

Trying Team-Based Learning in Two Classrooms: What Can an Anthropologist Learn from a Statistician and Vice Versa?

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Abstract

Team-based learning (TBL) was originally designed in the context of business education but has proven to be a remarkably adaptable approach. Here, a statistician and an anthropologist compare notes on how they have used TBL in two of their courses, a third-year statistics course and a first-year anthropology course. Their motivations for adopting aspects of TBL differed, as did their methods for researching its effectiveness. In this article, we tack back and forth between accounts of why we chose to use TBL, how we adapted TBL to serve our purposes, and how we researched TBL in our respective classrooms. Ultimately, our contrasting experiences demonstrated the flexibility of team-based learning as a way to increase student engagement, accountability, connection, and success, and the importance of allies in supporting innovation in teaching and learning.

Keywords: *team-based learning; student engagement; reducing barriers to innovation; cross-disciplinary collaboration in SoTL research*

Team-Based Learning at the University of Lethbridge

For instructors, the postsecondary classroom of today can look quite different from the one that we experienced when we were students ourselves. The range of teaching methodologies now available to support engaged learning can seem overwhelming when faculty and instructors consider investigating a new approach. Discovering allies can help facilitate making the choice to change your teaching and help to assess the effect of those choices. That is what happened for us, and here we present our contrasting experiences using one such approach: team-based learning (TBL). One of us teaches statistics in a Faculty of Health Sciences and the other teaches anthropology in the Faculty of Arts and Science. It was our university's teaching centre that brought us together to compare our experiences using team-based learning for a video in their series on teaching and learning. Our first conversations blossomed into a friendship and continuing collaborations on conference presentations and now this piece of writing. In many ways, this is a collaboration characterized by difference. We come from different faculties, different disciplines, and have different research interests and hence take different approaches to framing questions and answering them. As our discussions began, perhaps serendipitously, our university was recommitting to the principles of liberal education that was part of its founding goals (Wismath et al., 2018). Liberal education as conceptualized at the University of Lethbridge rests on four pillars, one of which is to connect and integrate knowledge across disciplines (University of Lethbridge, n.d.). So, it was fitting that a statistician and an anthropologist would begin to talk about how we were using team-based learning in our respective classrooms.

Team-based learning or TBL can appear prescriptive. It typically focuses on a case study approach and has been widely used in medical, engineering, and business school settings (Freeman, 2017). Yet, we have found TBL to be flexible enough to be used in a wide variety of teaching situations. Here we consider how we adapted the basic framework of TBL in two very different settings on our campus: a third-year applied statistics course taught by Awosoga and a first-year anthropology course taught by Newberry. Both of us received crucial support in course and research design from our Teaching Centre and Meadows, Teaching Development Coordinator, who has served as our collaborator and now co-author.

This is not a research article, although we each present some of the findings of research we have conducted. As it happens, TBL is also amenable to different research methods to assess the impacts on student learning, as we demonstrate here. Newberry approached the research using qualitative methods, while Awosoga used a quantitative approach. All three of us have benefited from the cross-disciplinary discussions about teaching and learning, but also about how to move into scholarship of teaching and learning (SoTL) research.

In the following, we first briefly describe team-based learning as an approach to engaged learning. Then, we tack back and forth between instructors to consider why we chose to adapt aspects of TBL in our classrooms, how it works in our respective classes, how we pursued assessing our success, and why we continue to use the method. We conclude by highlighting what we learned from each other, and why support for our efforts has been a part of that success.

Team-Based Learning

Team-Based Learning (Michaelsen et al., 2004) is a structured, small-group approach to teaching designed to allow students to work together to apply key concepts to further their understanding. As Michaelsen, Sweet, and Parmelee (2008) describe, TBL should go beyond merely covering content to provide students with the opportunity to practice using course concepts to engage in higher-level critical thinking, including analysis, synthesis, evaluation, and problem-solving. Consequently, TBL provides students with both conceptual and procedural knowledge (Freeman, 2012; Krathwohl, 2002), and it has been widely adopted in medical schools and management classes, as well as in the social sciences and humanities.

At the core of the TBL approach is work in permanent teams of five to seven students throughout the semester. Other key features in the implementation of the team-based approach derive from four underlying principles (Michaelsen & Sweet, 2008):

1. Groups should be properly formed and managed.
2. Students must be accountable for the quality of individual and group work.
3. Students must receive frequent and immediate feedback.
4. Group assignments must promote both learning and team development.

These basic principles produce continuous engagement with course materials through both graded and ungraded activities. Sweet and Michaelsen (2012) describe four pieces of the practical framework of TBL that are critical to its success: proper teams; the readiness assessment process (RAP), including both individual and group assessments; 4-S application exercises (the 4-S referring to significant problems, the same problem, with specific choices, and requiring simultaneous reporting); and finally student peer evaluations. Further resources on the TBL approach and the logistics required to realize it within the classroom as well as supporting materials (such as the scratch cards used for group assessments and software to prepare the quizzes/examinations) can be found on the Team-Based Learning Collaborative website, <http://www.teambasedlearning.org/>.

Although each of us made changes to the standard TBL model, we kept its central tenets as we describe below.

Why We Chose TBL

Awosoga: The course considered here is “Applied Statistics for Clinical Practice.” This required course is offered in fall (with two sections of sixty students each), spring (one section of sixty students), and summer (one section of sixty students) each year. Although offered in the third year of a four-year baccalaureate program in the Faculty of Health Sciences, the course may be taken by both undergraduate and graduate students. The course is focused on using descriptive and basic inferential statistics to analyze datasets involving real-life clinical problems. Rather than focusing primarily on theoretical and/or formulaic approaches to statistics, the course focuses on using computer software, such as the *Statistical Package for the Social Sciences* (SPSS), to create, manage, analyze, and interpret datasets containing clinically related data.

My motivation for using TBL in this class is my passion for student learning and in a so-called dreadful course. In addition, English is not my first language, and the structure of TBL offered a method to minimize any barrier to understanding that my accent may create for students. This approach also helps students who seem disinterested in subject material and/or have difficulty understanding the material. Adapting TBL in my classroom has enabled me to overcome these two issues: anxiety about my accent and the fear of statistics on the part of my students. Communicating statistical concepts to students using real-life examples and encouraging participation in team problems via the TBL structure has worked to address these issues. Not only has this approach aroused students' interest in applied statistics, but it has also created an enhanced in-depth understanding and appreciation of the subject matter. Using real-life clinical problems in presenting statistics has made it easier for students to appreciate the usefulness of statistics in various disciplines. Doing it this way, students are able to figure out the relevance of statistics in clinical practice, and that has made them pay attention to detail. Starting with data collection procedures, data entry processes, identification of important variables, and selecting appropriate methods of analysis and interpretation of outputs, students become more devoted to using statistics in solving applied clinical practice problems.

Newberry: The anthropology course described here is a large (300-student) introductory course. I modified this lecture-based course in response to its inclusion in a new Global Citizenship cohort program in the Faculty of Arts & Science that is meant to produce a cohort experience for a group of first-year students taking a set of courses together. The goal of the program is producing leaders, increased educational achievement, and retention of students beyond the first year. My problem was how to help build a cohort for the students in the Global Citizenship program (approximately eighteen in the first year and forty in the second) inside a classroom of 300 students who were mostly taking the course to fill a breadth requirement. The TBL approach offered a way to honor the cohort, but also to offer the experience to all students, who were generally first-year students in any event. What appealed to me was the structure for students to work collaboratively but with accountability.

By giving all students a cohort-type experience, I hoped to create the social networks of support that make a campus "sticky" enough to keep students in class and in school. TBL also provided the opportunity for enhanced content aimed specifically at first-year students, because the group structure offered students the chance to discuss some of the dilemmas and obstacles they faced. That is, part of the application exercises were aimed at problem-solving for first-years: where is the financial aid office, how do you find advising, how you register for next semester, and so forth.

Another key reason for choosing this approach was to prepare first-year students for the move from a broad, introductory anthropology course assessed through multiple-choice examinations to the kind of conceptual and writing-based, critical thinking work they would confront in later classes. The TBL approach offered an introduction to the kind of critical and conceptual thinking (Espey, 2018) that these students would need subsequently, another important transitional skill for first-year students.

How Did We Do It?

Here we outline briefly the specific ways we integrated TBL in each classroom with particular attention to how we formed teams, how they worked together within the class, how we used application exercises, and how we dealt with peer evaluation in the grading of participation. While both courses made use of central tenets of TBL, there was variation in how we adapted the elements. These differences reflected not only our different faculty homes and disciplines taught, but also the research skills and interests of each instructor.

Awosoga: My teaching style changed to incorporate team-based learning (Michaelsen et al., 2004) so that students were constantly working and learning in small teams. I began to use a broad range of visual aids and blended materials, and I made greater use of humor, cartoons, and funny/engaging videos. Prior to class, students are expected to listen to blended materials, including audio/video recordings of lecture/lab materials and to practice the embedded exercises. My decision to continue using the team-learning approach is due to its flexibility to suit the needs of my students and my course plan. This modified version of TBL has indeed improved my students' evaluation of the course and increased their level of interest and engagement.

When I began to use TBL in my Applied Statistics for Clinical Practice class, my first thought was how to assign students into teams composed of different characteristics, including: weak, moderate, or strong students; introverted or extroverted; and students with different subject majors. The next question was how to support each diverse team throughout the semester to achieve the course objectives and at the same time to help individual students be successful in the course. Finally, I considered time management and how to monitor the presentation of course material to students and encourage class participation through team presentations.

After initial offerings of the course, I moved to a different method for organizing the students into teams of five to seven on the first day of class. Now, every semester before classes resume, I prepare a set of cards. Each student is given one on the first day of class as they arrive to the lecture room. Each card type indicates the team to which the student belongs for the semester. I have come to use this method of group formation because it works best to separate old friends and to encourage students to make new friends and learn to work together. It also promotes interaction between students from diverse disciplines with different levels of statistical knowledge and background. Each team appoints a spokesperson to present their solutions to the assigned applied clinical problems during each class period.

On the first day of class, I also make available the instructions on how the class will run throughout each semester along with information on how to access the blended materials (audio/video lectures prepared using Articulate 2.0 software) and PowerPoint (PPT) slides for pre-class preparation. Students are also provided with information on in-class activities (Q&A, mini-lecture, team problems, individual and team quizzes) and application-focussed exercises (individual lab assignments and individual exams). I emphasize respect for other team members, dedication to team assignment, flexibility, and the collaborative learning structure.

For regular classes, students arrive having listened to the blended materials and answered the embedded exercises. Then, after a brief presentation of material by the instructor using PPT

slides, students have the opportunity to work as a team to discuss applied clinical problems and present their result to other team members. This teamwork session is the RAP portion of the cycle that allows individuals to work in the group setting on the problems similar to what they will be tested on. Individual quizzes follow, and finally the team comes together again to answer the same quiz questions as a group. During the group quiz, individual students are expected to seek clarification from each other on appropriate answers to each of the individual quiz questions. Both individual and group quizzes are administered in every class period except for the first and last and for the midterm lecture. To round out each class period, solutions to quizzes are discussed and scripts are graded. Individuals and teams receive immediate feedback on their performance and I attend to complaints, if there are any. Each class is conducted with minimal digression because all the logistics (physical space/room configuration) and class time management have been well planned and charted before the beginning of each semester. Feedback from teams (including how the material is presented and team chemistry) is sought at the end of each class, and I also give time for self-reflection on what adjustment might be needed to make sure students get the best out of the course.

The best six out of eight individual quizzes (20%) and eight team quizzes (10%) count toward a student's final grade in the class. Other items that count towards the final grade include a team participation mark (5%), individual lab assignments (10%), midterm examination (20%), and a final examination (35%). All tests are in multiple-choice format—both midterm and final examinations are computer-graded such that students receive immediate feedback as soon as they hit the submit button. The team participation mark of 5% comprises an average of scores awarded by each student to other members of their team on an individual basis (peer evaluation) using the following criteria: preparation before class, contribution to group discussions, respect for other members during discussions, flexibility in listening to other students' viewpoint, and dedication to team improvement.

Students also do a midterm assessment of the overall contribution made by each team member to group assignments. Individuals are required to identify two or three ways other members of the team have helped shed more light on team discussions of practical clinical problem-solving procedures. Although evaluations are conducted anonymously, individuals in each team are identified by name as to what they could be doing in the second half of the term that could improve their team's performance. Students are also encouraged to identify things that the instructor could do better or differently to improve their team's performance or the course in general. This serves as a form of peer evaluation (or feedback) to their group members on performance and to the instructor on course delivery. I take time to go through individual responses and effect changes in the second half of the course as necessary and speak one-on-one to team members that are slacking on their responsibilities to the team. I also address general concerns during the class period following the midterm assessment week. Feedback from the midterm assessment has actually increased the level of team participation in the second half of the course and improved students' performance in the course.

Newberry: To produce the permanent teams, I used a short survey of students including self-reported assessments of comfort around working in and leading group activities, year in school, and distance to hometown. Then, in a rather laborious process, Meadows and I built approximately thirty-seven to forty teams of six members that each included at least one self-

identified leader and one upper level student. We also spread those who came from away across as many teams as much as possible. Fortunately, our Teaching Centre was able to help with the logistics of this process. This support was extremely important during the early phases of transitioning this course to TBL.

For assessment, I decided to use ten cycles of the application (RAP) and testing (RAT) process across the semester, alternating between the RAP and RAT process each week. This amount of “testing” was not typical for me, and the pace meant less time to lecture. In the first two iterations, this course was delivered in two 75-minute periods per week. One week was devoted to lecture. The following week included a 75-minute period devoted to application exercises and another 75-minute period for both the individual and team tests. While the conventional TBL method relies on a blended approach to course materials, the use of lecture worked well, too. In fact, one surprising and surprisingly frequent comment on evaluations for this class has been a desire for more lectures.

Even so, the reorganization of this class made me think critically about what exactly I wanted to convey. For the application days (RAP), I pose an argument (typically using a PPT slide) that asks each group to make a choice to agree, disagree, or ask for clarification. The arguments or questions posed build on material from lectures the week before. Following the TBL model, groups use colour-coded cards to indicate their choice to the class. This simple procedure is very powerful as groups can immediately see whether their choice is widely supported or in the minority. Volunteers stand to explain their group’s decision. There is never any shortage of those willing to speak. The energy of the discussion often carries students over the fear of speaking in such a large class, and hearing a colleague speak in this forum has important effects for building consensus and confidence. This kind of discussion is especially important in an anthropology class where students confront widely divergent ways of thinking and behaving cross-culturally. Having the space to discuss the ethical dimensions of this work is particularly vital. The application exercises are also the space for applying concepts to contemporary, real-world problems. Given how little students know about anthropology before taking the class, the chance to show its applicability to their own lives is significant. Importantly, it is also a way to demonstrate the relevance of the major to students unfamiliar with it. This approach differs from the standard TBL approach because the application exercises worked as a review for the upcoming test as well as a time to consider conceptual and ethical issues in a more open-ended way. This flipping of the standard sequence of application and assessment worked particularly well in a large lecture-based introductory course.

On alternate weeks, students first take an individual Readiness Assessment Test (iRAT) before immediately taking the team Readiness Assessment Test (tRAT) with their team. These are short tests consisting of ten multiple-choice questions. Initially, there were some logistical issues in administering approximately 250-plus individual tests before turning immediately to group tests. For iRAT, I used old-school techniques: the Scantron and number two pencil. For the tRAT, the Teaching Centre purchased the scratch cards sold by the Team-Based Learning Cooperative through their website (Team-Based Learning Cooperative, n.d.). The scratch cards come with access to test-building software to build exams that matched the cards.

I did not expect the scratch cards to be such an important part of the tRAT process. There is something of the excitement and luck of a lottery scratch card in the process as students lean in to see whether they have gotten the answer right. The immediacy of feedback on the group process of consulting, conferring, debating, and articulating why one answer is better than another is immensely important, especially for building effective team dynamics of cooperation. The energy in the room registers this. It is often loud and sometimes appears chaotic, but as I walked through the room, I heard students talk about the concepts they have learned, their readings, and my lecture in ways I have never heard in other introductory courses. As Michaelsen and Sweet note, “in their search for correct answers, students invariably alternate in and out of a teacher’s role by asking each other the kinds of questions that the teacher normally would ask” (Michaelsen & Sweet, 2011, p. 44). It seems to me that this group process is particularly important for building social networks and cohort support.

The condensed time frame for lecturing meant that I needed to reflect on what it is exactly that a student should get out of an introductory anthropology course. This process has led me to explore designing a course around *how* anthropologists think rather than *what* they think. Michaelsen and Sweet (2011) argue that “TBL enables instructors to achieve equal or better content coverage and still use 70 to 80 percent of class time with students engaged in activities that deepen understanding of how course content applies to real-life situations and problems” (p. 42).

Like the RATs, the peer evaluation process posed a logistical problem at first. How to share the large numbers of replies back to students effectively? Each student would receive five to six evaluations that had to be aggregated and delivered to them, and this was done for 250 students. I gave this work to my graduate teaching assistants initially. They produced an Excel spreadsheet of responses, pre-emptively searching for any inappropriate comments, and grading the quality of the feedback on a simple scale. In the first iteration of this class, students received a grade based on whether they gave useful feedback. After struggles in the first round, this process was simplified to a grade based on whether the student completed the evaluation or not. Subsequent offerings have utilized a web-based software packages called Teammates that quickly and easily allows for a peer feedback process that not only protected the identity of the teammate who was providing the feedback but also allowed for a timely exchange of the feedback to group members.

One part of the TBL process that I did not fully appreciate initially was the use of appeals. A team can challenge a test question through a formal process that requires a written argument about why the question contradicted course materials or was unclear. Particularly in a large, often anonymous-feeling lecture classroom, students seem to email with the instructor to debate and argue about points missed on exams. Here, because the appeal process requires group work based on course materials (readings or lecture), it continues the learning process even as it grants students an avenue for sharing their concerns. I have found that giving even partial points for trying to form a useful argument serves me well in this context. How can I quibble with a procedure that has students reviewing, reanalyzing, and making informed arguments?

What We Found Out

Our different research backgrounds are clear in how we approached assessing what was happening in our classrooms. Awosoga pursued a quantitative approach to understand whether students liked the approach and whether it helped in overcome any communication or comprehension barriers related to his accent, while Newberry took a qualitative tack to understand whether students were practicing higher-order conceptual and critical thinking and building social networks. As with our individual adaptations of the TBL approach to suit our classrooms, we learned from our respective approaches to researching it.

Awosoga and Meadows: The objective of the research was to assess undergraduate students' attitudes towards an adaptation of the TBL approach and blended learning materials in the delivery of a Statistics course in Health Sciences.¹ With the support of the Teaching Centre, we constructed a survey instrument delivered to fifty-four volunteer undergraduate students registered in the course in two different semesters. Several steps were taken to protect participants' privacy, anonymity, and confidentiality. For example, the students were specifically instructed not to put their names on the survey, and the instructor did not have access to students' responses to surveys until after course results were released. The instructor had no role in invitations to students to participate and/or data collection, so that there was no perceived coercion and students realized their participation was voluntary.

We used a pre-experimental research design by administering an online survey to undergraduate students registered in the course in two different semesters (Fall 2016 and Spring 2017). After reviewing the literature and incorporating student feedback from previous course evaluations, we developed a ten-item online survey questionnaire that consisted of statements regarding four main areas: general attitudes towards group-based learning approaches, the instructor's teaching style, usefulness of learning resources available to students, and confidence level in the course. In addition, there were a few questions about basic demographic information (year of study, gender, and specific program of study). For each statement in the ten-item survey, students used a four-point Likert scale that ranged from "strongly disagree" (score of 1) to "strongly agree" (score of 4); "did not contribute" (score of 1) to "were very important" (score of 4); or "never" (score of 1) to "most of the time" (score of 4).

An online survey instrument was administered towards the end of the semester to all students registered in either the Fall 2016 or Spring 2017 semester. A response rate of 33% was achieved, and 87.0% of respondents were female while 13.0% were males. A summary of the year of study and program of study of participants is shown in the pie charts exhibited below. Charts of students' responses to survey questions are presented in Figures 1-4.

¹ The study was granted approval by the University Human Subject Research Ethics Committee (HSREC).

Figure 1: Student Perceptions of How Their Group Functioned in Key Areas

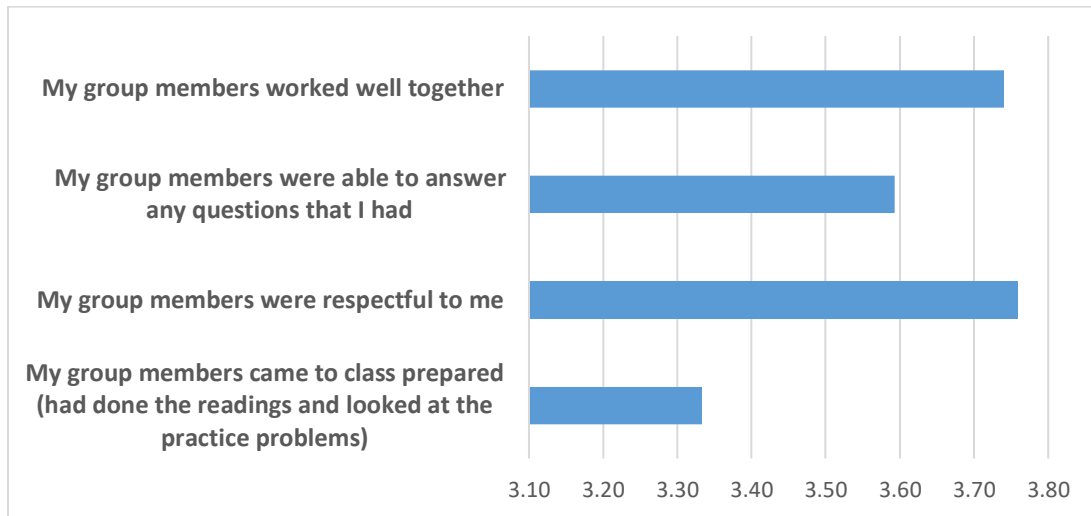
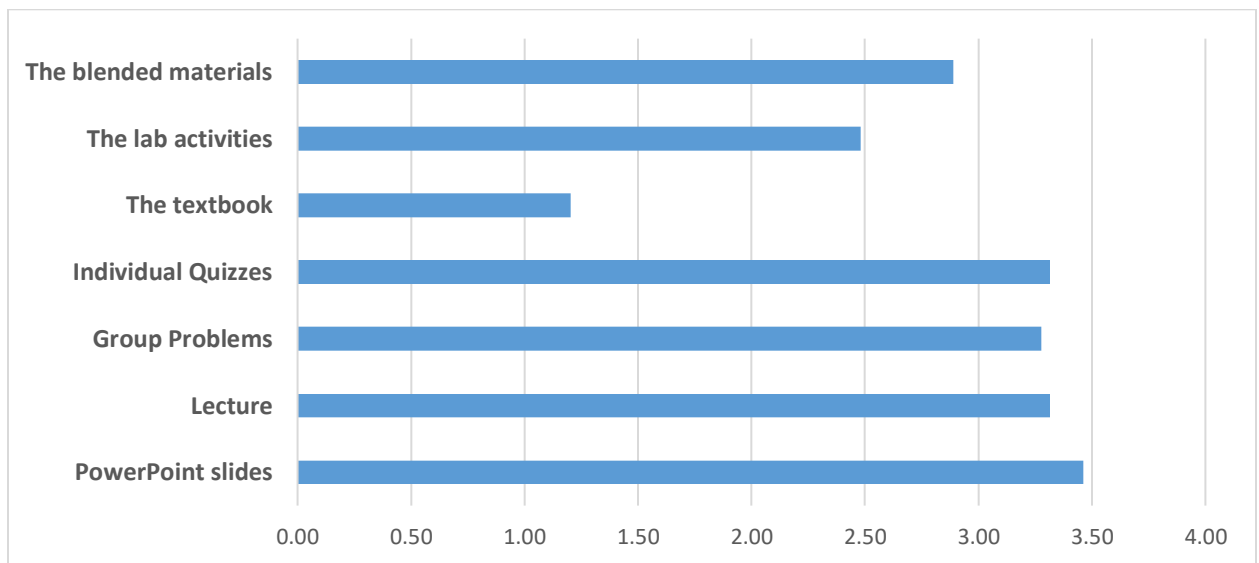


Figure 2: Student Perceptions of the Impact of Key Parts of the Instructional Method



Figures 3 and 4 help to illustrate that the students perceived their groups as working well together (with the exception of all members coming prepared all of the time) and that with the exception of the textbook, the resources that were utilized in the delivery of this course were all key elements of the process.

Figure 3: Student Perceptions of Instructor Performance in Key Areas of Instruction

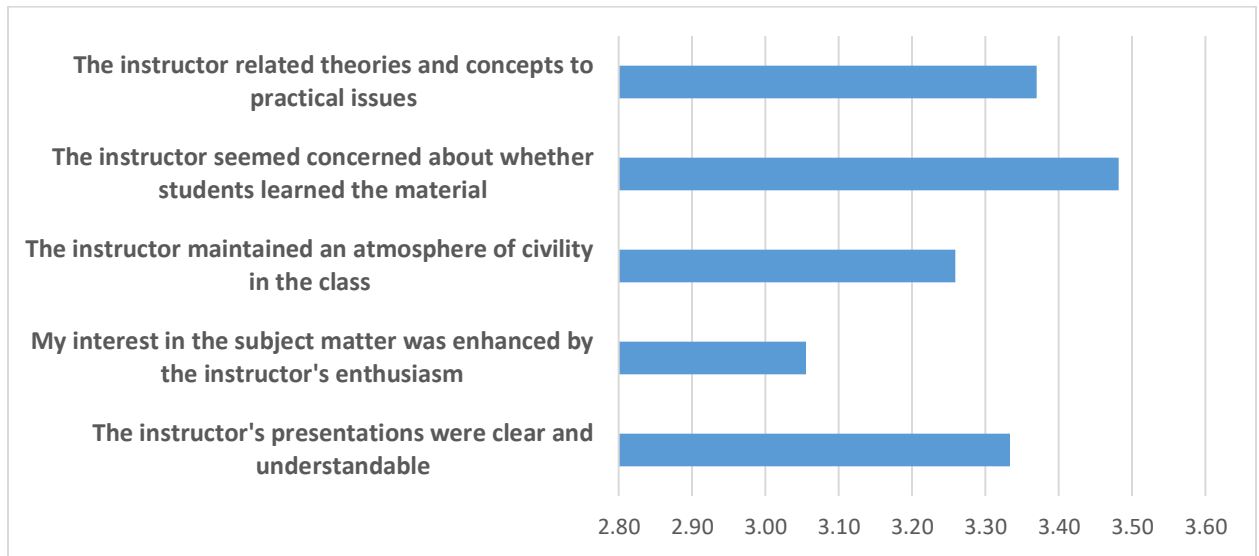
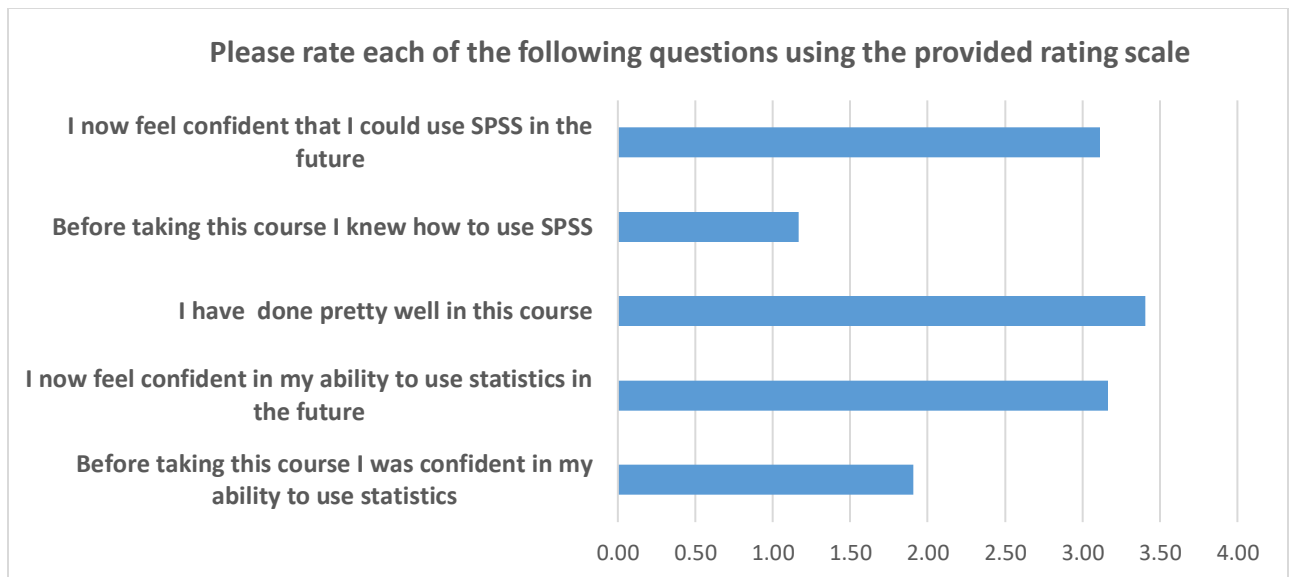


Figure 4: Student Indications of Confidence and Change in Ability



Based on the responses, a majority of students who volunteered for the study expressed their appreciation for the introduction of blended materials (Fig. 2) and the function of group in key areas (Fig. 1) throughout the semester. By blended materials, we mean the use of both online resources and in-class presentation slides to give students access to pre-class reading materials, audio, videos, sample test questions, and lab notes as part of RAP. Students identified TBL as a preferred teaching and learning approach (Fig. 5 below) because of the use of real-life examples and exercises, clear explanations, timely feedback, and a well-paced course. Student perceptions of instructor performance in key areas of instruction were very positive (Fig. 3). There was nothing to show any concern about instructor’s accent. The majority of respondents agreed that the instructor’s presentation was clear and understandable. Participants also confirmed that the

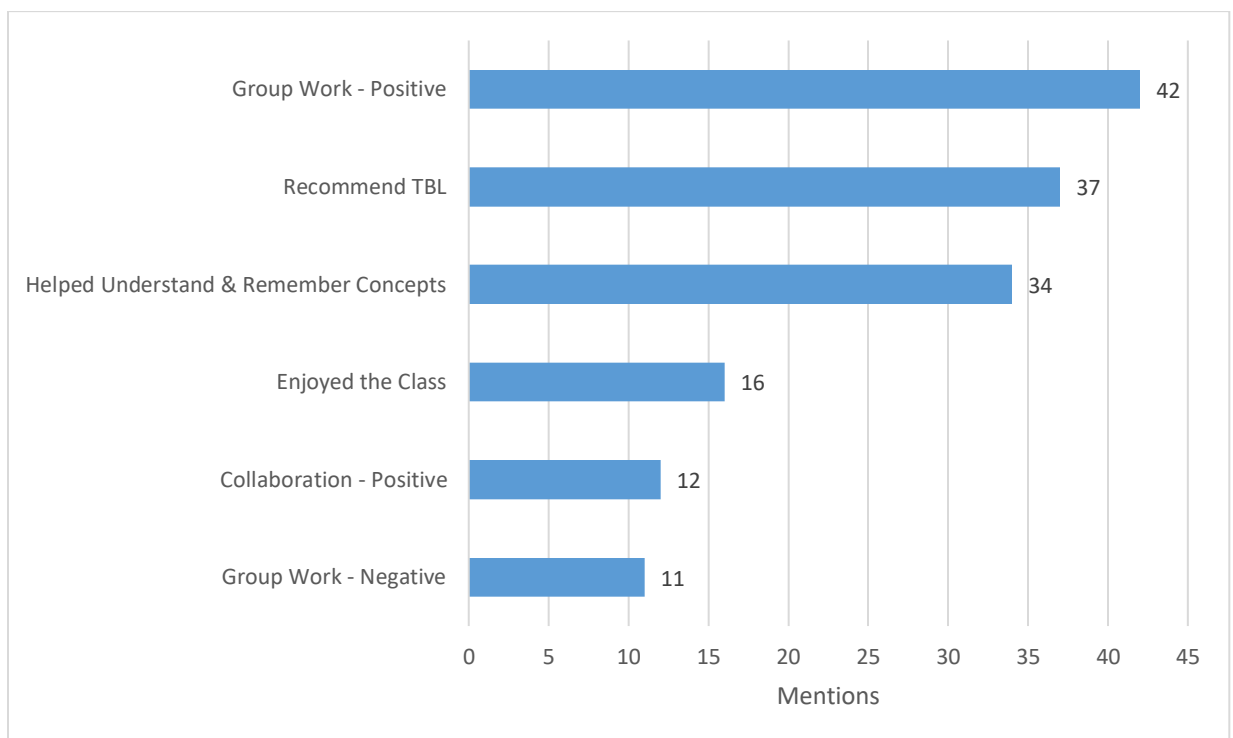
instructor related theories and concepts to practical issues, and that the instructor seemed concerned about whether students learned the materials (Fig. 3).

Students also responded to two open-ended questions on the survey dealing directly with the team-based learning approach as well as an open-ended question for general comments.

1. Compared with other courses that you have taken here at the University of Lethbridge, what comments would you make about the team-based approach that was used?
2. Would you recommend more classes adopting team-based learning? Why?
3. Please comment on any other areas of the HLSC 3450 course or instructor that you would like to discuss.

From the two semesters of data collection, there were 250 individual comments in response to the three questions. All of these were coded thematically using the NVivo software package. The results are shown in Figure 5.

Figure 5: *Major Themes Identified in Coded Observations*



In general, the responses were very positive with respect to the experience and the learning that took place. A few students expressed negative comments with respect to the group work process. These concerns ranged from issues related to dysfunctional group dynamics and students not “liking” their group members to one student feeling that they were paying to be taught by their professor and not their peers. While these are valid concerns and should not be dismissed, they were greatly overshadowed by positive student comments and reactions to the

method of instruction. One student even went so far as to state that this was the best course they have taken at the University to date.

Newberry and Meadows: Data collection on the first iteration of the anthropology course was minimal. We conducted a short in-class survey and two focus groups. Other information gathered included the actual course evaluations and the observations and evaluations of the two graduate teaching assistants in this first attempt at TBL. Because the TAs circulated through the large classroom during application exercises and tests, they were able to make some observations on group functioning. In the review sessions they led, they also were able to hear directly from students about their reactions.

Based on this preliminary data along with anecdotal feedback from students, we next took an anthropological approach to studying the problem. Six undergraduate researchers joined us as research assistants. They were paid through a small grant, and several opted to receive credit for this work as well through our Applied and Independent Studies options. The six students included three who had taken the course the year before and three who were upper division Anthropology majors. The mix was important for the same kind of peer teaching valued in the TBL method itself.²

Each of these young researchers was assigned six to seven teams in the classroom. They were asked to sit with each team once during an application exercise and once during a test during the semester. They were to take detailed field notes on what they saw, paying particular attention to group formation and indications of conceptual learning beyond rote memorization and recall. There was some felicity in having a group of slightly older students illustrate the fundamental method of sociocultural anthropology—ethnographic fieldwork—in an introductory anthropology course. Because of their own similarity to the students in the class, their observations on what was and was not working were particularly salient. Each student also was asked to conduct at least one focus group interview with a few students from their assigned groups.

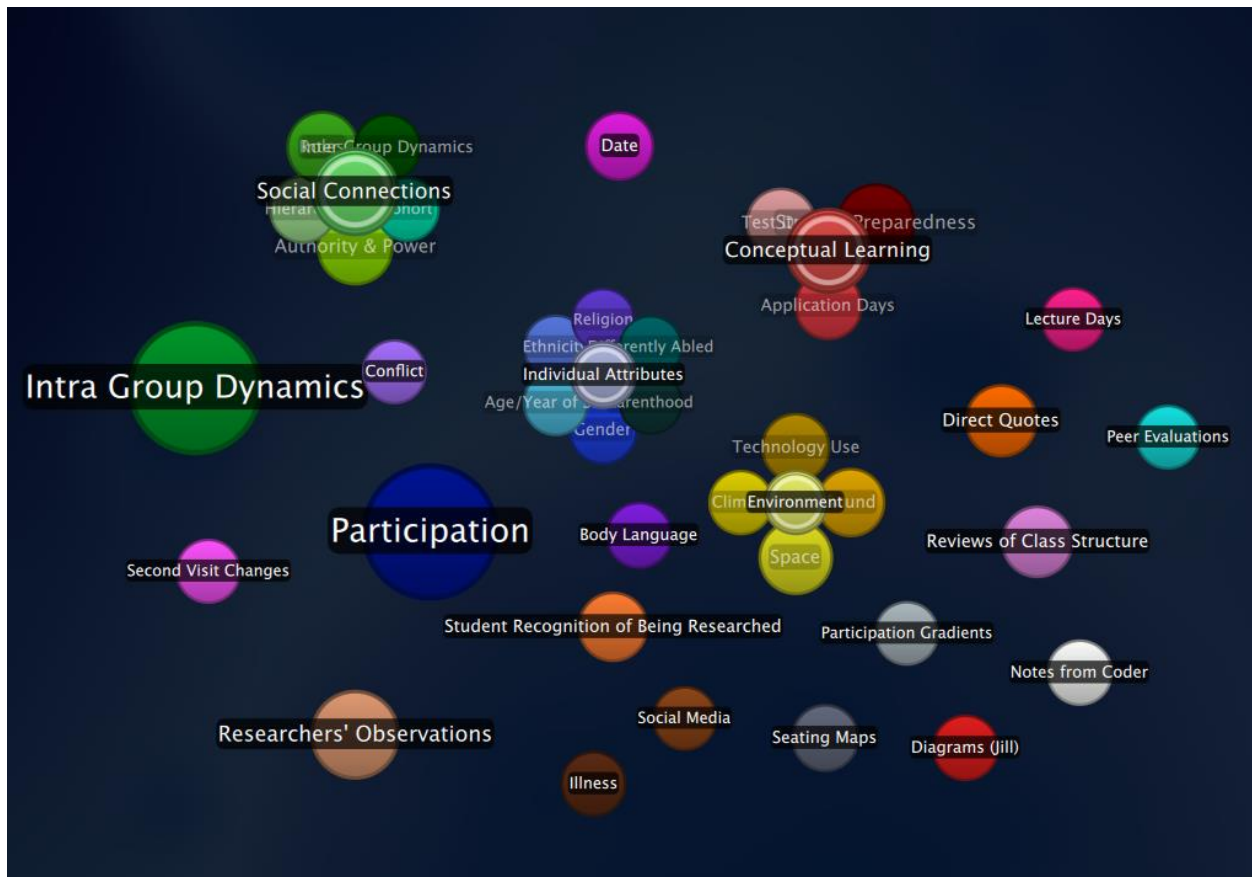
There were two other, somewhat unexpected, forms of data produced in this work. In order to provide supervision and consistency across observations and note taking, the student researchers met once a week with Meadows and Newberry. These meetings were wonderfully informative as to emergent patterns in their observations and the divergences generated by different groups but also different researchers. The work done together in identifying themes, obstacles and strategies for overcoming them was important, not only for understanding the class but for educating these researchers themselves. Indeed, this was another form of team-based learning. Those who had elected to take Independent or Applied Studies also provided a set of reports and insights that were useful. One student, Student 1, did further work on the project in the following semester, after completing her own work on a short survey she had conducted about obstacles to group participation, such as ability, ethnicity, gender, religion, and so forth.

² Both research projects for the introductory Anthropology were approved by the University Human Subject Research Ethics Committee (HSREC). The student researchers kept the identities of students in the classroom confidential so that the instructor and the TA responsible for grading could not identify their contributions.

In the following semester, Student 1 performed a thematic analysis using Quirkos software on the field notes collected. She transcribed the field notes of the other undergraduate researchers as she searched for themes related to our two key questions: Were the students in the class building social networks, and were they demonstrating higher-order conceptual and critical thinking? This work is preliminary at this point, but it does indicate some of the power of the TBL approach.

Student 1’s work produced maps of “quirks,” which represent concentrations of mentions in the field notes. The maps identified two very large clusters. The first was observations of interactions between group members that express their ability to work together. The other cluster of observations relates to classroom participation at both the group and individual levels. The figure below illustrates these clusters with some of the other themes/issues identified in the field notes made visible.

Figure 6
Visual Representation of Thematic Clusters from Observational Data



While the quirks showed that students were participating and working with one another, it was the field notes themselves that were a gold mine, albeit one yet to be completely explored. Excerpts from two journals illustrate both the variation in responses within groups but also the different approaches taken by the student researchers.

Student Researcher 1:

Citrine states things confidently, Amethyst says she's "talking out of her ass," Topaz gets really frustrated with Citrine and says, "it's the same concept!" Amethyst says something about Topaz "sassing" Citrine; Citrine doesn't seem too upset by it, although Topaz's body language clearly indicated frustration. *[Field notes; note the approach to pseudonyms here.]*

Student Researcher 2:

I'm less worried about group F now – at least they have good attendance on test days, which, at very least, shows that they are committed to completing the tests – I'm not sure if they do well or not, because I have not been with them for a test yet, but I will be before the end of the semester – but, I'm not worried for now. They were the only group I was afraid might be falling apart, but this shows that they aren't. *[Field notes]*

Student Researcher 2 later provided a kind of summative comment about the effectiveness of the groups:

At worst the groups worked neutrally, and at best they worked very well. There were no "bad" groups out of my 6. All 6 groups worked well during tests, and I never saw any signs of anything going wrong during tests – even among groups that I was initially worried about. All my groups scored between 7 and 10 out of 10 on tests when I sat with them, so the tests went well for everyone.... The application activities distinguished the groups I thought were "good" from the ones I thought were more "neutral".... The good groups had higher attendance, more discussion, spent the whole time discussing, and helped each other with concepts, using the application as a type of study session. The neutral groups had much lower attendance on application days, very briefly discussed the questions, then mostly stopped talking to one another (read notes, laptop, phone, etc.), and they didn't seem to see the value of the application with studying. Although both of these groups had some productive moments in their discussions. *[Field notes]*

What the Quirkos coding of the field observations shows is that group interaction and engagement is taking place in abundance. Of course, this was what the researchers were asked to identify, so the results are perhaps not surprising. What may be just as interesting for a general readership on the effectiveness of this method were some of the insights from our fieldworkers gleaned through our weekly workshops.

1. Students observed that no one kind of team was successful. There were down-to-business groups that were quite successful and groups that demonstrated closer interactions and more debate.
2. There was abundant evidence of peer teaching taking place within groups, one of the great benefits of the TBL approach.
3. The role of older (both in the sense of more years in school or more years in life) students was significant. They frequently became group facilitators and leaders. One further and rather surprising finding: They did not always enjoy this role. We had reports that some found it to be a burden.

4. Social networks did develop, but not the ones expected. We found students connecting via the undergraduate researchers, who were all students themselves after all.

Why We Keep Doing It

Awosoga: The benefits of this approach in my class include minimizing distractions such as use of cell phones, watching games or YouTube videos, side discussions, unruly behaviours, and visiting forbidden online websites during classes. The modified structure of TBL used in my class requires student attention and full participation; this in turn maximizes student engagement throughout the class period due to effective and efficient time management. The timeline is set for all activities scheduled for each class period. Students progress well beyond acquiring factual knowledge through achieving an in-depth understanding of course materials and improved ability to apply concepts to complex real-world problem-solving using group support. There has been an increase in class attendance, class participation, and mutual respect for team members. Improved critical thinking, personal engagement, and meaningful social interaction among peers are all evident. Group work does benefit student learning. Unfortunately, “social loafers” or students who do not pull their weight in terms of helping the group often plague it. As a result, a few students may learn to dislike group work and may seek to avoid it, although they were a small minority in my classes.

Newberry: The reorganization of this introductory anthropology course was meant to answer several needs: dealing with cohort formation, moving towards an emphasis on conceptual thinking, producing the space for discussion in a large classroom, and the offering of supports for the development of social networks for first-year students. The research program on the effectiveness of this approach in this classroom continues to develop, but early signs are that the approach is effective at the very least in increasing engagement with material in a big, anonymous lecture class. Preliminary analysis suggests as well that the group work not only produced better engagement, but also, the opportunity for peer-to-peer co-teaching and discussion.

It is perhaps hard to measure something ineffable and that is the spirit of the classroom. This class is unlike any other I teach. Visitors have commented not only on the complexity of ideas discussed but also on the fact that there is such engaged discussion in such a large classroom setting. During group tests, the energy in the classroom is palpable. The level of questions demonstrates that students are taking up the challenge to think through ideas. Of course, this is not always the case, by any means. There is also evidence that some students have not done the reading and are just making guesses. Even so, the chance to answer questions collaboratively offers space to teach a little more and for them to learn a little more. There are the usual fair share of dissenters in course evaluations (although fewer than expected). For a large class of students who do not start out loving group work to embrace this method is encouragement enough for me to continue.

What We Learned from Each Other

We have found in our conversations and presentations on our use of TBL that we differ in a few aspects. We consider some of these differences to illustrate the strength and flexibility of the approach.

1. We take a different approach to group formation. Awosoga introduces a little randomness in the creation of the fixed groups through use of cards at the beginning of the term. Newberry seeks to produce diversity within groups at least in terms of age in school and willingness to lead the discussion. While Awosoga's approach may appear to differ from Michaelsen's idea of "properly formed groups," this class is homogeneous with respect to educational experience AND discomfort with statistics, which invariably ends up creating relatively balanced groups.
2. We manage the peer evaluations differently. Newberry began by grading students both for the quality of their comments and for having completed the evaluation. Awosoga does not grade the evaluation beyond marks for correct procedure and completion. In the second iteration, Newberry moved to this approach as well.
3. Awosoga grades the individual and group tests separately while Newberry combines the two scores into an average. In Newberry's class, students are allowed to drop the lowest (combined) score from the semester while Awosoga allows students to drop the two lowest individual and team quiz scores.

Perhaps most significantly, we also learned to be resources for one another, sharing what did and did not work in our classrooms and how we each solved problems that arose in adapting TBL. Working along with the Teaching Centre, we also raised awareness not only about the power of TBL but also of SoTL research. While this is not a research article per se, writing collaboratively about our research projects has been an important part of sharing what we learned from one another.

What We Learned about TBL

Although some may insist that approaches that do not closely follow the prescribed TBL approach are not properly team-based learning, we find that Freeman's (2012) approach to understanding the obstacles to its adoption a more appropriate way to end here. We each adapted the TBL approach to suit our ends, but in both classrooms, we attended to what Freeman identifies as key aspects of the TBL approach:

- a deliberate focus on students experiencing the learning
- instructors are facilitators rather than dispensers of information
- class time is used to focus on students using concepts to solve authentic problems, rather than simply remembering key concepts presented
- as team members, students take responsibility for their learning, with an emphasis on their decision making, aided by provision of immediate feedback (Freeman, 2012, p. 156).

For both of us, the use of TBL aligned with our individual pedagogical inclinations (what Freeman calls "culture"); that is to say, like those who generally tend to adopt TBL, we both

favour student-centred innovations. Happily, neither of us faced a mismatch with the cultures of our department or our institution, one of the obstacles to innovation identified by Freeman. In fact, we both benefited tremendously from the support of Meadows and our Teaching Centre as an integral partner in the redesign of our approach to teaching.

Freeman also notes that the complexities of TBL, such as devising suitable questions and applying appropriate questions, can be an obstacle to adopting it. Again, we both had the support of our Teaching Centre with these issues. Finally, Freeman identifies the role of increasing the visibility of the adopters' practice and outcomes in supporting innovation in teaching and learning. This brings us back full circle to how we met and began to share stories, experiences and research outcomes. It was the work of our Teaching Centre in putting us together to make a video to raise visibility about what we were doing in our classrooms that began our transformative dialogue.

We continue to use and investigate how TBL-informed approaches help our students succeed. As scholars of teaching and learning, we come from different faculties and different disciplines with different research interests and different approaches to conducting research. We see TBL as a flexible choice that can be tailored to different classrooms. We each found success with TBL and for different reasons. It was the cross-disciplinary collaboration fostered by our teaching centre that helped us in this.

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