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Link to original published version: <http://dx.doi.org/10.1016/j.cptl.2015.09.008>

Citation: Tweddell S, Clark D and Nelson M (2015) Team-based learning in pharmacy: The faculty experience. *Currents in Pharmacy Teaching and Learning*. Article in press Dec 2015. doi: <http://dx.doi.org/10.1016/j.cptl.2015.09.008>

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Team-based Learning in Pharmacy: The Faculty Experience

Abstract Aim. To assess faculty perceptions and experiences when implementing Team-Based Learning (TBL) across a pharmacy curriculum. Study Design. A total of 19 faculty participated in a series of individual semi-structured interviews that allowed freedom of discussion within a structured framework of inquiry. Data were transcribed, coded using NVivo and analyzed to establish common themes. Participant quotations were chosen to reinforce the themes and give a voice to the participants. Findings and Discussion. The benefits of TBL were perceived to be enhanced student engagement, peer learning, increased faculty enjoyment of teaching, and student development of transferable skills. Challenges included increased initial workload, writing effective application exercises, and facilitating learner-centered classes. TBL may be useful in optimizing course content to ensure outcomes and activities focus on important concepts. Peer learning appears to benefit student learning. TBL may help equip students with valuable transferable skills. TBL requires an initial upfront investment in faculty development and time to prepare resources. A student-centered approach to learning may be daunting for faculty and require new skill sets. Conclusions. Faculty described their support for TBL, concluding that the pedagogical benefits of engaging students in active learning, the development of transferable skills for the workplace, and the personal satisfaction felt after a TBL class, outweigh the initial challenges of transitioning to TBL.

Key Words Team-based learning; faculty perceptions; student engagement

Disclosure Statement: We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

Introduction

Team-Based Learning (TBL) is an instructional strategy developed by Michaelsen¹ which is being increasingly used in the delivery of Doctor of Pharmacy curricula in the United States.^{2,3} The literature on this use of TBL in pharmacy curricula indicates that it is well-received by both students and faculty members⁴⁻⁶. TBL enhances class preparation as well as participation and may lead to higher levels of learning outcome achievement.⁴⁻⁷ The role of the faculty member in TBL is different from that of traditional lecture-based learning.⁸ At the beginning of a TBL course, the faculty member will facilitate the formation of teams of 5-7 students using a process that aims to evenly distribute specific student assets (backgrounds or skills perceived by the faculty as helpful to success with the course material), limit liabilities and break up any pre-existing sub-groups, which ensures diversity across teams. TBL requires students to prepare for class by studying essential course content guided by learning objectives. Students take a readiness assurance test (RAT) at the beginning of the first class in a unit to motivate them to study the pre-class learning resources. They first do this individually and then take the same test again with their team. The remainder of class time in the TBL unit is devoted to application exercises followed by teams justifying their answers and class discussion facilitated by the faculty member.

Given that the TBL process differs significantly from traditional instructional methods (e.g. lecture-based learning), it is likely that these faculty experiences will also differ. Reports on the effects of TBL on faculty workload and resources have mixed conclusions. TBL experts acknowledge that considerable faculty time and resources must be allocated for successful implementation of TBL.⁹ The transition from lecture-based learning to TBL in the Pharmacotherapeutics courses at Drake University was reported as being difficult for faculty initially which led to additional meetings amongst TBL faculty.⁶ With time, however, several faculty came to enjoy and appreciate TBL due to improved student preparation prior to class, development of student life-long learning skills, and development of teamwork skills. Implementation of TBL into an ambulatory care elective at the University of Tennessee resulted in minimal changes in faculty workload.¹⁰ A pilot study at the St. Louis College of Pharmacy reported an increase in student participation along with an increase in faculty workload.¹¹ A paper describing best practices for implementing TBL in pharmacy curricula suggested that faculty may experience unique challenges related to application exercise planning and execution.¹²

A study that examined the implementation of TBL in ten medical schools across the United States concluded that a key reason for the rapid expansion of TBL in medical education was its favorable effects on instructors.¹³ Positive effects identified included the perception that students understand the larger context of the material they are learning, the increased engagement of faculty in facilitating learning, the potential of TBL for integrating materials across disciplines, and the students' transition from passive to active learners. When using TBL for teaching medical residents, TBL was reported to be an efficient model for training large groups; however, it was labor-intensive for faculty when planning and developing TBL exercises.¹⁴ A study of factors influencing TBL use in medical schools found that faculty expertise and adequate time and resources for implementation of TBL were factors that health science faculty viewed as important to the successful implementation of TBL.¹⁵ Similar success factors were reported when implementing TBL in a pediatric clerkship.¹⁶

Nursing faculty reported satisfaction with and preference for TBL compared with former teaching methodologies; however, workload increased when switching from lecture-based learning to TBL.¹⁷

Conversely, faculty in a nurse practitioner program estimated the effort required to develop the TBL curriculum did not differ significantly from that of a new lecture-based curriculum.¹⁸

The literature on TBL in pharmacy is mostly limited to quantitative studies that measured the impact of TBL on student learning outcomes and student perceptions using end of course surveys. Literature is lacking regarding faculty experiences using qualitative methodology, particularly in a curriculum delivered mostly by TBL. Other authors have identified the need for further research on the faculty experiences of TBL.¹¹

The pharmacy curriculum at Regis University commenced in 2009 and is a highly integrated program,^{4,19} delivered predominantly by TBL since its inception (approximately 80% of the on-campus curriculum). Most TBL units are developed by teams of 2-3 faculty formed from the pharmaceutical sciences and pharmacy practice departments and taught by these faculty teams to year groups of approximately 75 students. This environment is the context for the findings presented here and undoubtedly has an effect on them. For example, faculty perceptions of the workload of TBL may be influenced by workload perceptions of a highly integrated curriculum and the logistics of team teaching; however, it does offer a unique opportunity to study the faculty experience. An extensive TBL faculty development program was provided, initially by bringing in TBL experts from across the country, and later by developing an in-house program.

The aim of the study is to assess faculty perceptions and experiences of implementing TBL across a pharmacy curriculum.

Table 1

Faculty demographics (at time of study)

Discipline	
Pharmacy Practice	68%
Pharmaceutical Sciences	32%
Number of years teaching	
0-5 years	76%
6-10 years	16%
11-15 years	8%
Experience using other methods prior to TBL	
Yes	60%
No	40%
Number of years using TBL	
Mean	2.68
Median	2

Study design

A literature review was completed initially to inform the study design. Qualitative research methods were chosen as they can provide a deeper understanding of faculty perceptions, gathering data by talking directly with smaller numbers of people, sacrificing some scope for depth.^{20,21} Semi-structured interviews were selected since they provide structure to the discussion while allowing freedom to adapt questioning to explore further understanding of each interviewees' perspective.²²⁻²⁵ An interview guide²⁶ covering six key areas of inquiry as outlined in Table 2 was prepared.

Table 2

Theme emerging from areas of inquiry

Areas if inquiry explored by researcher	Emergent themes
Experience of Previous Teaching Methods	Poor student engagement
Initial Perceptions of TBL	Feelings of anxiety Feelings of excitement Faculty recruitment Lack of understanding of the logistics
Development needs	Understanding the TBL process Developing effective facilitation skills Writing effective application exercises
Benefits	Enhanced student engagement Peer learning Faculty benefits Enhanced transferable skills
Challenges	Workload Facilitating student-centered classes
Lessons Learned and Evolution of Practice	Writing effective application exercises Managing the readiness assurance process Managing content

Following IRB approval, 27 faculty who had been using TBL for two years or more were invited to take part in the study. In all, 19 agreed to participate suggesting the sample is representative of the faculty. Of the nine faculty members who were not interviewed, eight were unavailable for interview during the week-long data collection period by the visiting researcher and one was excluded from the study due to being new to the school and not having experienced TBL. Participants were provided with a Study Information Guide that informed them of the purpose of the study, iterated that the interview data would be confidential and non-attributable, and sought informed consent to conduct a 30-minute interview. During the interviews, the researcher asked all predetermined questions and, at their discretion, asked follow-up questions probing beyond those in the interview guide. Interviews were recorded using a digital audio recording device, transcribed by the researcher, and entered into NVivo, a computer program designed to organize qualitative data. NVivo supports researchers in coding, classifying, and organizing data in addition to seeking relationships between codes. The researcher inductively analyzed each interview transcript line-by-line in NVivo and categorized them

into codes. The codes were reviewed and analyzed for regularity and commonality. Some codes were merged to establish holistic themes from each question, presenting multiple perspectives of the issues under study and to seek complex layers of meaning beyond the surface.^{27,28} The codes and emerging themes were triangulated with a third of the participants, selected at random to optimize the dependability of the data.²⁶ The areas of inquiry and resulting themes are presented in Table 2.

Findings and discussion

The subject areas explored with the participants are shown in Table 2. The researcher named the themes based on their analysis and interpretation of the data. They are discussed under the six areas of inquiry below.

Experience of Previous Teaching Methods

The theme that emerged in this area was *poor student engagement*. This theme emerged from the data from aggregating codes passivity, engagement efforts, poor attendance, and personal experiences with lecture as a student. Many participants reflected on their teaching experiences and their own learning using traditional methods, the lecture format in particular. The difficulty participants had with lectures was determining if the level and pace was correct and whether students were engaged and learning.

[With lecture], there's no real interaction between students and faculty, it's just [faculty] standing there presenting. Some students are interested and paying attention, some are doing other things and it's really hard to know if the material is making sense or not. (Participant 9)

This is not a new phenomenon, other educators have written about lack of student engagement describing their "somewhat lifeless students passively sitting in classrooms with glazed eyes".²⁹ Most participants described difficulties engaging students in lecture. One participant described how they tried to use more active learning strategies, only to be met with student resistance.

It would take [the students] a while to get going on a problem. The energy didn't seem to be there. It was more like something [the students] had to do. Looking back, I was putting a Band-Aid® on the problem and not really fixing it. (Participant 6)

The two major problems associated with teaching large lectures are that of anonymity and passivity.⁸ In large lectures, students can be inconspicuous, passive observers, unlikely to be challenged, provoked to thought, or required to actively participate.³⁰ Engaging students in large lectures is difficult. Changes are needed to prevent a decline in the quality of learning as class sizes continue to

grow.³¹ In an ethnographic study of large group teaching the authors reported a lack of rapport between faculty and students, decreased faculty job satisfaction and stress relating to the challenges of controlling large groups.³²

Another sign of disengagement was a notable decrease in lecture attendance as the semester progressed. Reflecting on their own time as a student, participants reported difficulties learning in lectures, struggled with retention of knowledge, and lacked the self-discipline to study after lectures.

I didn't find it very rewarding or fulfilling to provide traditional lectures. Neither did I feel that [as a student] it was a good use of my time to sit through lectures during the day and then go home and try to learn. (Participant 16)

However, this view was tempered by two faculty who did like learning from the lecture method.

I think I benefited from lecture, mainly because they told you everything and you heard it straight from the teacher's mouth. (Participant 19)

When explored further, these two participants were clearly self-motivated as students and would study after lectures. This method has worked for many students over many years; however, these participants acknowledged that students like them are in the minority, with many balancing study, work and family commitments, and others who lack intrinsic motivation.

Some participants had experimented with techniques aimed at engaging students during lectures; however, they found this a challenge in large groups. One participant commented on efforts to introduce problem solving during a lecture.

The students weren't ready to solve [the problems], even though I'd just lectured [on the content]. They were given notes ahead of time but of course they never read them, so I spent a lot of time going over content rather than getting them problem solving. (Participant 6)

Students learn by actively “doing”, yet their preference is often to passively “soak up” the content in the hope that they are learning as a result.³³ One of the benefits of TBL is that students are held accountable, through the individual readiness assurance test (iRAT), the team readiness assurance test (tRAT) and peer evaluation, for engaging with the content prior to class. This is to ensure that they are ready to apply new knowledge when solving problems during the subsequent application exercises.

Initial Perceptions of TBL

The themes that emerged from coding the data in this category were *feelings of anxiety, feelings of excitement, faculty recruitment, and lack of understanding of the logistics.*

Some anxiety came from fear of the unknown, poor experiences with group work, and whether they would personally have the skills to facilitate this style of learning.

I was very hesitant but also excited and intrigued. I like innovation and doing something different.
(Participant 11)

I was anxious about lots of group work because students don't always have a good experience of it. (Participant 17)

Some participants stated that TBL was the reason they joined the school. The idea of an engaging and structured learning and teaching strategy appealed to many of them.

It seemed to be a solution to many of the problems I had with didactic lectures as it would engage students and make them responsible for their own learning....I felt it was really formed around active learning. (Participant 16)

I really liked what I was reading; it made a lot of sense. It spoke directly to the frustration I had with trying to engage students. (Participant 5)

Prior to their first TBL experience, participants reported some skepticism about TBL as an effective teaching strategy. Part of this was their lack of understanding of the process and of the pedagogy.

I didn't understand the logistics. Why wouldn't you just have someone come in and teach you?
(Participant 19)

Some participants had doubts about controlling the class and whether they possessed or could develop the necessary facilitation skills.

When you first see a TBL class it feels chaotic. I had doubts as to whether I could be an appropriate facilitator; whether or not I could control the class and keep it moving. When the students are all talking, the challenge is bringing them back together again [for discussion as a whole class]. (Participant 14)

Without incentives that measure and reward individual preparation for teamwork and assessing and rewarding team performance, members of newly formed groups may prioritize individual effort over group effort resulting in some students carrying the load for the group.⁸ This did cause some initial concern.

One of the misperceptions I had was that weaker students would be able to go through relying on their teammates. I quickly found out that really doesn't happen. (Participant 9)

TBL ameliorates this by enhancing the accountability of students to their team through both the readiness assurance process and peer evaluation. One cannot avoid participation in a small team¹. As the teams work cohesively, a degree of competition between teams develops, further enhancing learner motivation.

TBL appeared to be congruent with pharmacy education; however, feelings of uncertainty and anxiety about using an unfamiliar instructional strategy were also present, a finding reported by others.^{6,17} It is easy to understand how faculty may find adjusting to student-centered strategies challenging.³

Developmental Needs

Designing and implementing a new curriculum requires considerable time and effort; therefore, the planning process should be well organized, robust and transparent.^{34,35} There must be a significant investment in faculty mentoring and development with a paradigm shift in an educational approach.

Faculty development needs were coded into three sub-themes, *understanding the process, developing effective facilitation skills and writing effective application exercises.*

Understanding the process

Participants initially needed to learn the TBL process by developing a functional understanding of its components. The consensus was that this was best learned experiencing TBL as a student would, by attending workshops delivered by experienced TBL trainers. Participants also benefited from online materials such as the TBLC website and published books by Michaelsen.^{1,8}

I needed to know the logistics of TBL and see it from the perspective of a student. (Participant 19)

Participants described beneficial developmental experiences such as shadowing other faculty, post-class discussions and lunchtime meetings dedicated to reflecting and sharing ideas.

We did some 'brown bag' sessions in the first year. At lunch we'd talk about what was working, what wasn't, and what the challenges were. That did provide some internal support. (Participant 16)

Collegial support via informal meetings to debrief and discuss successes and challenges were reported as beneficial.¹⁷

Developing effective facilitation skills

The two greatest development needs were identified as ‘*developing effective facilitation skills*’ and ‘*writing effective application exercises*’. Moving from passive, teacher-centered classrooms to active learner-centered ones requires major changes in thinking, planning, and using different skill sets.

We wrote a few workshops to help faculty debate questions, how to turn questions back onto students and give them the responsibility for the answer. An important part of the development process is learning how to facilitate TBL. (Participant 8)

Participants felt they needed to first teach a TBL class to identify ways to improve their approach.

You have to jump in and do it a couple of times before you necessarily know your development needs. (Participant 11)

Developing skills in writing effective application exercises was perceived to be an iterative process and will be discussed in depth in the section ‘*Lessons Learned and Evolution of Practice*’

Benefits of TBL

When asked about the benefits of TBL, the themes that emerged were, *enhanced student engagement, peer learning, faculty benefits, and enhanced transferable skills*.

Enhanced student engagement

Educators are often faced with poor student preparation and class attendance.³⁶ An important benefit of TBL is that it maximizes student attendance.

The most tangible positive is 100% attendance. That’s pretty impressive; you can’t get that almost anyway else. Having students there is a good starting point. (Participant 11)

The most common benefit that emerged from the data was the student engagement, interactivity and participation during class.

Absolute student engagement. When you walk in the room, [the students] are awake and they’re there. (Participant 18)

I love the engagement. The most positive thing is the ability to actually hear [students] reason. They think it through and you know that they’ve either mastered or struggled with the material before they leave the classroom. You also have that immediate assessment of where they’re learning is at; I think that’s really wonderful. (Participant 11)

We suggest that learning is enhanced if students are actively engaged, solving problems through peer discussion, applying course concepts and justifying their answers. It is important to create classroom

conditions that are conducive to learning and create practices that encourage students to take responsibility for their learning.³⁷

It is also important to know whether students have understood the course concepts. In TBL, faculty find out the degree of understanding immediately, enabling corrective action as necessary.

Because I work so closely with [students] in the classroom I get to understand their struggles. When I was lecturing...I had no idea if they understood until course evaluations came back, and by then it was too late to do anything about it. Now I know pretty much right away if they understand it or not, if the reading was confusing or conceptually they don't understand how that fits into the therapy. I get to see that right there and then. (Participant 8)

Another benefit cited by participants was that students come to class prepared so that class time is dedicated to application of knowledge through problem solving.

Students prepare in advance. It's really important that they come to class with the base knowledge, and from there you can take them to a higher level. When I was lecturing I was just giving them the base knowledge in class and there wasn't a lot of application. The better students can do that when they go home, but in this environment you're giving opportunities for students who may not be as strong academically to start processing at a higher level. (Participant 12)

Peer learning

Another perceived benefit of TBL is peer learning (i.e., the learning that occurs when one student explains a concept to others).³⁸ Students who learned from peers and those who served as teachers identified advantages to their own learning.³⁹ The benefit to the explainer is that they are verbalizing the concept and are relearning the concept themselves through their explanation. The benefit to the recipient is the explanation given by a peer at a similar stage of development may explain the concept at a more appropriate level. The recipient may also be more likely to ask for further clarification from a peer than from faculty.

I hear [students] talking about the issues and teaching each other in ways that I couldn't do because it's individualized between the students. (Participant 16)

Teams are together all the time so they don't feel bad saying "well I don't understand, how did you guys get there? Show me!" (Participant 9)

Medical students learning by TBL showed improved examination performance, with the greatest increase from those starting the course in the lower academic quartile. This may be as a result of peer learning.⁴⁰ Straight content lectures promote surface learning, in which information is passively transmitted from the teacher to the student. Learning theories suggest that knowledge cannot be simply given to students, they must actively construct their own meaning by relating it to pre-existing knowledge and experiences.⁴¹

I remember hearing first year discussions [students] were having in their groups that I would not have heard in my second year in a lecture format. In the past they weren't thinking that hard about it; they were just memorizing. In TBL they're evaluating; 'this drug will be better for this but what about this one?' They were really going beyond what I was expecting students to do in their first week or two of pharmacy school, so that just blew me away. (Participant 3)

A study of deep and surface approaches to learning found that students taking a deep approach were more spontaneous with their ideas, gave more elaborate explanations, referred to personal experiences and asked questions relating to explanations and causes. Students taking a surface approach provided explanations that just rephrased the question, referred only to what was visible and asked questions about basic factual or procedural information.⁴² Presenting students with challenging, meaningful and authentic problems to discuss, debate and solve in a TBL class creates meaningful learning. This form of deep learning requires relevant prior knowledge and meaningful learning tasks compared to rote learning that is arbitrary, verbatim, unrelated to experience, and lacking learner commitment to relate new and prior knowledge.⁴³ Application exercises in TBL utilize prior learning, present meaningful learning tasks and result in elaborate analyses, evaluations, and explanations.

Faculty Benefits

For many teachers, TBL transforms (or restores) the joy of teaching.^{8,49,50} A theme that also emerged from the data was improved faculty job satisfaction.

From my own point of view I enjoy teaching a lot better using TBL. I enjoy being in the classroom because you are engaging the students. (Participant 12)

I chose this school for a variety of reasons, but the primary one was the pedagogy and TBL. It makes the job more interesting and more fun and you feel like the students are actually learning. (Participant 2)

Using an instructional method that engages students may also engage and enthuse faculty, leading to improved job satisfaction and increased retention.

Enhanced transferable skills.

Another benefit of TBL, as perceived by participants, was the development of transferable or softer skills that could potentially enhance future employability. Healthcare teams are multidisciplinary; therefore, pharmacists need to develop effective team-working skills. In TBL students learn how to work with individuals who may be unlike themselves and were previously not acquainted. Through these interactions students learn how to effectively communicate, justify their contributions, listen to, support and encourage others while learning how to manage conflict, compromise, and settle disagreements.

[The student's] teamwork skills are excellent. On rotation the students are in different teams every few weeks and they adapt very well. I think it's because they've learned these skills through TBL. They've had to learn to work with so many different personalities so they're good at adapting to change. (Participant 19)

For some students it increases their ability to speak with others and come to common solutions, to have differences of opinion but then find one best answer to a problem. I think it's pivotal for healthcare providers to be able to come together with different opinions on what is best for the patient, but then come out with one solution in a relatively timely fashion. (Participant 8)

Challenges

Participants were asked about the challenges of TBL implementation. The two themes that emerged from the data were: *workload and facilitating student-centered classes.*

Workload

The most common challenge cited by participants was the initial increase in workload while developing TBL materials. Underestimation of time, effort and planning required during the implementation stage of TBL have also been reported.¹⁷ Opinions were mixed as to the amount of extra work involved. It is possible that this could be associated with variations in the level of previous teaching experience among the faculty. Two participants offered the following contrasting opinions.

Workload is substantially higher than normal lecturing. Not only are we giving all the content that we normally lecture on ahead of time, but now I have to develop a whole second part to my

teaching with all the applications. This is actually more work than if I was going to just lecture.
(Participant 12)

I think that TBL can be less work; it just depends on how you organize yourself. The first time [faculty] teach it's a lot of work, but the second time you have all this data on which applications went well, which didn't, how long did they took. So each year it is tremendously less work.
(Participant 2)

The general consensus of the participants was that the preparation time was initially more work. The workload decreased in subsequent years; however, it was still thought to be higher than traditional teaching methods. One participant explained that their workload allocation was twelve hours of preparation of new TBL material to one hour of student contact. This includes time for team meetings and peer review and may be higher than at other schools due to the integrated nature of the program. Previous literature has suggested similar findings. Educators are likely to require more preparation and administration time to deliver TBL when compared to traditional methods.³⁵ There's the pragmatic challenge of reconstructing existing course material to a TBL format.^{3,36} A pilot study reported that 75% of respondents indicated an initial increase in workload.¹¹ Another study found that TBL did not require any additional resources; however, a shift in faculty time from delivery to pre-class planning was necessary.⁴⁴

Facilitating student-centered classes

Another theme that emerged was 'facilitating student-centered classes'. The effectiveness of using active, collaborative and inquiry-based approaches depends on the ability of faculty to 'step aside' and let students take the lead.³⁷ Faculty who are more used to teacher-centered methods can find this particularly challenging. Sharing control of the classroom with students can be challenging, sometimes leaving faculty feeling vulnerable.

When [faculty are] lecturing you've done your preparation and know exactly what you're going to tell [the students]. With TBL [students] ask more questions because they've read it and thought about it. Sometimes [faculty] get put on the spot and you have to say; "I'm not sure, I'll have to get back to you". (Participant 5)

Two participants commented on how their facilitation skills have developed as a result of using TBL.

My facilitation has improved. I'm better at asking the right questions to draw out the answers and rationales from the students. (Participant 10)

I still find myself talking too much. When you're not getting the answers you want then it's in our nature to say "let me just tell you". If [faculty] can hold back and try to get the students to get there themselves, then that's [the sign of] a really good TBL facilitator. (Participant 9)

The challenge of transitioning faculty from traditional roles of 'sage on the stage' to 'guides on the side' have also been reported by others.³

Another concern was whether students who work primarily in teams would be able to work effectively on their own.

[Students are] so good at bouncing ideas off each other in teams but are they losing their ability to think when not in a team? (Participant 3)

Lessons learned and evolution of practice

Participants described how their TBL practice had evolved over time. These were categorized into three themes, *writing effective application exercises, managing the readiness assurance process, and managing content.*

Writing effective application exercises

Writing effective application exercises that challenged student teams, created discussion and promoted higher-level thinking was another common challenge.

Writing good application exercises is so hard sometimes; am I giving [students] busy work or am I pushing them to that higher level of learning? I struggle with that sometimes. (Participant 3)

Other studies report similar experiences with application exercises more challenging and time-consuming to create than anticipated.¹⁷ Creating application exercises that require analysis, synthesis, and evaluation of information were difficult to write.¹²

To create individual accountability and foster discussion within and between teams students must work on a *significant* problem case or question that is authentic and important in the discipline, work on the *same* problem to promote inter-team discussion and energetically engage with the subsequent debate, make a *specific* choice about how they would solve the problem, and *simultaneously* report their choice of action to promote discussion and prevent teams from changing answers to go with the majority.⁴⁵

Attending to group dynamics and effective task design are important factors for students to see the benefits and have positive experiences of teamwork.³⁷

Coming up with applications that take a team to figure out is challenging. You want to keep [students] engaged by developing diverse types of applications and ensure they're relevant to pharmacy. (Participant 13)

A good collaborative learning problem engages students and orientates to the real world, often has multiple outcomes, requires team effort, builds on previous knowledge, is consistent with desired learning outcomes and curriculum objectives, and promotes the development of higher-order cognitive skills.⁴⁶ Four participants reported trying to achieve these objectives by initially writing creative, complex assignments. The problem they soon discovered was the differing length of time teams required to complete them, often resulting in long periods of 'downtime' for some teams while others caught up. It was custom and practice in the school to use a 'flag system.' Teams displayed a flag to indicate to the instructor their completion of the task. When half the teams were displaying their flag, the rest of the teams were given five more minutes. This provided a flexible timeframe but often resulted in substantial periods of waiting for the first teams finished. To keep the class engaged, some participants reported setting a time limit for each application exercise, which can be adjusted should the majority of teams need slightly longer.

[Students] hate sitting there waiting for others to catch up. I've tried to speed it up and get as many examples in as possible. (Participant 10)

At first I spent a lot of time working on creative applications as opposed to effective and efficient applications. Now I go for simplicity versus complexity. I've realized that the discussion is where the rich learning takes place. (Participant 2)

A number of other participants also reported moving to shorter, faster-paced problems that keep the students engaged throughout.

Instead of giving one large problem with multiple steps, I've scaled down to shorter concise applications. It may be part of one big problem but I break them into smaller steps to keep the class moving. (Participant 6)

Setting significant and appropriate applications to complete within a set, realistic timeframe helps engagement. Checking on progress and reviewing the time remaining helps to keep students on task. Another suggestion is the use of pre-prepared 'sponge activities' to manage any unexpected downtime. These are pre-prepared supplementary activities that teams may work on if they complete the original task early. They are related to the task but not necessarily discussed during class.

TBL requires students to make a specific choice; however, this does not mean there should only be one correct answer. TBL works best when teams must rationalize their answer to peers in other teams. Increasingly participants reported moving towards this model.

One of the biggest changes I've made is that I want students to be able to justify their answers. So I'll ask a question, more often now than I did before, where I have multiple correct answers. I force [teams] to make a choice and then they have to justify their decision. (Participant 7)

Faculty have also introduced summary slides after each application to ensure students understand the purpose of the activity and the teacher's rationale for their best answer.

We've started doing 'take-home points' at the end of applications to let [students] know the faculty's perspective of why 'D' was correct. Sometimes there are multiple answers and some student's don't like that. Part of the discussion is, "well that's real-life". (Participant 2)

Managing the readiness assurance process (RAP)

Participants reported an evolution in the RAP. Its purpose is to motivate, encourage, reward, and hold students individually accountable for pre-class preparation of course concepts. At Regis the RAP comprises 10-20, single-best answer, multiple-choice questions based on course content. Four participants struggled initially in creating questions at the appropriate level of difficulty.

Initially I was writing my RAT questions at a higher level than they should've been. As a school we're trying to ensure that, if [a student] reads their material once or twice and has a basic understanding of the material, they should be able to pass the RAT. The idea is 'Have you read it?' (Participant 2)

Others have also reported that students found the RAT questions harder than anticipated.¹⁷ It is recommended that RAT questions are written at the lower levels of Bloom's Taxonomy (i.e. remember, understand, apply).¹²

Managing content

An interesting and important benefit of an integrated curriculum delivered using TBL is that teaching teams are formed from the pharmaceutical sciences and pharmacy practice faculty to design and deliver TBL units around the body systems. When designed backwards from the program outcomes, the focus of the curriculum and the underpinning content is on meeting these outcomes. If the outcomes are transformational (i.e. include what you want students to be able to 'do' rather than just 'know' by graduation) then the focus of the curriculum is to achieve outcomes rather than covering

content. Five participants stated that they are more focused on ensuring the content is relevant to the future practice of pharmacy, rather than covering potentially irrelevant areas of the sciences in their own specialized area.

I now try to come up with applications that are clinically relevant, that will keep [students] somewhat engaged and pointing out why they need to know the content. I've taken out, or greatly edited, a handful of applications that it was clear were just filling space. [The content was] what I'm interested in, but [students] really don't need to know it. (Participant 5)

Higher education programs have focused on content coverage rather than using content to develop skills that can be applied in the workplace. There is a danger of adding more content to courses which results in memorization of facts due to a growth of knowledge in pharmacy.⁴⁷ Memorization of facts teaches students how to take assessments without developing practical skills such as critical thinking, problem solving, communication and interpersonal skills.

Learner-centered strategies such as TBL take a constructivist approach to learning. Students use content to actively construct their own meaning to knowledge through thought, discussion, and debate rather than passively receiving information from teachers or textbooks.⁴² This has implications as to how much content can be covered.³⁸ Faculty must focus on what students *must* know rather than *could* know, keeping content manageable so students have time to develop the critical thinking, team work, and communication skills necessary to be successful professionals and lifelong learners.

I'm better at seeing the big picture. Before, I might have been more concerned about the minutia, now I think [students] are getting the deeper concepts. If [the students] can remember these five concepts in five or ten years, then I feel we've done a good job. (Participant 12)

Benefits versus challenges

Finally, participants were each asked whether the positives outweighed the negatives.

I really enjoy this style of teaching. I really feel that our students are grasping the concepts a lot earlier and to a deeper level. For my job satisfaction I really enjoy the way that we teach. I don't know if I could go to a school that was purely lecture-based. (Participant 10)

Wherever I'm teaching, whatever I'm doing for the rest of my life I will always be, to some degree, using team-based learning. (Participant 12)

The consensus suggested pedagogical benefits, the development of transferrable skills, and the satisfaction after a TBL class outweighed the extra work involved in transitioning to TBL. Two

participants were more hesitant, first wanting to see how students performed in the licensure board exams and as practitioners before committing to an answer.

I don't know if I can definitely say yes yet. [Students are] excellent on rotations when it comes to working in teams and knowing how to speak up, but their knowledge base might not be there yet. (Participant 19)

If we have a great Board [NAPLEX¹] exam pass rates, then definitely. (Participant 4)

Others felt that although the strategy isn't perfect, it is superior to the alternatives.

I don't think we're perfect or the students are perfect or TBL's perfect, but I think it's far better for student learning, enjoyment and satisfaction, and the same for faculty. It's much more enjoyable to go into class, even though you're more vulnerable. There's more satisfaction in the interactions you have and knowing immediately that students understand what you're talking about and what you want them to learn. (Participant 16)

Summary

Participants expressed their frustrations with engaging students using traditional methods of teaching and initially viewed TBL with mixed emotions from anxiety to excitement and from the skeptical to the all-embracing. Participants were required to take training regarding the understanding of logistics, developing facilitation skills and writing effective application exercises. The perception is that TBL improves student preparation for, and engagement in class, which helps students develop the transferable skills needed in the workplace. Participants felt that TBL is more work for them, especially in the first iteration of a course and found writing good application exercises and developing effective facilitation skills challenging. There was clear support for TBL with the benefits outweighing the challenges. Twelve participants felt that TBL has transformed them as educators, understanding much more about pedagogy and sound educational practices. Perhaps most importantly, TBL has made teaching more enjoyable and interactive. Sixteen participants stated that they would continue to use TBL, even if they left their current institution.

This study has provided insight into the issues faculty have with traditional methods that focus on teaching rather than learning and is consistent with previous evidence.⁴⁸

¹ North American Pharmacist Licensure Examination

Limitations

Qualitative research has limitations. Because the researcher is heavily involved in the data collection and analysis, the findings can be influenced by the researcher's personal biases, for example their presence during the data gathering or the way they phrase a question may affect the participants' responses.¹⁹ These results were gathered from one school of pharmacy where the majority of faculty have taught for less than five years and the authors do not infer that they are transferable to other pharmacy schools. It should also be noted that 40% of respondents had no experience using other methods of teaching prior to using TBL. TBL is the predominant instructional strategy for the pharmacy program at Regis University and has been since the program inception, it is possible therefore that the school is more likely to attract and retain TBL enthusiasts to join its faculty. This is a cross-sectional analysis and opinions may have changed preceding or following the interview. Each quotation is specific to one individual, these were chosen by the authors to represent the emerging themes. With any qualitative research the authors must interpret the words spoken and construct theories from them. There were a further eight faculty who were not available for interview during the data collection period and it is possible that their views differed from the nineteen who were interviewed.

Conclusions and implications

There are a number of implications arising from this study that may be beneficial to other educators considering using TBL in pharmacy programs. It is important to allow sufficient planning and preparation time to redesign courses for TBL delivery. Application exercises can be challenging to write so they are at an appropriate level of difficulty to promote discussion, debate, and teamwork. Transitioning to a facilitatory role requires different skills, and these take time to develop. Setting time limits for application exercises is recommended to prevent teams spending significant time off-task. Providing a summary slide at the end ensures that students understand the "take home message". Focusing RAT questions on the main concepts and testing at the lower levels of Blooms Taxonomy is advisable. When planning TBL units, focus on the big picture of what you want students to be able to do at the end of the unit commencing with the outcomes and working backwards.

Using a new instructional strategy can be daunting for faculty who are both experienced and inexperienced in traditional methods. Participants indicated some clear anxiety prior to using TBL as well as a need to understand how and why it works. Another theory generated from this research is

the effect of peer learning in a group of students. Participants indicated potential benefits to both peer teachers and peer learners. It was also the belief of participants that TBL enhances transferable skills in preparing students for the workplace. Further research is needed to study this.

Participants reported that workload is higher when implementing a new TBL module; however, there was no clear consensus as to increased workload in subsequent iterations. Finally, this research generated the theory that TBL might be useful in managing and optimizing course content to ensure outcomes and activities focus on important and relevant concepts; this might be as a result of team taught courses in an integrated curriculum.

Acknowledgements

The authors wish to thank the faculty at Regis University School of Pharmacy for giving their time to take part in the study.

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