Evaluating the implementation of an active learning platform in a team-based learning postgraduate Medical Program

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"Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing" (Prince, 2004). Basing his definition on foundational work done by Bonwell and Eison (Bonwell, 2000 and Eison, 2010), this definition of active learning has been widely accepted. In the first decade of the 21st century, notwithstanding educational technological tools were not as ubiquitous as it is now, strategies for active learning have already been developed to help direct teachers to better plan their lesson to incorporate such style of learning. The advancement of technology vis-à-vis the proliferation of student response applications have revolutionized the way such learning is captured in the classroom.

This paper presents a context of a Medical School in the Faculty of Health, Medical Sciences (FHMS) of the University of Western Australia (UWA) undergoing changes to its cased-based learning (CBL) curriculum to a more time-efficient Team-based (TBL) one. At about the same time, there was an institution-wide implementation of an active learning platform in the institution. Juxtaposing the two elements led to this preliminary study of capturing student's active learning in a Team-based context using the Analytic Dashboard from the active learning platform. Student engagement scores captured in the dashboard were very positive and the use of Eric Mazur Concept Testing Model helped achieve the active learning goals of the TBL sessions. Moving forward, future iterations of team-based learning sessions with the active learning platform could be deployed in other schools within FHMS that have case-based studies (CBL) in their curriculum and compared them to the TBL practice in Medical School.

Keywords: active learning, team-based learning, student engagement, student engagement scores.

Introduction

Team-based learning (TBL) is a strategy for small group learning in a large group context. Originating in business education (Michaelsen, Knight & Fink, 2002), the TBL approach has been gaining ground in medical education over the last decade (Parmelee, Michaelsen, Cooke & Hudes, 2012). From a teaching and learning perspective, TBL is a student-centred active learning model that encourages collaborative group learning by collectively applying knowledge to solve problems.

Case-based learning (CBL), on the other hand, is an approach that engages students in discussion of specific scenarios that resemble real-world problems. This method is also learner-centered with students participating in group discussion to build knowledge and work collaboratively to reason through the case. CBL in the small group setting encourages development of a broader set of competencies and in the medical student context, competency involves demonstration of additional skills expected of a doctor, including teamwork, leadership, professional behaviour and adult learning (Govaerts, 2008).

In short, whilst TBL and CBL operate in small groups, the learning outcomes differ in how learning is measured – the former counts team work, collaboration, peer and group review as part of its outcomes and the latter measures competencies and skills that would help the students in their future work place.

Background and context

In the context of UWA Medical School, a shift to a biomedical science focus in the early years of our Medical program led to a lean curriculum that focuses on the diagnostic and management aspects of the program's core conditions and presentations. Additionally, a rationalisation of program resourcing led to the decision to deliver CBL content in a more efficient TBL format that was new to both staff and students. Hence, a blend of CBL and

TBL approach is attractive from a resourcing perspective, as it permits higher student-to-teacher ratios of approximately 120:1. The institution's challenge was to maintain the broad competencies, previously achieved via CBL, in the TBL context.

Additionally, the format of delivering CBL content in a TBL format was facilitated by the institution's recent acquisition of key physical and technological resources. At about the time when the new TBL format was introduced in the Medical School, UWA was promoting a new Echo360 active learning platform (ALP), designed to go beyond passive lecture captures and encourage active engagement of students. The Medical School has also recently invested in building several e-learning suites with each suite accommodating 15 tables and two large 40-inch LED screens at each table (Figure 1). 8 students could be assigned to each table as their BYOD could be connected wirelessly to the LED TV screens. The design of the e-learning suite encourages collaborative study, enabling students to 'huddle together' in groups whilst discussing the cases presented, as well as engaging with activities in the ALP shown on the LED screens. The ALP employs a number of active learning tools, including real-time polling in which results are shown immediately to stimulate further discussion, 'live' Q&A to further facilitate inter-group discussions, and other functionality that promote formative and summative assessment. Two repeated TBL classes were scheduled back-to-back in a 2-hour 120-students class, optimising the use of teaching staff time.
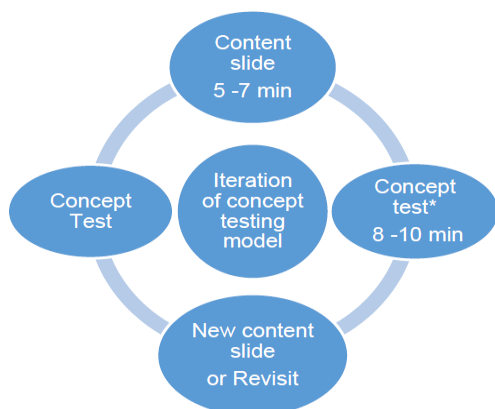

Figure 1: Medical School e-learning suite

In light of the CBL/TBL challenges faced by the Medical School and the preliminary solution of implementing an active learning approach with a technology-enhanced platform to the new format TBL sessions, this paper aims to evaluate the effectiveness of this new approach in three areas:

☐ Student engagement with the active learning tools
☐ Staff delivery of the TBL following a pedagogic Active Learning approach
☐ Sustainable ALP features to check active learning in a TBL setting

Methodology

A mixed-method approach was used in this preliminary study to analyse the statistical data collected from 11 TBL sessions using the Echo360 Analytics Dashboard and the qualitative feedback written by the students towards the end of every TBL session. The analytics provided insights to student engagement with the TBL session and their interaction with the activity slides inserted by the teaching staff.

The capabilities of the ALP together with Eric Mazur's Peer Instruction Manual (1997) enabled the researches to customise a model of a quality Active Learning approach in TBL. A modified version of Mazur's Concept Testing that the current study employs is set out in Figure 2 below. Triangulating the data obtained in ALP by analysing student's end-of-TBL session feedback with the Echo360 Data Analytics Metrics determine, preliminarily, the effectiveness of implementing a technology-enhance platform to the TBL format in UWA Medical School. Additionally, moving forward, the data would help formulate a working framework/template that would inform future implementation of similar CBL using a TBL format with an active learning approach and technology-enhanced tools in other schools within FHMS.

Concept test approach:

1. Question posed – 1 min
2. Students given time to think – 1 min
3. Students poll group response
4. Students given time to discuss and convince group members – 5 min
5. Feedback from teacher – 2 min

Figure 2 - Modified Version of Eric Mazur's Concept Testing Model for UWA Medical School TBL

Discussion of Findings

In this section of the paper, we will discuss the statistical analytics generated by Echo360 ALP (Table 1) and qualitative feedback from the students towards the end of every TBL(Table 2) to evaluate the effectiveness of this study in three areas:

☐ Student engagement with active learning tools
☐ Staff delivery of the TBL following a pedagogic Active Learning approach
☐ Sustainable framework/template for future active learning implementation in a TBL setting

Table 1: Student Engagement analysed in 11 TBL sessions with Echo360 Analytics Dashboard

TBL Session	Total Engagement	Video Views	Slide Deck Views	Polling Responses	Note Events	Q&A Events	Confusion Flags
10	1184	0	240	792	152	0	0
1	1138	0	297	723	103	1	14
11	959	0	236	652	71	0	0
6	906	0	217	593	93	1	2
8	855	0	227	537	88	0	3
5	816	0	191	504	121	0	0
3	598	0	212	223	162	0	1
7	568	0	289	256	21	1	1
2	535	0	256	113	165	0	1
9	317	0	220	54	41	2	0
4	97	0	83	14	0	0	0

Student engagement with active learning tools

Students welcomed the opportunity to use the technology to drive their learning as recorded in both the positive qualitative feedback obtained at the end of each class and the total engagement statistics obtained from Echo360 Analytics. The metrics of total student engagement is a cumulative total score of all of the "countable" data points. These data points include: Video Views, Slide Deck Views, Polling Responses, Q&A Entries, Note Events, and Confusion markers (Echo360 Resource Center). An analysis of the engagement metrics showed that in Semester 1 across UWA, TBL in our unit for Medical students had the highest student engagement scores (1184 in Table 1 – TBL Session 1) of any unit across the University. 82% of the TBL sessions (9 out of 11) had engagement ratings of 500 or more.

A cross reference to the qualitative feedback given by the students in Table 2 showed the enthusiastic response of the students counting interactive nature of the TBLs, critical thinking, CBLs, group discussions, team quizzes as the most prized aspects of their learning. One telling remark mentioned in TBL Session 7 that the student/s appreciated being asked if 'they were learning well rather than if they understood the content'. This echoed

Chonkar et al. (2018) conclusion that the majority of medical students in a Singapore context predominantly utilised the deep and strategic learning approach and as in our context, they wanted their academics to be concerned about this aspect of their learning approach rather than being shepherded through the 'technical mumbo jumbo'.

Table 2: Qualitative Feedback obtained through Echo360 Short Answer Polling Question

TBL Sessions	Qualitative Feedback	
	Most effective aspects	Most ineffective aspects
1	Interactive; interesting; engaged (justifying answer promotes quality/critical thinking; Cases; clinical scenarios; Collaboration (19 responses)	Overall, the positive comments from the previous question spilled over to this part of the feedback. (22 responses)
2	Useful when interactive; discussion bits that got us to do active learning; appreciated the tool and screening method taught (9 responses)	Went a little too long and draggy; too much teaching that could have been covered in pre-TBL; not much discussion and interactivity; everything that wasn't active or when lecturer was talking; mic issues (8 responses)
3	ECG following a CBL and clinical reasoning was fun; hands on session with questions embedded to get students to think critically (8 responses)	Different version of slides was confusing; too much going on at too hurried a pace; too rush given the 2-hour TBL and so much content to cover and no time to digest; very challenging to start off with an irregular ECG → suggestion to start with a 'normal' one (5 responses)
4	NIL	NIL
5	Discussion questions with recommended links were helpful; (1 response)	Students were leaving and not staying on to give feedback; (1response)
6	CBL; good videos and interactive questions on slides; explaining the responses from class was helpful as groups were given different sets of questions (8 responses)	A lot of content is covered; not enough time given for group discussion; not enough vMDs; (4 responses)
7	Team quiz in kahoots!; kahoot with Echo360; worksheet format was effective and competitive (we're competitive) element embedded within TBL; being asked about the learning that takes place rather than being asked if content is understood!; (72 responses)	Therapeutic guidelines not updated wrt strontium ranelate; first hour was slow; waste of paper (re: worksheet); engagement was lacking; have some of the slides earlier before the TBL and hide answers; don't hide slides as it was difficult to follow as students' computers were off; don't know how to complete the GP chronic patient assignment; too much explanation on how to do wards; (21 responses)
8	NIL	NIL
9	4 cases presented and related diagnoses; role plays; interactive; kahoots! And TB quiz; ranking activity; best TBL session so far (25 responses)	Not enough time for 4 cases; more difficult and challenging questions should be posed; don't like role play activity; Constantly being given XRs and other imaging to review and diagnose every week with zero teaching is completely unreasonable and pretty distressing to be honest. This NEEDS to be taught to us. We need a method of going through scans and not just having them thrown at us with the next slide saying 'what is the diagnosis' (as per this week..). I would like to stress we have not had ONE teaching session on imaging... Would make a very good TBL. (13 responses)
10	NIL	NIL
11	Kahoots and CBL; clinical reasoning; (4 responses)	Liam's video/slides was interesting but pace could be faster and more engaging (the presenter?); sepsis quiz too challenging; too much time for discussion and then boredom sets in; technical mumbo jumbo; (8 responses)

Staff delivery of the TBL following a pedagogic Active Learning approach

Delivery of the TBL took a total of eight hours of staff time, compared to 40 hours in the small group CBL curriculum. This allowed academic time to be invested in developing authentic clinical cases, quality student activities, and the inclusion of locally generated evidence-based guidelines. The large group element of the format allowed short pre-recorded audio or video by content experts to precede and inform subsequent learning activities.

Additionally, the teaching staff were briefed on the use of the Echo360 ALP by the Educational Enhancement Unit team of Learning Designers and Educational Technologist. What ensued was a modified version of following Mazur's Concept Testing model (Figure 2) for the active learning approach adopted together with the new ALP.

An analysis of the data in Table 1 showed that TBL sessions 1 and 10 had the highest engagement scores of 1138 and 1184 respectively. One look at the lessons showed that TBL 1 had 86 PPT slides and 17 Activity slides (which are either MCQ, Short Answer, Image Quiz or Ordering types of questions) spread across the lesson at an average of 1 interactive slide (which is the Concept Testing Stage in Figure 2) per 5 content/teaching PPT slides. This session garnered 723 polling responses in total and very positive feedback (Table 2) with key words like

'interactive', 'engaged', 'interesting', 'collaboration' repeatedly mentioned in the student's feedback. Likewise, TBL10 had 70 PPT slides and 16 Activity slides, making it an average of 1 Activity slide inserted between 4.5 teaching/content slides.

Overall, we do believe that there is a strong correlation between applying Mazur's concept testing model in a TBL and the strong engagement scores.

Sustainable ALP features to check active learning in a TBL setting

As the ALP is relatively new to the institution, there were many engagement functionalities like Q&A events and Confusion Flags that were not fully exploited. In Table 1, the Q&A events and Confusion Flags had the lowest engagement scores. The use of Q&A events are like discussion board that happen in real time and takes the preparatory load off the teaching staff in preparing activity slides, hence the reason why it is termed sustainable. Judging from some of the comments given in Table 2, this feature could take the place when students found that there was too much didactic delivery of lecture content.

Confusion Flags are flag buttons for students to click on to flag their confusion at any stage of the lesson. Teaching staff would be alerted with a notification number representing the count of any students who have marked that location or slide in the classroom as confusing. If checked during class, this information can provide vital feedback on whether students have struggled to understand any part of the session, and offers the opportunity to address it immediately, after class or addressing the confusion in the next class.

Conclusion and Recommendations

Overall, marrying an active learning approach with technology-enhanced platform for the new format TBL sessions have positively enhanced student engagement in active learning. Notably, the teaching staff have saved copious amount of time when the CBL curriculum was embedded into the new TBL format, freeing up time for them to develop not only authentic clinical cases but pedagogically sound quality active learning activities.

As the ALP is relatively new to the institution, there were many functionalities in the system that were not capitalised. However, due to the positive feedback from both teaching staff and students, the future iterations of the TBL sessions would look into such features like 'live' Q&A discussion forums, Confusion Flags etc. in order to capture real-time feedback with a particular focus on the learning and teaching implications of using such features in measuring active learning.

Notably, as this is using CBL content in a TBL format, one of the interesting future research to undertake would be to compare the difference in student learning outcomes between the CBL and TBL approaches and to ascertain which approach facilitate the students to achieve better learning outcomes.

References

Bonwell, C.C. & Eisen, J.A. (1991). Active Learning: Creating Excitement in the Classroom. School of Education and Human Development, George Washington University: Washington DC.

Echo360 Resource Center (n.d.). Definitions of Analytics Data Metrics. Retrieved from https://support.echo360.com/customer/portal/articles/2971137-analytics-metrics-definitions?b_id=16610

Chonkar, S. P. (2018). The predominant learning approaches of medical students. *BMC Medical Education,* Vol. 19:106

Govaerts, M. J. B. (2008). Educational competencies or education for professional competence? *Medical Education*, 42, 234–236.

Mazur E. (1997). Peer Instruction: A user manual. New Jersey: Prentice Hall

Michaelsen, L.K., A.B. Knight and L.D. Fink. (2002). *Team-Based Learning: A Transformative Use of Small Groups in College Teaching*. New York: Greenwood Publishing Group.

Michaelsen, L. K., & Sweet, M. (2008). The essential elements of team-based learning. *New Direction for Teaching and Learning*, 116, 7–27.

Parmelee D., Michaelsen L.K., Cook S., Hudes P.D. (2012). Team-based learning: A practical guide: AMEE guide no. 65. *Medical Teacher*, Vol. 34, No. 5, pp 275–287.

Prince, M. (2004). Does Active Learning Work? A Review of the Research. Journal of engineering education, 93(3), 223-231.

Wilcox, H. and Lee, I. (2019). *Evaluating the implementation of an active learning platform in a team-based learning postgraduate Medical Program.* Paper presented at ASCILITE 2019: Personalised Learning. Diverse Goals. One Heart, Singapore, 2 - 5 Dec 2019.