Team Based Learning

An Introduction

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Context

Abstract of Workshop

Team Based Learning (TBL) offers the potential to transform group work into something that: builds high performing teams; creates meaningful learning partnerships between students; and holds students accountable to their peers. The promise of TBL is that flipped teaching will work and peer learning will become a reality not just an aspiration. TBL offers a scaleable way to increase engagement while delivering higher level learning outcomes – a triple win. Is TBL too good to be true?

In this workshop you will answer this question by experiencing TBL for yourself.

Pre reading will be provided and you will be assigned to diverse teams. You will then experience the student journey through a typical TBL session, including an individual test, and team test. If time permits there will be a short application activity during which you will assess to what extent TBL could be applied to your teaching.

The author was introduced to TBL in 2017 and it has since transformed his teaching in cohorts of 80-100 students. Along the way, many lessons have been learnt about what works best in an engineering context. Some of the empirical data will be provided as part of this workshop.

This session is suitable for those with no experience of TBL, but it is designed to be of value to those who have experienced TBL or related approaches like problem based learning or flipping.

Intended Learning Outcomes

- Define Team Based Learning (TBL)
- Describe some empirical evidence for the efficacy of TBL.
- Assess the suitability of TBL for your own context.

Your Notes:

Intended Learning Outcomes for this pre reading

- Define Team Based Learning (TBL)
- List and sequence the events in a TBL unit
- Describe the form and function of an application activity
- Identify the characteristics of a course that define its suitability for TBL.

These outcomes will be TESTED at the start of the workshop!

Your Notes:

What is Team Based Learning?

According to the Team Based Learning Collaborative[1], Team Based Learning (TBL) is:

*"an evidence based collaborative learning teaching strategy designed around units of instruction, known as **modules …** [these] are taught in a three-step cycle: preparation, in-class readiness assurance testing, and application-focused exercise. "*

[1] http://www.teambasedlearning.org/

Your Notes:

What does this mean in practice?

A team based learning course is divided into modules, each a significant part of the course, and each 6-10 hours of class time (typically 5-7 units for a semester long course). The structure of each module is arranged using the 'castle-top' arrangement of active learning (fig 1) and using a flipped approach, with individual study done out of class and team application done in class.

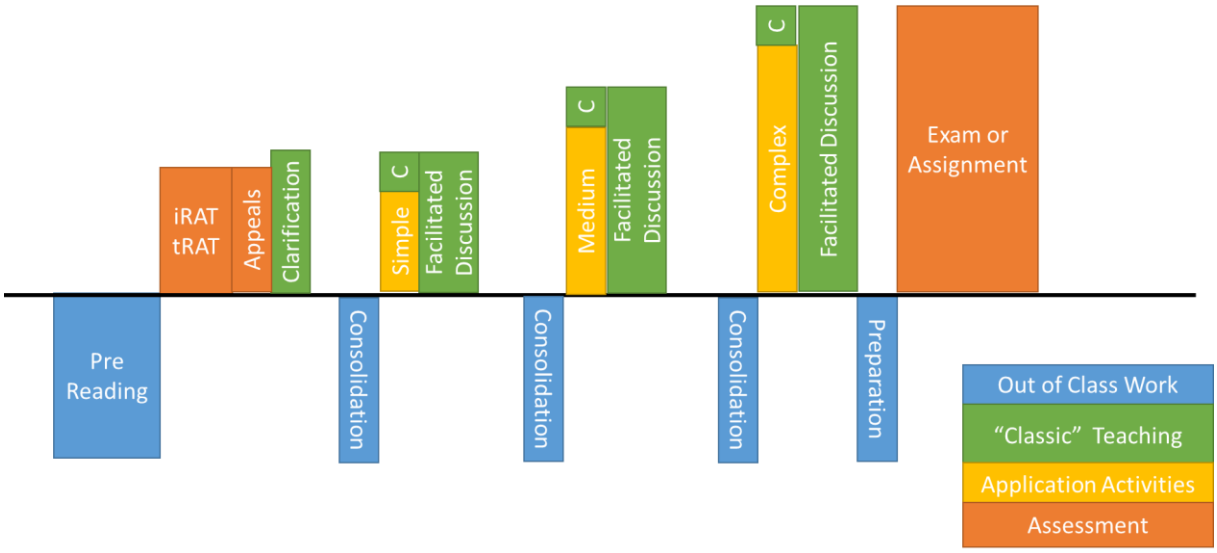

Figure 1: A Team Based Learning instantiation of the 'castle top' approach to Active Learning: adapted from basic castle top approach defined in (Fink 2013). C = Clarification.

Your Notes:

Readiness Assurance Process (RAP)

The pre reading, iRAT, tRAT, appeals and clarification (5 elements) comprise the Readiness Assurance Process (RAP). The RAP does not have to cover all the details of the unit content, it is there to ensure that a 'coding scheme' (in the Bruner[2] sense, see Sibley et al 2014) is firmly in place.

Pre Reading

Each module starts with out of class work by individual students. The pre reading can be a chapter of a book, academic papers, video clips, on line tests, games or a combination of the above and other self study options.

iRAT/tRAT

The first in-class activity in the module is a 10-20 multiple-choice question test known as the Individual Readiness Assurance Test (iRAT). The team then retake the SAME test; this is the Team Readiness Assurance Test (tRAT).

Appeals

Teams are allowed to appeal questions they got wrong, either because the question was ambiguous or because they feel their answer was permissible. But they need to make a written case for this which is considered out of class. Making an appeal requires a team to engage more deeply with the material, and successful appeals reward only those teams that made the appeal.

Clarification

the tRAT acts as a diagnostic to identify problems that remain problematic for the class – these can be addressed in a short, highly targeted, mini lecture.

[2] https://www.simplypsychology.org/bruner.html ; *"Bruner (1961) proposes that learners' construct their own knowledge and do this by organizing and categorizing information using a coding system. Bruner believed that the most effective way to develop a coding system is to discover it rather than being told it by the teacher. The concept of discovery learning implies that students construct their own knowledge for themselves (also known as a constructivist approach)."*

Your Notes:

Application Activities

There follows a series of application activities. Typically application activities would build: earlier ones could be as short as 5 minute discussions; later ones could be more complex, involved exercises (up to 30 minutes). The 4S framework is used to structure application activities:

- **Significant** : Problems should require the whole team to solve; this stops 'free loading' or the converse, a dominant team member being able to complete the activity on their own.

- **Same**: All teams should work on the same problem; this ensures teams are interested in what other teams are doing.

- **Specific** Choice: Teams should make a decision (often on competing options) rather than creating a complex output like a report, diagram or a poster. This means team outputs can be easily compared and challenged.

- **Simultaneous** Report: Teams reveal their choices/decisions at the same time; this means teams must commit publicly to an answer which they have to defend.

Depending on timetabling, application activities may be delivered immediately after the RAP or at the next timetabled slot – but they are always in class. There is an opportunity to provide short clarifications at strategic points during these application activities, and there is always a facilitated discussion afterwards. This allows teams to challenge each other, to learn from each other, and provides instant feedback on the teams' performance. If the module spans multiple timetable slots (it usually does) there will be time for individual reflection, consolidation and preparation (out of class) between application activities.

Your Notes:

Application activities are phrased as decisions of varying, but always non trivial, complexity:

- What is the most significant of these risks?
- Which material is the best choice for this design?
- In which location should I build my factory?
- Given this ECG, what is the most likely diagnosis?
- Which storage technology is the best suited for this microgrid?

Assessment

The application activities should prepare students for the summative assessment; depending on the nature of the course, this could be a substantial team project, an individual assignment, an end of semester exam or some combination of these and other assessments. Summative assessment can be per unit or more holistic over the entire course.

The key is that the application activities and assessments should be linked in some way. For example, assessments might include a presentation of the reasoning behind a team decision, or a similar decision in another context, or an activity that builds on the skills developed in the application activities.

In TBL, the iRAT and tRATs are usually summative, application activities are usually formative.

Peer Assessment

Summative peer assessment is an essential part of TBL. Normally there will be at least one formative round of peer assessment (and the provision of constructive peer feedback) in a course; often once each module.

Your Notes:

The Importance of Teams

Teams should be large, diverse and permanent

In Team Based Learning, teams are:

1. Assigned by the instructor: experience suggests that self-selected teams will be prone to cliques, group think, free loading and other undesirable characteristics.

2. Assigned in order to evenly distribute **assets**. Assets include subject knowledge (previous courses taken) but could also include work experience, technical ability (eg coding) or cultural background (for example, if your course deals with the global automotive industry then having 'local knowledge' of the Chinese market will be an advantage).

3. Assigned at the start of the course and last the whole course (no rejigging of teams each module). Research (Sibley et al 2014) suggests that teams take between 20-30 hours working together on meaningful activity to reach the 'norming' stage (Tuckman and Jensen 1977)

4. Large (5-7 students) to allow for the mix of assets required to tackle complex, meaningful, challenging tasks.

Your Notes:

Students are accountable to their teams

Students are held accountable for preparing for class, for attending class, and for participating in class. Primarily they are accountable to their team (rather than to the instructor); this is more scaleable, more enforceable, and builds learner autonomy. There are four elements of TBL that promote accountability (Michaelson et al 2004)

1. The RAP promotes accountability for coming to class prepared. The iRAT is (usually) summatively assessed and this is the obvious mechanism; however there is also social pressure during the tRAT.

2. Team accountability is promoted through working together on the tRAT and application activities throughout the semester. This accountability is given 'teeth' through the (usually summative) peer assessment

3. 4S application activities ensure that a team is held accountable through a public revelation of their decisions.

4. Teams and individuals are given frequent and immediate feedback; this enables teams and individuals to rapidly make the changes required to improve.

Your Notes:

Does TBL Work?

TBL is a powerful way of peer learning. Students come to class prepared and then spend the bulk of class time engaged in activities that help them learn how to use course content to solve problems. TBL has been implemented in every discipline and has been used effectively in classes as large as 350.

There is robust evidence for the efficacy of Team Based Learning. I have recently gathered my own evidence from an MSc cohort of 79 students studying Project Management (semester 1 2018-19; MSc in Innovation and Technology Management and MSc in Engineering Business Management).

Figure 2 shows the result of the ten averaged RAP tests. To my surprise, **every single** student got a better team mark over the semester than their individual mark, with the median improvement being 21% (and the lowest 2%). In fact only 1 student even managed to equal the performance of the lowest team score (which was obviously not their team!). This illustrates the relative advantage of working with a team.

In fact this type of result is common in the literature; according to Sibley et al (2014; chapter 3), only 1 student in 4 years (500 students in all) ever outperformed the lowest performing team in their class, and no student ever outperformed their team, with the lowest improvement being 6% (and the average 14%).

Your Notes:

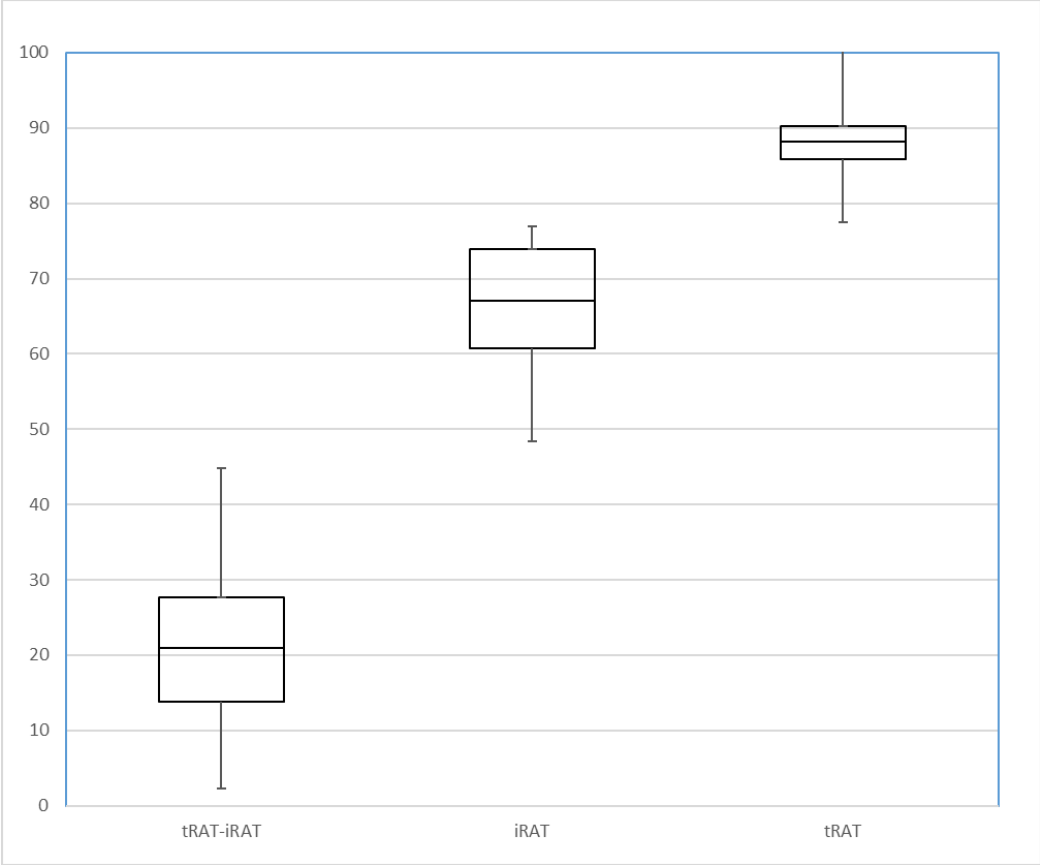

Figure 2: Performance of team based learning. The boxes show the 1st to 3rd quartile with the median indicated. The bars (whiskers) show the maximum and minimum values. The left hand box shows the average increase in score with all being positive and the median at 21%. The second two boxes show the average individual and team scores with the best individual (88%) only just reaching the level of the worst team (also 88%).

Your Notes:

Educational outputs have been also shown to improve, for example Persky (2012) shows that examination scores are improved by TBL. He also found that TBL increased student professionalism, offered opportunities for development of verbal communication skills and developed skills for working with diverse populations. This speaks to the arguably more important, though harder to measure, effect of the application activities.

This is indicated by some of the student comments from the unit evaluations:

"Team Based Learning is something new for me which apparently worked very well. I like the assessment of this unit which is devided" (sic) "into many parts, which let me reinforce the knowledge from different angles. I like the process of evaluating other groups' work. I can not only see what they have got, but their way of thinking as well"

"Having experienced many teamwork projects before this offers a new experience one that I found valuable."

"The activity method is a great way to apply all the material taught and shared and to ensure the fact that we understand the content and its usage in real life. Also, the choice of doing it with a group helped me individually to come out of my comfort zone and improve personally and professionally. I have learned a lot from working with different cultures and the feedback that is part of the course target that very well"

Your Notes:

What makes a course suitable for TBL?

"Instructors must have a clear answer to the question: 'What do I want students to be able to do when they have finished the course?'. Otherwise I would strongly recommend against using team-based learning."
Larry Michaelson, the creator of TBL (Michaelson et al 2004):

TBL approaches learning outcomes differently to the traditional (and perhaps, nowadays, apocryphal) way of expressing learning outcomes in terms simply of content memorized. To be slightly more expansive, TBL course outcomes are expressed in terms of **cognition** (what do they know), **ability** (what can they do) and **attitude** (how will they behave). For example, a student might understand quantitative approaches to risk estimation (knowledge), apply these methods to decision making (ability), and work with a diverse team to holistically evaluate risk in a complex scenario (behaviour).

These wider outcomes are often sought after by industry, and specifically encouraged by accreditation bodies. For example the Engineering Council in its Accreditation of Higher Education Programmes (AHEP)[3] requires graduates to *"apply problem-solving skills, technical knowledge and understanding to create or adapt design solutions"* and have an *"ability to work as a member of an engineering team."* These requirements fit very closely to TBL principles and outcomes.

Perhaps counter intuitively, you do not have to cut down the topic material for a TBL course. TBL works in a 'flipped' style with the individual content learning done out of class (perhaps using video clips of didactic lecture material) and the application work done in class. In fact, there are stories of TBL instructors (Michaelson et al 2004) who have needed to make their exams harder because the students are engaging more deeply with the material!

[3] https://www.engc.org.uk/standards-guidance/standards/uk-spec/

Your Notes:

References

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Further Reading

http://www.teambasedlearning.org/

Your Notes: