we did them on our own. Working in a team helped me remember what to do on my own" (Spring 2019, online TBL).
	Online TBL	48% (10)	
Instructor	Face-to-Face TBL	23% (3)	"I loved _____ and I look forward to taking more classes with him as an instructor. It is clear that the team-based learning that has been put together for this class was well thought out" (Spring, 2019, online TBL).
	Online TBL	5% (1)	
Lecture/Instruction	Face-to-Face TBL	0% (0)	"Immediate application of material covered" (Spring 2019, online TBL).
	Online TBL	10% (2)	
Student Perceptions	Face-to-Face TBL	23% (3)	"I overall really enjoyed the class. It was hard and a lot of work" (Fall 2018, face-to-face TBL).
	Online TBL	10% (2)	
Technology	Face-to-Face TBL	15% (2)	"One of the most important aspects of this course was the technology implemented to conduct class. It allowed an online class to be more interactive and allowed me to be better acquainted with my professor and classmates" (Summer 2019, online TBL).
	Online TBL	5% (1)	

Ineffective Course Aspects

The themes, theme frequencies within each method of course delivery, and representative quotes specific to ineffective aspects are reported in Table 8 and include: *assessments*, *assignments/activities*, *course organization and expectations*, *teams*, *instructor*, *lecture/instruction*, and *nothing*. When considering how students' discussion of least effective aspects were similar across delivery methods, students commonly identified *teams*, *assessments*, and the *instructor*.

Table 8

Themes Identified as Least Effective Aspects for Each Course Delivery Method

Theme	Course modality	*N*	Representative quote
Assessments	Face-to-Face TBL	20% (2)	"I feel that I did not learn much during the iRAT and tRAT. Even though I went over the learning objectives and read the chapters, I feel the test questions were off. Maybe I just didn't comprehend the material well enough" (Summer 2019, online TBL).
	Online TBL	35% (7)	
Assignments	Face-to-Face TBL	20% (2)	"All of the individual and team lesson plans that were due every single week" (Fall 2018, face-to-face TBL).
	Online TBL	5% (1)	
Course Organization and Expectations	Face-to-Face TBL	0% (0)	"Amount of time in team meetings needs to be addressed in course description" (Spring 2019, online TBL).
	Online TBL	25% (5)	
Teams	Face-to-Face TBL	30% (3)	"As often happens with group work, it is difficult when team members are not pulling their weight. Peer evaluation at some points during the semester could help address this problem, although honest feedback on these could damage team relationships" (Fall 2018, face-to-face TBL).
	Online TBL	45% (9)	
Instructor	Face-to-Face TBL	20% (2)	"Some individuals in the class dominated discussion and class time, which prevented us from accomplishing as much as we could have otherwise. More regulation from the profession would help move things along and balance out those concerns" (Spring 2019, face-to-face TBL).
	Online TBL	20% (4)	
Lecture/Instruction	Face-to-Face TBL	0% (0)	"…the lack of direct instruction seemed to cause more problems for me throughout the semester" (Summer 2019, online TBL).
	Online TBL	10% (2)	
Nothing	Face-to-Face TBL	20% (2)	"There is nothing I think of as least effective. I learned different things from each aspects of the course that I believe will help me later" (Spring 2019, online TBL).
	Online TBL	5% (1)	

Similar to the effective aspects, students in face-to-face (30%) and online (45%) TBL courses identified *teams* as a least effective aspect of the course, namely about team members not pulling their weight and peer evaluation. In some cases, team members did not feel that other

team members were contributing equally to team activities or attending out-of-class team meetings: "I do not like team-based learning when all the team members do not participate. There were several times when I felt like some team members were not productive in the activities or beneficial in the learning" (Spring 2019, face-to-face TBL). Specific to online TBL, some students indicated that it was not fair when a team member did not show up to an out-of-class meeting. In other cases, teams appeared to function well and students expressed a dislike for having to differentiate numeric scores among their team members during peer evaluation, especially as this was calculated in students' course grade. Although peer evaluation provides a means of providing team members with feedback on their performance, one particular student feared that honest peer feedback would damage team relationships.

Regardless of method of delivery, students in TBL courses–face-to-face (20%) and online (20%)–identified specific aspects of the instructor as least effective. These critiques primarily related to wanting feedback directly from the instructor, and not necessarily from the other teams in the course. For example, one student responded with the following: "I do not feel that each team should choose the best representation of other team's work...It would be better if the instructor indicated which product they felt met the criteria and why, so that we could all learn from their expertise" (Spring 2019, online TBL). A last critique of the instructor centered on managing whole-class discussion as it relates to more dominant, vocal students.

Some students in both face-to-face (20%) and online (35%) TBL courses identified the assessments, specifically the readiness assurance tests, as a least effective aspect of the course. Students stated that they did not feel that they helped them learn, or that regardless of how they prepared, they struggled to perform well. Other comments were critiques specific of the final exam.

There were two least effective aspects that appeared in online TBL, but not face-to-face TBL–*course organization and expectations* (25%) and *lecture/instruction* (10%). Specific to *course organization and expectations*, students in online TBL desired that the required meeting day and time be clearer at the time of registration, while one student did not feel the required meeting time was even necessary. Another student comment did not appreciate the course only being offered online and the university fee associated with online courses. Specific to lecture/instruction within online TBL, some students expressed a desire for more explicit instruction, while another student felt that what little lecture was provided within the course was ineffective. Specific to wanting explicit instruction and explanations, one student responded with the following: "It would have been much more effective for the professor to directly explain how to lesson plan and create classroom management plans rather than have us look at past examples and review them as a team" (Summer 2019, online TBL).

The last two aspects identified least effective included *assignments* and *nothing*. Both comments specific to assignments related to either the frequency or type of lesson plan required within the course. And lastly, *nothing* represented those comments where students explicitly expressed no least effective aspects of the course.

Discussion

In this study, we examined students' perceptions of TBL in face-to-face and online teacher education courses. Specifically, we explored how method of delivery (face-to-face and online) affected students' perceptions of TBL, as well as inductively identified what students reported as effective and least effective course aspects. Students in teacher education courses completed the *TBL-SA*I, as well as responded to open-ended questions around effective and

ineffective aspects of the course. We found that students in TBL courses, regardless of delivery method, reported a strong preference for TBL, which provides a structured and consistent course framework for team learning. Students in TBL courses also commonly identified *course structure* (i.e., elements of TBL) and *teams* as effective aspects of the course.

Students' Perceptions of TBL

Student mean scores in face-to-face and online TBL courses were statistically significantly higher than the neutral score on the *TBL-SAI*. Additionally, there was not a statistically significant difference between the mean scores of students in face-to-face and online TBL courses. This lack of statistical significance in-between groups indicates that students' TBL courses, regardless of how the course was offered, perceived TBL positively (Mennenga, 2012). As the most promising affordances of TBL have been reported in face-to-face settings (Fatmi et al., 2013; Haidet et al., 2014; Liu & Beaujean, 2017; Swanson et al., 2019), these results provide some indication that these same affordances would be available in online settings.

Student Accountability

In considering the accountability subscale, students in both methods of course delivery scored significantly higher than the neutral score. There was also not a statistically significant difference between the mean scores of students in face-to-face and online TBL courses, indicating that students, regardless of how the course was offered, felt accountable towards their teammates and the course requirements, i.e., preparing for the iRAT, etc. (Mennenga, 2012). This is in contrast to previous studies that have shown some students are reluctant to participate in their group and are apathetic to the goals or objectives of the group and class assignments (Kerr & Brunn, 1983; Morgan, 2002), which have been referred to as motivational issues of "social loafing" and "free riding" (Hall & Buzwell, 2013; Jones, 1984; Latane et al., 1979; Ruel et al., 2003; Strong & Anderson, 1990; Watkins, 2004). Our qualitative findings provide deeper explanation of the way accountability functioned across face-to-face and online course modalities and suggest that accountability was inherently recognized by students as they felt like their team was counting on them, regardless of method of course delivery. This was further evidenced as students viewed teams as an opportunity to build relationships with a small number of other students. As TBL provided consistent opportunities for students to interact with the same teammates across the semester, trust and camaraderie were developed in such a way that students did not want to let their teammates down. These high-functioning teams were also reported to improve learning as students could leverage the strengths and views of their teammates.

In other cases, and in alignment with challenges reported in the literature, students did not always feel like one or more of their teammates were contributing equally on team activities and assignments. While there is certainly evidence that many of the participants viewed their teams positively, it does not appear that TBL completely eliminates the possibility of "social loafing" among some team members. Likewise, although peer evaluation is one TBL structure intended to hold students accountable to their team, one student feared that an honest evaluation would damage team relationships—especially as peer evaluation may occur at mid-semester. In future implementations, we will explore the possibility of implementing peer evaluation more frequently across the semester, as well as including a confidential portion of the peer-evaluation such that students will feel comfortable providing honest peer feedback.

Preference for TBL

With respect to the preference for lecture or TBL subscale, students in both methods of course delivery scored statistically significantly higher than the neutral score. There was also not a statistically significant difference between the mean scores of students in face-to-face and online TBL courses, indicating that students, regardless of course delivery, preferred team activities versus lecture, which is similar to findings in other studies (Opdecam et al., 2014; Remington et al., 2017). When considering our qualitative findings, the c*ourse structure* was often identified as an effective aspect of TBL courses, regardless of method of delivery. This is not surprising as TBL is a course framework with a clear structure across the course; within each module, students engage in the same sequence of instruction: (a) individual preparation, (b) the readiness assurance process (RAP), and (c) team application activities (Michaelson & Sweet, 2008, 2011). The course structure and predictability of TBL was recognized and valued by students, and in some cases, was even attributed to their learning. Likewise, in one particular case, a student identified the opportunity to engage with application activities during the "lecture" portion of the class meeting as an effective course aspect.

Student Satisfaction with TBL

In considering the student satisfaction subscale, students in both methods of course delivery scored significantly higher than the neutral score on the student satisfaction subscale. However, this subscale was the only instance in which the difference in mean scores of students in face-to-face and online TBL courses was statistically significant, with students in face-to-face TBL courses scoring higher. Even though students in face-to-face TBL were more satisfied than students in online TBL, they were both generally satisfied. This is in contrast to research that shows not all students enjoy working in teams and often have difficulty communicating with team members when completing team projects (Koh & Hill, 2009; Roberts & McInnery, 2007).

To further understand why students in face-to-face TBL were more satisfied with TBL than those students in online TBL, students' responses were considered. Although online TBL included a number of scheduled course meetings throughout the semester—one per module—a significant amount of team engagement had to be scheduled outside of this class time and might have contributed to this decrease in student satisfaction. This is in contrast to face-to-face courses where class meetings are likely more frequent, and teamwork occurs primarily within the scheduled class meetings. The specific model of online TBL implemented, IO-TBL, requires students to coordinate team collaborations in between required online class meetings, which may be an atypical expectation for an online course and thus impacting their satisfaction of the overall course. Parrish et al., (2021) also reported that students enrolled in an IO-TBL course were often unaware of the synchronous requirements at the time of course registration and identified this as an area of improvement for the model.

Limitations and Future Research

The primary limitation was the survey response rate of 16.4%, which was less than the recommended 29.9% (Blair et al., 2015). Future studies should consider additional means of survey dissemination and incentives to ensure a higher response rate. A second limitation is that IO-TBL was the only model of online TBL included within the study; students' perceptions in either fully-asynchronous or synchronous TBL courses might differ from those students in IO-TBL courses.

Conclusion

In this paper, we examined students' perceptions of TBL in face-to-face and online teacher education courses. Given the benefits available to students through team learning, such as fostering social membership in education environments (Davies, 2009) and helping students develop critical thinking skills, determining if TBL maintains these affordances is essential. We posit that TBL, in both face-to-face and online settings, provides students with the course structure and consistent opportunities to engage with teams in a way that students benefit from team learning.

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