

REFLECTIONS ON PRACTICE

Design And Implementation of Synchronous Online Team-based Learning: A Learning Community's Reflection on Lessons Learned

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ABSTRACT

Team-based learning (TBL) is a pedagogical approach grounded in constructivist learning theory that is frequently used in health professional education. TBL is adopted in the Bachelor of Pharmacy (Honours) programme to facilitate integration and application of knowledge, and to enhance students' communication and collaboration skills. In Academic Year (AY) 2020/21, TBL was delivered online. This Reflection aims to describe the evidence-based approach undertaken by a learning community (LC) to design synchronous online TBL, and to reflect on the lessons learned by the LC in the implementation of synchronous online TBL, specifically highlighting differences from face-to-face (F2F) experiences. The LC adopted best practice recommendations in the literature to make teacher decisions on four key elements of online TBL—orientation, readiness assurance test (RAT), application, and peer evaluation. Reflecting on our experiences and lessons learned, we recommend a combination of online and offline approaches for TBL orientation and to support team bonding, designing learning activities that are suited for online teaching and learning, and to establish avenues to receive frequent feedback from faculty and students. As the COVID-19 pandemic irreversibly accelerated digital transformation in higher education, we believe that our experiences, reflection, and suggestions are valuable to educators in all disciplines seeking to engage students in TBL or similar student-centric pedagogical approaches through online platforms.

Keywords: Team-based learning, online teaching and learning, pharmacy education, learning community

INTRODUCTION

Team-based learning (TBL) is a learner-centred, instructor-led pedagogical approach grounded in constructivist learning theory (Hrynchak & Batty, 2012). TBL has been shown to improve attainment of learning outcomes and promote knowledge retention (Hake, 1998; Zgheib et al., 2010; Bleske et al., 2016). In health professional education, TBL is frequently adopted because it also promotes teamwork and enhances communication skills essential in the training of future healthcare professionals (Hrynchak & Batty, 2012).

A TBL cycle begins with pre-class individual study, followed by readiness assurance test (RAT) at the start of class to assess learners' knowledge. RAT is first completed individually to ensure individual accountability and then in teams to facilitate peer learning. Following RAT, the application phase allows learners to actively engage with the materials learned and to think critically in teams, during which learners reflect, challenge, and modify their existing knowledge (Fatmi et al., 2013).

The Department of Pharmacy at the National University of Singapore (NUS) (also known as NUS Pharmacy) launched the Bachelor of Pharmacy (Honours) [BPharm(Hons)] programme in August 2020 to support the integration and application of knowledge across biomedical, pharmaceutical, clinical, and health system sciences (Gonzalo et al., 2017), and to promote active learning by adopting innovative pedagogy such as TBL.

The programme was launched amidst unprecedented challenges due to the COVID-19 pandemic, which accelerated digital transformation in higher education (Martin-Barbero, 2020). Similarly, at NUS Pharmacy, TBL had to be delivered online. However, the literature supporting TBL is largely based on face-to-face (F2F) sessions and there are limited experiences on online TBL (River et al., 2016). Therefore, delivering TBL online was particularly challenging as faculty members in the BPharm(Hons) programme had to adopt new pedagogy (i.e. TBL) in less familiar online platforms with limited guidance from existing experiences in the literature.

This Reflection aims to describe the evidence-based approach undertaken by a learning community (LC) to design synchronous online TBL and to reflect on the lessons learned by the LC in the implementation of synchronous online TBL, specifically highlighting differences from F2F experiences.

DESIGN OF SYNCHRONOUS ONLINE TBL

The LC was formed in April 2020 to support the design and implementation of synchronous online TBL in the BPharm(Hons) curriculum. Members include academic staff from NUS Pharmacy and partnering academic units, practicing pharmacists, and undergraduate pharmacy students. Students were recognised as partners in curriculum design in order to minimise expert bias and to ensure that learners' perspectives were considered (Mercer-Mapstone et al., 2017).

The LC adopted Michaelsen's conceptual framework, which centres on learner engagement, to inform the design of synchronous online TBL (Figure 1) (Michaelsen et al., 2008) since LC members recognised that the value of TBL was its ability to engage learners for achieving learning outcomes (Reimschisel et al., 2017). Considering that teacher decisions on the design of various phases of TBL affect learner engagement with course content and peers (Figure 1), LC members attended training as well as reviewed evidence and best practices from the literature, including an online TBL white paper (Clark et al., 2018). Teacher decisions which covered all four areas critical to the success of TBL were contextualised to pharmacy education and digital infrastructure within the University.

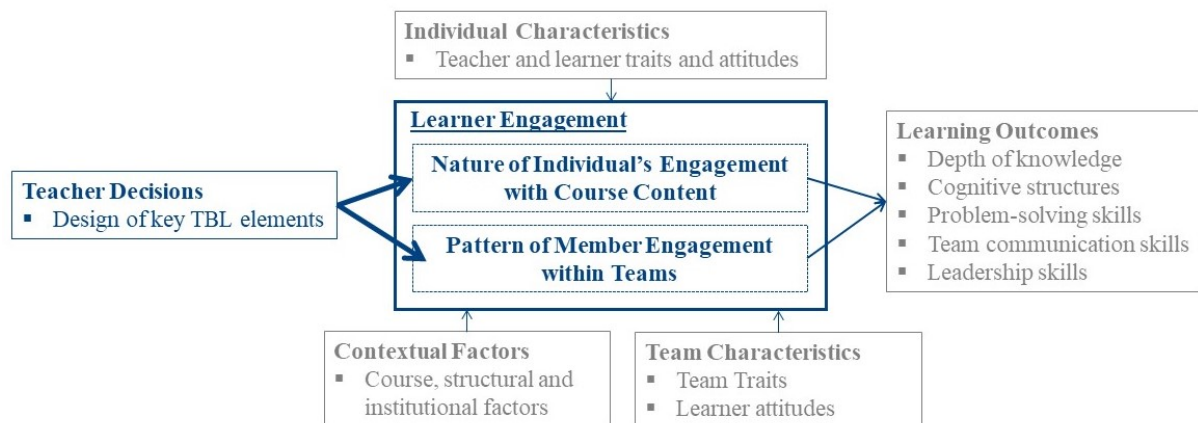


Figure 1. Conceptual framework for the design of synchronous online TBL.

Orientation

A comprehensive learner orientation is essential to the success of TBL. Teams need to be formed by faculty, and learners need to be familiarised with the rationale for and approach to TBL, and to develop a social presence in the programme through forming interpersonal relationships with peers (Clark et al., 2018). Hence, faculty assigned Year One BPharm(Hons) students into teams of four to five, which is largely consistent with the optimal team size recommended in the literature (Gullo et al., 2015). To ensure balance and diversity within teams, the following criteria were considered in team assignments: 1) gender, 2) prior academic qualification and institution, and 3) prior coursework in biology. These teams are intended to be permanent across all four years of the BPharm(Hons) curriculum to allow time for team bonding (Parmelee et al., 2012).

Our LC designed and conducted a four-hour online TBL orientation workshop in first week of the academic year (AY) to explain TBL, present evidence supporting this pedagogical approach, describe how TBL would be adopted in the curriculum, allow team members to interact with each other virtually through Zoom breakout rooms and to get to know each other by completing a team charter (see [Appendix](#) for a sample). Faculty members teaching in the BPharm(Hons) programme served as facilitators during the workshop; they engaged students and facilitated conversations in the Zoom breakout rooms. This intentional effort to develop interpersonal relationships among team members is essential for TBL, and particularly important in the Asian context where students traditionally have been described as being passive learners who participated less during class discussions (Loh & Teo, 2017). Additionally, mock online TBL sessions were also conducted in an identical format to what students were expected to experience during the curriculum, and were intended to familiarise students with the phases of TBL and the various technology platforms to be used (Clark et al., 2018).

RATs

Each RAT consisted of 10 open-book application-based multiple-choice questions (MCQs), which students first completed individually (iRAT) and then as a team (tRAT). The choice of open versus closed-book RATs was carefully deliberated. Many Asian students, including those in Singapore, focus predominately on grades and may resort to rote learning in pursuing academic excellence (Loh & Teo, 2017). Members of the LC believed that open-book RATs shift the focus away from recall of facts to application of concepts, which align with the rationale for adopting TBL in the BPharm(Hons) programme. Zoom breakout rooms and the University's learning management system (i.e. LumiNUS) were used to administer RATs and to allow for team discussions online.

Application exercises

The LC adopted the “4S” Framework (i.e. Significant Problem, Same Problem, Specific Choice, Simultaneous Reporting) in designing application exercises that engage and challenge students to apply their knowledge in various scenarios relevant to pharmacy practice (Gullo et al., 2015). These scenarios were co-developed by biomedical or pharmaceutical scientists and pharmacy practitioners in Singapore to promote interdisciplinary thinking (Harden, 2000) and ensure relevance to the Singapore healthcare context. Zoom breakout rooms and LumiNUS were again used to allow for online team discussions and submission of application exercises, respectively.

Peer evaluation

Peer evaluation is essential in TBL by recognising individual contributions and providing feedback for students to monitor and adjust their own behaviours in team interactions (Michaelsen et al., 2002). The LC elected to adopt anonymous formative peer evaluation once per semester to support team building, since previous literature suggested anonymity and formative peer evaluation without implications on students’ grades facilitated students in providing honest feedback (Basheti et al., 2010; Wu et al., 2012).

Peer evaluation was facilitated through the use of technology (Clark et al., 2018). Four questions were administered through TEAMMATES^{®1} where students evaluated their own and their team members’ contributions and commented on overall team dynamics:

1. Your estimate of how much each team member has contributed.
2. Comments about your contribution.
3. Your comments about this team member
4. Comments about team dynamics.

Although students were blinded to the identity of team members that the feedback came from, faculty was privy to such information to maintain oversight and ensure accountability.

REFLECTION OF EXPERIENCES WITH SYNCHRONOUS ONLINE TBL

An “on and off” approach is needed for orientation to TBL and to support team bonding

The importance of orientation to prepare students for TBL and to allow them to build rapport within their respective teams are paramount to the success of TBL (Clark et al., 2018). Our TBL orientation was conducted as a four-hour online workshop which we felt served its intended objectives of explaining the rationale of TBL, describing how TBL will be adopted in the curriculum, and introducing the team structure. The team charter activity (see [Appendix](#)) was selected for the workshop based on evidence demonstrating that the use of a team charter improved team performance, communication, and coordination among team members (Aaron et al., 2014; Johnson et al., 2021). While much of this evidence was initially derived from business students, the team charter activity had also been used successfully in health professional curricula that adopts the TBL pedagogy (Dougherty et al., 2018). We felt that this structured activity provided a framework to help Year One students—who were meeting each other virtually for the first time—initiate and direct conversations. An online format also allowed us to fulfil the objectives of the orientation safely and efficiently, given the class size (approximately 160 students) and prevailing safe management requirements in August 2020.

While students interacted with their team members in the breakout rooms and we observed meaningful discussions during the team charter activity, we felt that these online activities alone were not adequate for optimal team bonding. In a few instances of Semester 1 of AY2020/21, we observed students in silence in the breakout rooms after completing the team's assigned task had been completed. Indeed, other educators had also described challenges in forming connections with peers online which were highlighted by the COVID-19 pandemic and the subsequent move to online teaching and learning (Bettinger et al., 2016; Waranyuwat, 2020). Examples of these challenges include the perceived lack of human connection through virtual interactions, and the absence of non-verbal communication cues, which could only be partially mitigated with webcams (Waranyuwat, 2020). These challenges were also evident in our experience. From the first peer evaluation completed in December 2020, we noticed that optimally functioning teams—with positive comments on team dynamics—were teams where members created an online community and invested time to interact with one another F2F outside of class. We felt that the human connections developed through such interactions built a rapport among team members that allowed them to work together more effectively online as we observed more lively team discussions in the breakout rooms for these particular groups, especially when more social activities were possible in the second semester of AY2020/21.

Hence, we would advocate for a combined “on and off” approach to orient students to TBL and to support team bonding. An online platform is safe, efficient, and effective to introduce this pedagogy and support initial communications between students, particularly for large classes. However, students must be supported to develop stronger rapport with their team members both online and offline. Optimally performing teams in AY2020/21 suggested group chats that allowed team members to ask and respond to each other's questions, group lunches after F2F classes, or weekly study sessions to discuss challenging concepts either F2F or via other online platforms. While these appeared to be simple strategies that could be easily implemented, these might not be apparent to students who are new to the TBL pedagogy, and it is our role as educators to highlight the importance and suggest practical ways to support team bonding. In AY2021/22, we plan to do so by giving our Year Two students a voice during our TBL orientation to share these practical tips and advice with their juniors.

Design activities specifically suited for online teaching and learning

While the literature supporting TBL is largely based on F2F sessions (Reimschisel et al., 2017), educators implementing synchronous online TBL should consider unique challenges in online teaching and learning, and not simply seek to reproduce the same F2F experience online. We would like to highlight two adjustments made in the implementation of our synchronous online TBL sessions.

Firstly, RATs are intended to be assessments for learning, and these are often administered as closed-book quizzes to ensure that students have acquired basic knowledge from the pre-class preparatory materials (Clark et al., 2018; Ofstad & Brunner, 2013). However, closed-book quizzes are challenging to administer and enforce virtually. Additionally, considering the potential for increased student stress with the preparation and accountability necessary in TBL, particularly in the context of the widely-reported adverse consequences of the pandemic on students' mental and emotional well-being (Son et al., 2020; Yang et al., 2021; Voltmer et al., 2021), we opted for open-book RATs in our synchronous online TBL, consisting of application-based MCQs. The design of MCQs was informed by best practices in designing open-book online assessments to focus on application, evaluation, and critical analysis (Er et al., 2020). When we initially used recall-type questions to assess fundamental concepts, we noticed that students were able to easily retrieve answers from references during the iRAT and to point their peers to those answers during the tRAT, thus resulting in little meaningful team discussion. Although application-based MCQs were undoubtedly more challenging for students, we felt they were necessary to ensure that students were adequately challenged on the iRAT and subsequently engaged in a richer discussion and debate around their peers' understanding of concepts.

Secondly, health professional curricula often incorporated case-based learning in the application phase to challenge students to apply their knowledge in patient-specific scenarios (Thistlethwaite et al., 2012; Reimschisel et al., 2017). In the context of pharmacy education, these patients might present with escalating or deteriorating clinical conditions, requiring students to first recommend certain therapeutic options, and then adjust their recommendations as additional information was made available. We found such case scenarios logistically challenging to implement through an online platform as time was often wasted on transitions into and out of the breakout rooms, which felt disruptive to students' and facilitators' thought processes and increased the risk of technical glitches. We circumvented this issue by using the quiz function in LumiNUS which did not allow students to return to previous questions as new information was presented to them later in the case. The application phase was much smoother when teams were able to complete all their discussions in breakout rooms before facilitators reconvene the entire class for discussion and debrief.

Establish avenues for frequent feedback from faculty and students

Since TBL was a new pedagogy for teachers and students alike, obtaining frequent feedback and making minor adjustments were key to our successful implementation of synchronous online TBL. In AY2020/21, the LC provided a platform for faculty to share experiences in facilitating online TBL. We felt that these early experiences were critical in allowing faculty to learn from prior experiences and paved the way for continuous quality improvement. For example, sharing within the LC made it evident that online activities often take longer than similar activities conducted F2F, and the two-hour timeslot allocated for each TBL session was inadequate for a comprehensive class discussion during the application phase. Hence, the Year One BPharm(Hons) team acted swiftly to extend all TBL sessions to three hours in Semester Two.

Like many educators around the world, we also found that it was more challenging to assess students' experiences, responses, and feedback in an online environment (Tanase & Hammack, 2021, p. 23), particularly in how well teams were functioning. While peer evaluation is a critical component of TBL, it may not occur at a frequency that allows faculty to monitor team dynamics in a timely fashion. Secondly, the literature suggests that students tend toward leniency with peers even in anonymous peer evaluation (Wagner et al., 2011). In our experience, peer evaluation was conducted at the end of each semester, and we observed neutral or even positive responses from teams where team members had stepped forward to report less optimal team dynamics. Therefore, educators must seek to engage students during team discussions in the breakout rooms to truly feel and understand how the teams are functioning, and to establish avenues for frequent dialogues with students to understand their experiences and perspectives. In our experiences, these avenues included informal conversations with students after team discussions, and regular dialogues with class leaders or other student representatives. We felt that the qualitative feedback received through such conversations were often more informative in guiding quality improvement efforts compared to formal or quantitative measurements (e.g. surveys or module evaluation).

CONCLUSION

We described our LC's evidence-based approach in designing synchronous online TBL and our experiences with implementation in AY2020/21. We also reflected on our lessons learned through these experiences, particularly highlighting how synchronous online TBL might require additional considerations as compared to F2F sessions. As the COVID-19 pandemic irreversibly accelerated digital transformation in higher education, we believe that our experiences, reflection, and suggestions are valuable to educators in all disciplines seeking to engage students in TBL or similar student-centric pedagogical approaches through online platforms.

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ENDNOTE

1. TEAMMATES® is a platform designed by a team of teachers and students at the NUS School of Computing to facilitate peer feedback and peer evaluation. Details about this platform can be found on the [TEAMMATES® website](#).

APPENDIX. [SAMPLE OF A TEAM CHARTER](#)

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