

Student perceptions and comfort with content in a women's health elective utilising team based learning versus lecture delivery

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Abstract

Objective: Team based learning (TBL) is a form of active learning that focuses on teamwork, student accountability, and team application exercises. The purpose of this research was to compare students' perceptions in knowledge and comfort making recommendations, students' perceptions of traditional lecture versus TBL delivery methods, and overall course grades in a women's health elective delivered with traditional lectures versus TBL.

Methods: Pre- and post-course surveys were administered to assess students' perceptions related to women's health topics.

Results: Ninety-two students completed surveys. Overall, perceived comfort levels improved regardless of course delivery method. There were no significant differences in course grades. Students in the TBL based course overwhelmingly preferred lecture delivery in the post-survey.

Conclusion: Student comfort level with women's health topics significantly increased regardless of course delivery method without significant change in student grades. Students may be resistant to incorporating team-based, active learning due to the increased accountability and out of class work.

Keywords: *Student Perceptions, Team Based Learning, Women's Health Elective*

Introduction

Incorporation of team based learning (TBL) in pharmacy schools has been described in various areas of curricula including required courses, topic modules, and elective courses. Student performance, perception, and response to components of TBL, as well as factors affecting implementation, have been previously reported in the literature (Letassy *et al.*, 2008; Beatty *et al.*, 2009; Conway *et al.*, 2010; Zingone *et al.*, 2010; Addo-Atuah, 2011; Grady, 2011; Persky, 2012; Ofstad & Brunner, 2013; Sicat, 2013; Frame *et al.*, 2015).

Beatty *et al.* demonstrated that the readiness assessments for teams were 20% higher than the individual assessments, and improvement in understanding of course material with TBL was reported in over 90% of students when TBL was implemented in a pathophysiology and therapeutics course workshop. Additionally, over half of students reported working in teams was the best component (Beatty *et al.*, 2009). Similarly, improved exam grades that focused on Bloom's taxonomy levels (1 = application/analysis, 2 = synthesis/evaluation) were observed in a second year

pharmacokinetics course when TBL was implemented. Higher exam scores focused at level 2 were observed when utilising TBL. Notably, student attitudes of professionalism and attitudes scores towards team learning also increased after the course (Persky, 2012).

When comparing course grades for the lecture based delivery format to TBL in an endocrine module for third year students, grades were higher using the TBL for the third time in the course, as more students received an "A" in the course compared to the last year of lecture based delivery (23% for TBL vs. 9.5% for lecture based, respectively) (Letassy *et al.*, 2008). Comparison of course evaluations revealed an overall higher rating for the lecture based delivery method offered previously, which authors associated with an increased level of student accountability that may have affected student comfort. When self-directed learning assignments for lecture portions and TBL for case discussion portions were incorporated into a cardiovascular module for second year pharmacy students, no students failed the course during the TBL case format compared to 2.7% who received a "D" with the previously used lecture

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method and 1.7% who received a “D” during the first year of self-directed learning assignments in the lecture component. However, the percentage of those receiving an “A” decreased, while the percentage of those receiving a “B” increased with the TBL method for case discussion. Authors reported student resistance when self-directed learning assignments were introduced, but course ratings improved after TBL case discussions were implemented (Conway *et al.*, 2010). Similarly, when comparing TBL to mixed-active learning in an ambulatory care elective, student grades were significantly higher using TBL, and the student course survey reflected a higher rating for TBL in the areas of utility of pre-class readings and course coordination (Zigone *et al.*, 2010).

In contrast to the above, when comparing TBL to lecture based delivery, Grady reported no difference in exam grades at the end of a module in a pharmacotherapeutics course (Grady, 2011). When comparing student perceptions of TBL to lecture based delivery in a self-care and biochemistry course, first year students preferred TBL if this was the teaching method experienced first by students. Authors concluded that TBL was the more popular method if TBL was introduced early in the curriculum before a lecture based format (Frame *et al.*, 2015).

Previous studies have also suggested that students’ perception of critical thinking skills improve when TBL is incorporated. Integration of TBL into a global health elective reflected that a majority of students believed their analytical skills improved using the TBL method (Addo-Atuah, 2011). Almost half (48%) of these students believed TBL would have a lasting effect on their careers compared to the other half that thought lectures and group projects would achieve a similar result. Through a course evaluation of a women’s health elective offered in the third year, the majority of students agreed or strongly agreed that TBL improved understanding of course material and improved problem solving and critical thinking skills (Sicat, 2013).

Literature available specific to a women’s health course highlights responses to active learning activities and changes in student perspectives after the course. A women’s health elective used a traditional lecture method and active learning activities to deliver content to second and third year students (Marshall & Ashworth, 2010). A student survey at the conclusion of the course showed that 52% of students strongly agreed and 33% of students agreed that the methods of evaluating performance in active learning activities and class participation were clear. The most common themes for changes in student perceptions after the course were: *“realisation that many diseases manifest differently in women than men, awareness of numerous diseases primarily affecting women but which are not addressed in required courses, and greater appreciation of the physiological and pharmacokinetic differences that increase the potential for adverse drug reactions in women”* (Marshall & Ashworth, 2010: p.4). Another women’s health elective course that included a pre/post-test, reflection on reading

assignments, in-class discussions, active learning activities, research and presentation of a scientific seminar, creating a project for the national women’s health week, and a reflective essay demonstrated significant improvements in student knowledge as reflected in the pre- and post-course assessments ($p < 0.001$) (DiPietro, 2013).

The women’s health elective at our institution has been part of the curriculum for over a decade. This elective runs for an entire semester and is a two-credit hour course. This course has historically been delivered by a group of faculty utilising traditional lectures since inception, although some active learning methods were incorporated via in-class case discussions and post-class homework cases in recent years. However, in 2013 the course was redesigned and approved by the school’s curriculum committee to be delivered as an active learning, TBL course. There had been varied success in student engagement through in-class discussions, which was substantially impacted by student preparation prior to coming to class. Faculty goals of transitioning the course into a TBL format were to enhance critical thinking skills, improve teamwork, promote effective and professional use of peer evaluations, and to encourage strategies to prepare students to be life-long learners.

The overall course objectives were to: (1) Acquire, evaluate, and synthesise information related to health issues facing women over their lifetimes; (2) Educate female patients on health monitoring and wellness screenings that are recommended for women in order to prevent premature morbidity and mortality; (3) Respond to drug information questions from healthcare providers and from patients concerning women’s health issues and pharmacotherapy; (4) Provide medication therapy management services for female patients. These remained unchanged in the conversion from lecture-based delivery to TBL delivery. The elective is 14 weeks in duration, with 12 weeks of classes. There were slight revisions in topics covered in the 12-week course, with the conversion to TBL based on overall curriculum analysis and student feedback. See Table I for comparison of topics.

The Auburn University Harrison School of Pharmacy has a main campus and a satellite campus with live, synchronous video streaming for all courses delivered in the first through third years of the curriculum. There are also four additional advanced pharmacy practice experience (APPE) regional campuses from which faculty can video-conference. Faculty teaching in the course have changed through the years (lecture based delivery vs. TBL delivery), but six full-time faculty members taught in the course each year, and three faculty members were consistent for all four years in the conversion before and after implementation of TBL. Two to three faculty members taught from the main campus, two faculty members taught from the satellite campus and all others taught from an APPE regional campus any given year. No faculty had experience with TBL prior to implementation in this course.

Table I: Course topic content by traditional versus TBL course

Traditional lecture based	TBL based
Eating disorders and body composition analysis*	Eating Disorders
Pyelonephritis*, vaginal candidiasis and urinary tract infections*	Sexually transmitted infections and vulvovaginal infections
Sexually transmitted infections and cancer screenings	Infertility and polycystic ovarian syndrome*
Infertility	Premenstrual syndrome and premenstrual dysphoric disorder, dysmenorrhea* and endometriosis*
Contraception*	Drug principles in pregnancy and lactation
Premenstrual syndrome and premenstrual dysphoric disorder	Acute conditions in pregnancy
Pregnancy and lactation	Labour*, delivery* and postpartum care*
Menopause, hormone replacement therapy and cancer screenings	Menopause: hot flashes and osteoporosis
Osteoporosis and osteopenia	Menopause: alopecia* and incontinence*
Cardiovascular disease in women	Cardiovascular disease in women
Depression* and post-partum depression	Post-partum depression, generalised anxiety disorder*, obsessive compulsive disorder*, post-traumatic stress disorder*
	Cancer screenings, ovarian cancer* and cervical cancer*

*Topics not offered in both course deliveries

When converted to TBL, ten item individual readiness assurance tests (IRAT) and ten item team readiness assurance tests (TRAT) were administered weekly throughout the semester via online testing software (the first year in Canvas® and the second year in ExamSoft®). The IRAT and TRAT covered material from the weekly required readings (no more than 50 pages in length) and aligned with objectives provided on each topic, which were all housed on Canvas®. Lower-level Blooms objectives were provided to direct student readings and preparation for the IRAT/TRAT (which were all lower-level questions for knowledge, comprehension or application). Higher-level Blooms objectives were provided to guide preparation for class case discussions and preparation for the midterm and final exams (>85% of exam questions were higher-level Blooms for analysis, synthesis or evaluation). Case discussion followed (within the teams and then with the faculty member content expert) the remaining 60 to 90 minutes of class. There were differences in the evaluation methods in the course when transitioning from lecture-based delivery to

TBL delivery. When the course was delivered via traditional lecture based method, the grade distribution was as follows: 10% for active learning/homework, 20% weekly quizzes (pre-assessment in 2011 and post-assessment in 2012), 10% (2011) and 5% (2012) for in-class participation and 30% each for the midterm and final exams. When the course was redesigned for TBL delivery, the grade distribution was as follows: 15% for weekly IRATs, 10% for weekly TRATs, 10% for peer evaluations (midpoint and final), 30% for midterm exam and 35% for the final exam. All exams (both course delivery methods) were multiple choice and administered via Canvas® or ExamSoft®.

Given course delivery was via synchronous video-conferencing to both campuses and potentially an APPE regional campus for a faculty member teaching, several areas needed to be taken into consideration when the course was converted to TBL. First, to aid with team interactions (within teams and with course faculty) for TBL, the course was limited to less than 30 students, which was similar to prior years. In order to have a class on either campus, at least four students had to enrol from that campus to have a “team” for the course. It was pre-determined that it would not be ideal for IRAT/TRAT and case discussions, based on technology limitations, for teams to be “mixed” with members from both the main and satellite campuses. Previously, there were no campus enrolment limits with the course by campus. There was only one team on the satellite campus both years it was offered as a TBL course. As in prior years when students were randomly assigned to small groups of four students/group for homework or in-class group work, students were randomly assigned to teams of four to six students (based on enrolment numbers) when it was delivered as a TBL course, true to the Michaelsen method (Michaelsen & Sweet, 2008).

While positive results regarding student attitudes towards teamwork, professionalism, and beliefs regarding various skills such as understanding course content and working as a member of a team have been noted in required courses and electives including a women's health elective, student comfort level with specific topics pertinent to women's health course content pre- and post-implementation of TBL has not been reported. The objectives for this research were to compare students' perceptions in knowledge and comfort making recommendations, students' perceptions of traditional lecture versus TBL delivery methods, and overall course grades in a women's health elective delivered with traditional lectures compared to TBL delivery.

Methods

A pre-course survey was developed and administered in Qualtrics® to assess students' baseline comfort level in making recommendations for care and knowledge/general understanding with women's health topics using a 5 point Likert scale (ranging from very comfortable to very uncomfortable), as well as their individual goals for

the course. There were two to three comfort level, knowledge/general understanding questions per topic area in each survey. When the course was redesigned to be a TBL course, questions were added to the survey to assess student-learning preferences through course delivery. To assess students' perceived comfort level in making recommendations for care and general understanding of women's health topics (utilising the same topic area questions and 5-point Likert scale as the pre-survey), if the students' individual goals were met, and learning preferences, a post-course survey was administered to assist course coordinators with course assessment and future course planning. All students enrolled in the course were given the survey on the first (pre-) and last (post-) day of class all four years.

The primary objective for this study was to compare student perceptions regarding comfort level in making recommendations and knowledge/general understanding with women's health topics before and after a women's health elective was offered. In addition, survey responses were compared between classes delivered by traditional lectures versus TBL. Secondary objectives included comparing overall course grades between delivery methods and evaluating students' perceptions of TBL before and after the course was completed. This study was approved with exempt status by the Auburn University Institutional Review Board.

Data were analysed using SAS version 9.2 (SAS Institute, Cary, NC). Survey responses were analysed utilising descriptive statistics and ANOVA (the independent variable was teaching method and dependent variables were comfort level/knowledge perception questions). Overall letter grades were analysed utilising a *chi*-squared test and scores for individual course components (midterm exam and final exam) were analysed utilising a *t*-test. An *a priori alpha* <0.05 was chosen for significance testing.

Results

Ninety-two students were enrolled in the course between 2011 and 2014. Table II shows enrolment by year and response rates. The overall response rates were 100% for the pre-survey and 79% for the post-survey.

For the majority of topics (70%) in the course, students' perceived comfort levels for making recommendations related to women's health topics improved at the end of the course based on the in the pre- vs. post-survey responses. This was consistent for both learning formats (traditional lecture versus TBL), yet there seemed to be larger percentage changes overall with TBL delivery (2011 19.9%, 2012 12.8% [traditional lecture] vs. 2013 32.9%, 2014 42.6% [TBL]). There were three topic areas that had significant improvements in student's comfort level making recommendations when the course was delivered via TBL vs. traditional lecture [CV risk reduction (ANOVA, $p=0.0053$), eating disorders (ANOVA, $p=0.0244$), cancer screenings (ANOVA, $p=0.0343$)] from the pre- vs. post-survey responses.

Table II: Enrolment numbers and survey response rates

Design	Year	N	Pre-survey response rate (%)	Post-survey response rate (%)
Traditional lecture	2011	24	100	42
	2012	30	100	80
Team based learning	2013	27	100	100
	2014	11	100	100

Table III: Overall course letter grades by year

Design	Year (n)	Number of A's (%)	Number of B's (%)	Number of C's (%)
Traditional lecture	2011 (24)	10 (40)	13 (56)	1 (4)
	2012 (30)	10 (33)	19 (63)	1 (3)
Team based learning	2013 (27)	8 (30)	12 (44)	7 (26)
	2014 (11)*	3 (27)	6 (55)	2 (18)

**chi*-squared, $p=0.0276$ vs other years

There were no significant differences in overall course grades between TBL and traditional lecture delivery in course years with similar enrolment numbers ($n>20$). There was a significant difference in the overall course grades (*chi* squared, $p=0.0276$) in 2014 when the enrolment in the class was smaller ($n=11$). Table III shows the overall course grade breakdown by year.

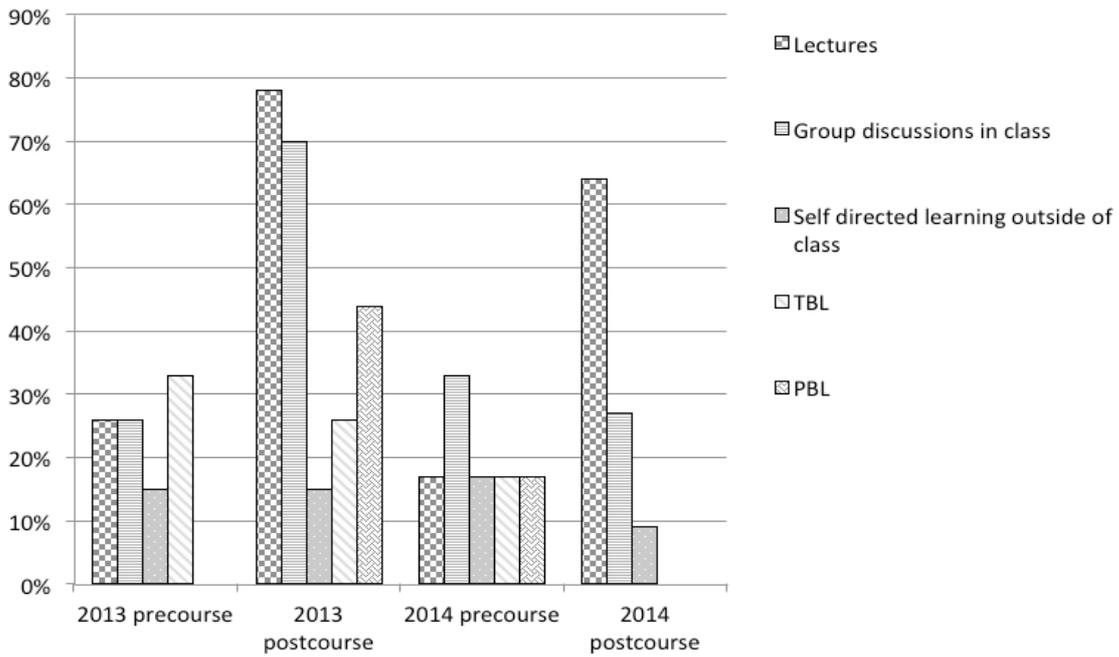
Table IV: Course components grades by year

	% of grade (11/12/13/14)	Traditional lecture		Team based learning	
		2011	2012	2013	2014
Homework	10/10/--/--	93.9	95.5	NA	NA
Participation	10/5/--/--	98.0	99.3	NA	NA
Weekly Quizzes	20/20/--/--	90.9	89.0	NA	NA
Midterm*	30/30/30/30	85.8	78.2	82.2	78.3
Final*	30/30/35/35	85.2	81.4	81.1	78.3
Peer evaluation	--/5/10/10	NA	97.4	95.6	97.9
IRAT	--/--/15/15	NA	NA	81.6	70.9
TRAT	--/--/10/10	NA	NA	99.4	89.8

NA- not applicable

*Grades are significantly different for exam to exam comparisons for the following: midterm exams (2011 vs 2012, *t*-test, $p=0.0004$ and 2011 versus 2014, *t*-test, $p=0.009$) and final exam (2011 versus 2014, *t*-test, $p=0.02$). No significant difference noted overall for traditional lecture (2011 & 2012) versus team based learning (2013 & 2014) format for comparable variables (midterm [*t*-test, $p=0.70$] and final exams [*t*-test, $p=0.12$]).

Figure 1: Student Course Delivery Preferences for Beneficial Learning



There was no significant difference noted for traditional lecture (2011 & 2012) vs. TBL (2013 & 2014) for the overall midterm exam average [mean 81.8 vs 81.1, *t*-test, *p*=0.70] and the overall final exam average [83.2 vs 80.3, *t*-test, *p*=0.12]. Grades are significantly different for exam to exam comparisons for the following: midterm exams (2011 vs 2012, *t*-test, *p*=0.0004 and 2011 vs 2014, *t*-test, *p*=0.009) and final exam (2011 vs 2014, *t*-test, *p*=0.02). Table IV shows the course components by year grade breakdown.

In 2013 and 2014, 32% of students reported familiarity or prior experience with TBL in the pre-surveys. When asked about which course delivery methods were most beneficial to their learning, 33% (2013) and 17% (2014) reported TBL was most beneficial in the pre-survey (see Figure 1). This course delivery preference decreased in the post-survey both years (26% in 2013 and none in 2014). The largest change was in student preferences for course delivery for beneficial learning was an increase in lecture preference (26% and 17% in the pre-surveys and 78% and 64% in the post-surveys for 2013 and 2014).

Student written feedback regarding TBL in the survey was variable, with both positive and negative comments. Students commented favourably on working in teams, learning from their peers, interacting with the faculty in the case discussions and utilisation of cases to reinforce material learned from the readings regarding TBL. Students commented critically the TBL process was too much self-directed learning prior to coming to class, required too much out of class reading and found it was frustrating when team members were not prepared for IRATs and TRATs. Students also commented TBL was not their favourite/favoured learning format (see Table V).

Table V: Student comments regarding TBL (2013 & 2014)

Comments in favour of TBL (n=)
It created great discussions with peers (7)
If the team is prepared it is great (4)
I liked working within a group (2)
I enjoyed the cases and discussions (5)
I enjoyed interacting with the faculty (6)
Helped me find more answers and learn independently
Case discussions reinforced information I learned (6)
Comments not in favour of TBL (n=)
It was frustrating when team members were not prepared for IRATs/TRATs (2)
It was not my favourite way to learn (5)
No lectures before IRATs/TRATs
It was ineffective
Too much before class reading (5)
Too much self-directed learning (5)

Discussion

This study was conducted to assess the change in students' perception in comfort and confidence in learning and applying knowledge in women's health topics, as well as comparing the student comfort level between traditional lecture versus TBL delivery methods and evaluating student perceptions of TBL. Previous evaluation of student perceptions of the integration of

TBL into a women's health course demonstrated that students felt that TBL helped promote an increased understanding of course content, apply course concepts to solve problems, and to think critically, as well as increased understanding of skills needed to work productively as a task group member and provided an opportunity to learn from other students (Sicat, 2013). Similarly, this study found that students' perceived comfort levels for making recommendations related to women's health topics improved at the end of the course, regardless of the method of delivery. However, there was a seemingly higher percentage change in comfort level when the course was taught via TBL. To the authors' knowledge, no other literature specifically comparing women's health courses taught in a traditional lecture-based format versus TBL exists, but a recent study comparing these methods in a biochemistry and self-care course demonstrated an increased agreement that TBL was more effective than traditional lecture (Frame *et al.*, 2015).

No significant differences were found in overall course grades between delivery methods. While studies have demonstrated that TBL can increase student performance, other literature has found that TBL may be of more benefit to the students who are academically weaker (Ofstad & Brunner, 2013). While this was not specifically evaluated in this study, it may be that students are able to retain the knowledge learned long-term rather than memorise it only for the exam when TBL is utilised. However, the final grades did shift to an overall lower distribution. Grading components did vary slightly between the different methods of delivery, which may have impacted grade distribution. The IRAT and TRAT components of the course did account for a higher overall percentage (25%) of the final grade when the course was delivered in the TBL format than the weekly quizzes (20% of final grade) that were given when the traditional lecture format was utilised, and the final exam proportion of the overall grade was also increased in the TBL format. Homework and participation grading components, which favourably impacted student grades in 2011 and 2012, were removed when the course transitioned to TBL; this may have contributed to the lower grades seen in 2013 and 2014. Peer evaluation grades were not significantly different between the formats used, and in general, those grades favourably impacted the students' final grade; therefore, peer evaluations were unlikely to have contributed to the difference in grade distribution seen.

Interestingly, even though overall student comfort increased each year and grades were not significantly different between teaching methods, students were found to have an increased preference for lecture-based delivery after completing the course with TBL. This may be due to a number of factors. TBL requires an increase in student accountability, as students must work independently to prepare for class sessions so that they can both perform successfully on the readiness assurance portion and contribute to the team session of the class (Letassy *et al.*, 2008; Michaelsen & Sweet, 2008; Ofstad & Brunner, 2013; Frame *et al.*, 2015). Students may

resist implementation of TBL as it is a shift from the passive learning process of traditional lecture-based settings to an active learning environment (Felder & Brent, 1996; Michaelsen & Sweet, 2008; Conway *et al.*, 2010; Ofstad & Brunner, 2013). Previous exposure to lecture-based delivery and timing of TBL integration may also impact student preference for delivery methods (Letassy *et al.*, 2008; Grady, 2011, Ofstad & Brunner, 2013). Currently, the third professional year at this programme is typically the first time that students are engaged in active learning, as the first two years of the current curriculum are driven by more lecture-based delivery. As only approximately 30% of students had any familiarity or experience with TBL prior to course enrolment, explanation of the long-term benefits of TBL and student expectations may have resulted in better understanding of, and increased preference for TBL (Whitley *et al.*, 2015). Furthermore, students were also introduced to problem-based learning (PBL) at the same time they began this class. Pharmacy literature has indicated that stress levels are highest in the third professional year, so out of class workload may have impacted student preference as well (Gupchup *et al.*, 2004). Finally, while not specifically assessed in this study, conflict may arise when working as a team and may impact student perception of TBL (Frame *et al.*, 2015), which was reflected in student comments (Table V). As an increase in comfort level was not associated with a significant difference in student grades or preference for TBL, this suggests that measures of comfort may not be good overall predictors of academic performance or methods of course delivery.

Limitations in this study do exist. Topics offered through this elective were not consistent between the traditional lecture-based format and TBL format, so not all topics were assessed in the pre- and post-surveys for both delivery methods. Additionally, less than 50% of students responded to the post-survey in 2011, which could impact the overall assessment of student comfort level at the end of the course. Qualitative analysis was not available for student-specific comments, which limits overall interpretation of comments. The difference in the overall course grades in the 2014 year was likely due to the small sample size, as no difference was found when the class enrolment number was similar. However, the small total sample size included in the evaluation of the TBL format may impact external validity, as it is difficult to ascertain how results would have varied with a similar number of students enrolled as in the lecture-based delivery format. As this was a team-taught course, the approach for content delivery such as the expectations and required pre-class reading assignments did vary between instructors, which may have impacted the students' overall preference for delivery method. Improved consistency in week to week class structure and delivery of team-based learning sessions by the team of faculty teaching within a course may improve student satisfaction with the overall course (Zingone *et al.*, 2010). Lastly, while teams were randomly assigned, there may have been a lack of heterogeneity within groups, as groups were not determined based on

personality or learning styles, both of which have the potential to impact learning in the TBL setting (Frame *et al.*, 2015; Whitley *et al.*, 2015).

This study demonstrated that student comfort level with women's health topics significantly increased when content was delivered by either lecture-based or TBL methods without significant change in student grades. TBL is an effective approach for increasing student engagement and discussion, but students may be resistant to incorporating more active learning due to the increase in accountability and out of class work. As ACPE Accreditation Standards state that active learning is a key element for pharmacy curricula, TBL could be one approach for satisfying this requirement.

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