Putting Structure to Flipped Classrooms Using Team-Based Learning

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Current educational practices and cognitive-developmental theories emphasize the importance of active participation in the learning environment, and they suggest that the first, and arguably most important, step to creating a better learning environment is to make learning an active and reciprocal process. Flipped classrooms, in which students learn the primary course content outside of class, have gained recent popularity. Many institutions, especially medical and business schools, have established flipped classrooms and recorded the method's effectiveness. One key component to the flipped classroom is the absence of traditional lectures inside the classroom. Unfortunately, how to effectively structure the classroom experience in light of this absence is largely missing in the literature and creates a unique challenge for instructors who are unsure of how to spend class time. In this paper, we present Team-Based Learning (TBL) as one way to effectively structure a flipped classroom environment.

Traditionally, teachers are responsible for transmitting information to students while they absorb the material from lecture. Most fundamentally, flipped classrooms result in a critical paradigm shift in which the responsibility for learning the primary course content occurs outside of the classroom and lies with the student (Berrett, 2012; Bishop & Verleger, 2013; Fulton, 2012; Kim, Kim, Khera, & Getman, 2014; McDonald & Smith, 2013; Moffett, 2014). During class, the teacher serves as a guide who helps and leads students toward understanding course content, but students must think more deeply about course content and make connections by actively engaging with the material (Findlay-Thompson & Mombourquette, 2014; Missildine, Fountain, Summers, & Gosselin, 2013). This method of active processing is supported by the sociocultural theory of cognitive development (Hausfather, 1996; Hmelo-Silver, Duncan, & Chinn, 2007; Vygotsky, 1978; 1980; Yildirim, 2008;). Therefore, the responsibility of learning the primary course content shifts from the teacher to the student. In other words, there is a shift from the instructor being the sage on the stage to the guide on the side (King, 1993).

In flipped classrooms, teachers provide students with short pre-recorded video lectures, vodcasts, and podcasts to deliver primary course content outside of the classroom (Kim et al., 2014; Moffett, 2014; Smith & McDonald, 2013). These online resources allow students to learn the material at their own pace because students have the ability to slow down or speed up a lecture or podcast, and they can pause, rewind, and watch the video again (Kim et al., 2014; Smith & McDonald, 2013; Sweet, 2014). Although the use of technology is a focus in the literature, primary course content can be introduced to students through more traditional means, including a textbook or supplemental reading. Once students acquire the primary course content outside of the classroom, class time can be spent clarifying more advanced material through application based group activities (Bishop & Verleger, 2013; Fulton, 2012; Hawks, 2014; Kim et al., 2014; McDonald & Smith, 2013). In-class activities can include class dialogue, pair discussions, and practice questions (McLaughlin et al., 2014). Rather than spending class time laying down the foundation, students are able to delve into a deeper understanding of the material.

While flipped classrooms outline a general paradigm shift in which what was traditionally done in the classroom (i.e., learning primary course content) now takes place outside of the classroom, the literature lacks clear guidelines for teachers on alternative in-class structures.

Effectiveness of Flipped Classrooms

While some studies have found increases in academic performance using flipped classrooms compared to traditional lectures (Flumerfelt & Green, 2013; Fulton, 2012; McLaughlin et al., 2014; Pierce, Fox, & Dunn, 2012; Talley & Scherer, 2013; Wilson, 2013), others have found no difference in academic performance, even though students perceived to have learned more in the flipped classroom (Findlay-Thompson & Mombourquette, 2014; Kirschner, Sweller, & Clark, 2006). Flipped classrooms seem to lead to additional benefits, including creating strong social ties between students and with their teachers, and overall, students are more positive towards the learning environment (Flumerfelt & Green, 2013). Students who participated in a flipped classroom were more willing to participate in class and to work together to gain a deeper understanding of the material (Strayer, 2012). In addition, flipped classrooms appear to increase class attendance (McLaughlin et al., 2014), increase perceived value of the flipped classroom (McLaughlin et al., 2014), and increase student cooperation and

student involvement (Flumerfelt & Green, 2013). Flipped classrooms also tend to hold student attention for longer spans; the average attention span in a lecture style class is ten minutes, whereas the interactive activities increased attention capacity in flipped classrooms (McLaughlin et al., 2014).

Guidelines for Structuring Flipped Classrooms

Student buy-in. One of the key factors in successfully flipping a classroom is to get students to buy into a method of teaching with which they may be unfamiliar. Oftentimes, students resent a format of teaching that requires them to put in any effort to their learning. There are several strategies that can help with student buy-in. Although students may not perceive it as valuable initially, presenting a flipped classroom as an evidence-based practice that results in higher quality learning is important (Moffett, 2014). Being transparent with the students from the beginning helps to build trust and helps students recognize that the instructor is using a flipped classroom to encourage learning, which may make them more receptive to the process. Balan, Clark, and Restall (2015) suggest having students participate in a sequence of activities to aid in their understanding of the requirements to be successful in a flipped classroom. Although it may take students several units to truly see the value of the flipped classroom, most students are willing to participate and, in the end, appreciate the flipped classroom (McLaughlin et al., 2014; Strayer, 2012).

Structure. While several studies have demonstrated students' positive attitudes toward flipped classrooms, in some cases, students were less satisfied with the flipped classroom compared to more traditional methods (Missildine et al., 2013; Strayer, 2012). Students in the lecture classroom felt like there was more structure, and students in the flipped classroom expressed concern that they never knew what to expect during class (Strayer, 2012). In order to alleviate this concern, researchers suggest setting up a pattern or structure to class time when employing a flipped classroom (Findlay-Thompson & Mombourquette, 2014; Strayer, 2012). Unfortunately, teachers may find it challenging to identify how to structure class time because much of the flipped classroom literature focuses on what to do outside of the classroom, without clear guidance on how to structure class time.

Accountability. A critical factor to consider when flipping a classroom is that students are expected to learn the primary course content outside of class and then be able to use that information to complete activities during the class period. One concern that teachers may have in this scenario is that students do not complete their work outside of the classroom and,

therefore, cannot engage with planned activities during class. There are several ways in which individual students can be held accountable for preparing for class, including requiring students to complete a homework assignment or pre-lecture/class quiz (e.g., Moravec, Williams, Aguilar-Roca, & O'Dowd, 2010; Narloch, Garbin, & Turnage, 2006).

Technology. Another detriment to the flipped classroom is the reliance on technology (Hmelo-Silver et al., 2007; Kirschner et al., 2006). It would be nearly impossible for students who do not have Internet access through electronic devices—such as a computer, tablet, or smart phone—to be successful in a flipped classroom (McDonald & Smith, 2013). Although most higher education campuses are wired, it would be difficult to implement flipped classrooms in areas where these resources are not easily accessible. Previous literature suggests that flipped classrooms can only be successful if they utilize technological advances, and video lectures are paramount to many of these designs (e.g., Kim et al., 2014). Although vodcasts and podcasts can be useful tools, they are not the only ways to transmit primary course content. We argue that it is just as effective to use traditional resources, such as reading the textbook, as it is to access the information online. An advantage to maintaining traditional resources is that flipped classrooms can be utilized in diverse settings where Internet access in the home might be limited.

Structures for Flipped Classrooms

The idea of the flipped classroom is not new, and it is similar to methods described by others (Crouch & Mazur, 2001; Lage, Platt, & Treglia, 2000; Mazur, 2009; Walvoord & Anderson, 2011), including interteaching (Boyce & Hineline, 2002), problem-based learning (PBL; Kilroy, 2004), process oriented guided inquiry learning (POGIL; Pierce et al., 2012), and inverted classrooms (Lage et al., 2000), in which students learn the primary course content outside of class and actively engage with the material during class. Each of these methods has been studied empirically and increases student academic performance (Bishop & Verleger, 2013; Crouch & Mazur, 2001; Lage et al., 2000; Pierce et al., 2012; Saville, Zinn, Neef, Van Norman, & Ferreri, 2006).

Team-based learning is also a successful way to structure a flipped classroom (Moffett, 2014). Team-Based Learning (TBL; Michaelsen, Knight, & Fink, 2004) is a method in which students learn the primary course content outside of class and spend class time working in teams to apply that content. The teacher guides classroom activities and discussions and clarifies any difficult material through the social learning principles of guided participation and scaffolding, but he or she spends little time teaching in the conventional sense of the word (Hausfather, 1996;

Vygotsky, 1978; 1980). TBL has been used across disciplines, including criminal justice (e.g., Tucker & Brewster, 2015), psychology (e.g., Jakobsen, McIlreavy, & Marrs, 2014), sociology (e.g., Hunter & Robinson, 2012), literature and English (e.g., Harde & Bugeja, 2012; Robertson & Reimers, 2012), business (e.g., Michaelsen, Watson, & Black, 1989), biology (e.g., Carmichael, 2009), nursing (e.g., Clark, Nguyen, Bray, & Levine, 2008), and other medical fields (e.g., Chung, Rhee, Baik, & A, 2009; Hunt, Haidet, Coverdale, & Richards, 2003; Zgheib, Simaan, & Sabra, 2010). Additionally, TBL has been used not only in higher education, but also in middle (Kubista-Hovis, 2012; Wanzek et al., 2015) and high schools (Kent, Wanzek, Swanson, & Vaughn, 2015; Wanzek, Kent, Vaughn, Swanson, Roberts, & Haynes, 2014).

Introduction to Team-Based Learning

The methodology of TBL makes it an exemplary structure for a flipped classroom. Most generally, TBL includes the delivery of primary course content outside of the classroom, allowing for class time to be used to apply course content through the use of properly structured permanent teams, ensured readiness, application exercises, and accountability for learning through peer evaluations (Michaelsen et al., 2004).

Traditionally, TBL is designed to cover four to seven units (Michaelsen et al., 2004) during the course of the semester; however, more units may be included if necessary. The key in determining the number of units for a particular class is dependent on the class and up to the discretion of the instructor. For example, each chapter may be an individual unit, which results in 10-12 units for the semester (e.g., Jakobsen et al., 2014; Mahler, 2012). One way to determine how many units to include is to use backward design to develop the course. Backward design starts with identifying what you want students to be able to *do*, then designing the course to meet those goals (e.g., Wiggins & McTighe, 2001). Using backward design ensures that the TBL process results in students being able to *use* the course concepts. Each unit is structured in the same way, alleviating students' uneasiness about expectations for the course (Strayer, 2012).

Teams

The first critical piece to successfully implementing TBL is to create permanent student teams of five to seven members (Michaelsen et al., 2004). Teams should be heterogeneous based on characteristics that are important for the particular class. Some general factors to consider when creating teams may include whether students in the course are required to take the course or whether it is an elective, as well as whether the students are majors or non-majors, but

other factors more specific to the course may be important as well. For example, in a statistics class, the level of students' prior statistical knowledge, performance in previous math and/or statistics classes, and their anxiety for statistics may be factors to consider. Instructors should be transparent about the way they create teams in order to start building trust with students about the TBL process.

Students may resist the *team*work initially due to previous experiences with *group* work. Students' previous *group* work experience may have included difficulty in finding a time to meet, the division and completion of the work, and some students' lack of contribution to the task at hand. Students are often relieved when they find out that all teamwork takes place in class. Clearly explaining the structure of the class to students early can help with student buy-in. Additionally, helping students understand that that structure of the course requires students to be prepared for class (i.e., there is accountability for being prepared) helps ease fears about potential social loafers.

Readiness Assurance Process

The Readiness Assurance Process (RAP) holds students accountable for learning the primary content for the course (Michaelsen et al., 2004). Students complete part of the RAP outside of class by individually learning the primary course content through carefully designed preparation/assignments, while other parts of the RAP are completed inside the classroom individually and through teamwork. Each RAP takes about 50-75 minutes to complete.

Outside the Classroom. For each unit, students complete preparatory work outside of the classroom. The preparatory work need not be technology reliant, as in traditional flipped classrooms, but can include readings and guided questions. Scaffolding students' learning outside of the classroom is critical for creating clear expectations with regard to how to prepare for the class activities. Reading/preparatory guides may be particularly useful in guiding students' learning of the primary course content: students may not know what is important from the readings and may not be able to integrate the readings for usable knowledge without guidance. Guides should be based on the learning objectives for each unit and include questions at multiple levels of Bloom's taxonomy (Bloom, Engelhart, Furts, Hill, & Krathwohl, 1956; Krathwohl, 2002) to ensure that students know the basics of the core concepts (e.g., remembering, understanding) and that they think about the content at a deeper level (e.g., applying, analyzing; evaluating; creating; Krathwohl, 2002). The structure of the preparatory work (e.g., readings, watching lecture/videos, completing reading guides) is consistent for each unit, providing clear

expectations for what students need to complete before coming to class.

Inside the Classroom. The RAP process continues inside the classroom. Although teachers clearly outline their expectations for what students should know when they come to class through the preparatory work, they need to ensure that students are indeed prepared for class. For each TBL unit, students first take an individual readiness assurance test (iRAT), which is a short multiple-choice quiz. The questions on the quiz should test students' knowledge of the primary content and should include questions at several levels of Bloom's taxonomy (in line with the reading/preparatory guides and learning objectives provided). The iRAT holds each student accountable for learning the material and decreases the likelihood of social loafing (Michaelsen et al, 2004). Once students have completed the iRAT, they complete a team readiness assurance test (tRAT), which is the same multiple-choice quiz they completed individually. Because the RAT includes questions at all levels of Bloom's taxonomy, questions at higher levels of Bloom's taxonomy should generate discussion among teammates during the tRAT. One of the key features of the tRAT is that teams receive immediate feedback on their performance. There are multiple ways to provide immediate feedback on the tRAT, even in large classes. One of the simplest ways is to use an Immediate Feedback Assessment Technique (IF-AT) scratch-off card (http://www.epsteineducation.com/home/about/).

For any questions that the team misses on the tRAT, they can generate a written appeal using evidence from their preparatory work, including the textbook, videos, and guides. This process allows students to revisit the preparatory work and engage with the material again. In the event that students find that they in fact have a valid argument for why their answer was correct on the tRAT, they use evidence from their preparatory work to write an appeal. In the event that students find that they misunderstood the information, they now should have a better understanding or can ask for further clarification. The last step in the RAP involves a facilitated discussion led by the teacher, during which time students ask questions about concepts that are still unclear (Gullo, Ha, & Cook, 2015). At the end of the RAP, students should be sufficiently prepared to successfully complete application exercises. The RAP in TBL provides a structure with clear expectations and accountability for student assessments.

Application Exercises

Following the RAP, there are several (two to four) class periods devoted to application exercises, all of which take place during class. The content of the application exercises should be driven by the goals for each unit, therefore reinforcing students' understanding of the primary course content while engaging them in higher levels of thinking. Depending on the content of the course, teams may be presented with application exercises that have one or more problems per class period.

Application exercises should be designed using the 4Ss: significant problem, same problem, specific choice, and simultaneous reporting (Sibley, 2012). Each of the 4Ss is critical in and of itself, but also in conjunction with the other Ss. *Significant problem* refers to students working on a problem that is relevant for them and challenges the team to work together. If the problem is not relevant to the course content and objectives, students will be less likely to engage with it. If the problem is too simple, so that one student complete it on his or her own, there is no need for the team to work together, which may lead to social loafing.

Working on the *same problem(s)* is critical because it facilitates a successful classroom discussion in which all teams (and students!) are engaged. To guide the team and classroom discussion in a manageable way, teams should be asked to make a *specific choice*, which allows each team to present their answer *simultaneously*. Problems may be presented in numerous ways that allow teams to make a specific choice (Sibley, 2012). Here we outline some of the more common ones. Problems may be open-ended in the sense that students need to identify a specific one-word answer. For example, teams may be asked to summarize Vygotsky's theory of cognitive development using only one word. During the simultaneous reporting, each team holds up a small dry-erase board on which they have written their word. During the discussion, teams provide rationales for choosing their word, and through interteam discussions, several features of the theory are discussed.

More commonly, problems are written using multiple-choice answers. For multiple-choice problems that have a correct answer, the problem must be *significant* in that it requires all members of the team to work together to come to a decision. For example, teams may be asked to analyze which of three method sections (Method Section A, Method Section B, or Method Section C) is not written according to APA style and then simultaneously report their answer by holding up cards that have letters corresponding to each method section. This activity requires students to know the features of APA style method sections and to identify features that are correct as well as incorrect when making their decision.

Multiple-choice problems can also be written in a way that all answer choices are correct, but teams need to come to a consensus and rationalize their decision. For example, teams may be asked to first identify how children contribute to their own language development

and also to identify ways in which adults contribute to children's language development; proper language development requires the contributions of both. Next, teams decide whether children's contributions or adults' contributions are more likely to lead to children's language development. Each team may report their answers simultaneously using clickers.

Simultaneous reporting clearly identifies the decision of each team and commits them to their decision. Regardless of the format of the specific choice (open-ended, multiple-choice with correct answer, multiple-choice with no correct answer), teams' discussions of their rationale for making a specific choice should result in a rich inter-team discussion. Facilitating inter-team discussion is a critical step following the application exercises. Some tips for successful facilitation include deciding how to facilitate the discussion ahead of time, preparing follow-up questions, ensuring there is time for discussion, and providing closure for students following the discussion (Gullo et al., 2015).

Student Buy-In of TBL

Getting students to buy in to a flipped classroom may be challenging. Much like any teaching method with which students are not familiar, teachers should be transparent with regard to their use of TBL. Teachers should spend time explaining the structure of TBL, including the purpose of each component of TBL and the rationale behind the flow of TBL (e.g., why the RAP comes before the application exercises). For examples, teachers may use the syllabus as a practice TBL unit in which students have to do preparatory work (e.g., read the syllabus outside of class) then complete the RAP and application exercises using the content presented in the syllabus.

Structure in TBL

The flipped classroom literature is lacking in terms of outlining what teachers should be doing inside the classroom. Additionally, students in flipped classrooms express concern that they do not know what to expect during class (Strayer, 2012). TBL alleviates the concern over lack of structure in the classroom because each unit has the same sequence: students expect to complete the RAP and then application exercises. Additionally, the structure of the RAP and application exercises is consistent across units.

Accountability in TBL

Students need to be accountable for both their individual and team learning (Michaelsen et al., 2004). TBL grades are usually comprised of individual performance grades, team performance grades, and peer evaluations. The main components of individual performance grades are the iRATs, which ensure that students come prepared to class ready to contribute to their teams and are held accountable for this preparation. Students' individual performance grades may also include exams, papers, homework, and projects. The team performance grade is primarily comprised of the tRATs and peer evaluations, which are used to assess students' contributions to the team. Using formative peer evaluations early in the semester allows students a chance to adjust their approach to team contributions before the summative peer evaluations are used as part of their final grades (e.g., Lane, 2012). Additionally, some instructors also grade application exercises (either for correctness or completion) and include team projects that may also contribute to the team performance grade.

Technology in TBL

Traditional flipped classrooms are highly reliant on technology outside of the classroom (Kim et al., 2014; Moffet, 2014). Although the use of technology has advantages, including allowing students to access course materials from home multiple times (Smith & McDonald, 2013), traditional resources (i.e., textbooks) are also effective ways for students to access course content. TBL is a flipped classroom structure that does not limit the delivery of primary course content outside of class to video or audio lectures.

Conclusions

TBL can be a resource for instructors who are interested in implementing the paradigm shift associated with flipped classrooms. TBL addresses the guidelines necessary for a successful flipped classroom. As with any teaching method with which students may not be familiar, teachers must get students to buy in to the method by being transparent about the method, including explaining the structure, how it works, why the teacher has adopted it, and how students will benefit from it. Spending time during the first class periods to explain TBL and demonstrate it with low-stakes assignments (e.g., doing the RAP process and application exercises based on the syllabus) allows students to experience the process and ask questions before diving into the course content.

Previous research shows that students may have negative perceptions about flipped classrooms when there is no set structure (Missildine et al., 2013; Strayer, 2012). TBL provides a structure for students inside and outside the classroom, clearly outlining what students can expect to be doing for each unit (i.e., preparatory work before coming to class, and the RAP process and

application exercises with a specific structure during class). Additionally, the intentional structure of TBL holds students accountable. The RAP holds students accountable to their teammates to learn the core content, while the peer evaluations help ensure that students are contributing to their teams. While traditional flipped classrooms rely heavily on technology (e.g., Hmelo-Silver et al., 2007), teachers can continue to use traditional resources (e.g., textbook, printed articles) in addition to online resources (e.g., prerecorded lectures, videos) to deliver primary course content to students.

Implementing TBL is time consuming and effortful initially. There are several ways to introduce TBL into the classroom. One option is to jump in with both feet and flip an entire course. Another option is to introduce TBL into an already existing class by implementing only one piece at a time. For example, one may consider introducing iRATs/tRATs during one semester or gradually building application activities over time.

Although implementing TBL may seem daunting, TBL is an effective way to structure a flipped classroom to promote positive student outcomes. Compared to traditional classroom structures, TBL increases student academic achievement (e.g., grades on exams and in classes; e.g., Carmichael, 2009; Levine et al., 2004; Vasan, DeFouw, & Holland, 2008; Zingone et al., 2010), results in higher attendance (e.g., Haberyan, 2007; Jakobsen et al., 2014), and seems to benefit academically at-risk students (e.g., Koles, Nelson, Stolfi, Parmelee, & DeStephen, 2005; Nieder, Parmelee, Stolfi, & Hudes, 2005). In addition, students have positive perceptions of TBL (e.g., Abdelkhalek, Hussein, Gibbs, & Hamdy, 2010; Levine et al., 2004; Tucker & Brewster, 2015; Vasan, DeFouw, & Compton, 2009).

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