LEE KONG CHIAN SCHOOL OF MEDICINE
TEAM-BASED LEARNING (TBL) OVERVIEW
What is TBL?

The Lee Kong Chian School of Medicine (LKCMedicine) uses Team-Based Learning (TBL) as its anchor pedagogical approach. TBL is student-centred, facilitated by educators, clinicians and scientists, and incorporates multiple small groups of five to seven students within a single classroom. It has been used effectively with both large (>100 students) and smaller classes (<25 students). At LKCMedicine, students remain in the same teams for the entire academic year.

What is a typical TBL session like?

TBL begins with students preparing for the class by going through TBL preparation material which is accessible on their iPads. Once in class, students use their iPads to take both individual and team quizzes based on the assigned preparation material. This process helps students understand the key concepts and prepares them for the final stage in TBL in which the teams engage in a series of Application Exercises (AE). AEs reinforce the key concepts and give students insight into the authentic problems that doctors may encounter. Teams will discuss each AE and come to a decision on the best answer for each of the questions. The teams then present their AE answers simultaneously and students may be called upon to explain or defend their team’s decisions. This encourages teams to critique each other’s answers as well as justify their own. After the simultaneous report of AE, the content experts will present the closing statements which highlight the key issues and concepts raised during the TBL session.

At the end of the session, students are encouraged to provide regular feedback which helps to improve the quality of the TBL sessions. Teams may submit a written appeal, for faculty to consider alternative answers, to the questions presented in the TBL session. Lastly, a compulsory peer evaluation is conducted periodically throughout the academic year. Details on this sequence of events which occur before, during and after class, as well as rationale for this entire process, are presented in the following pages.
Sequence of events in TBL

**BEFORE CLASS**

**TBL preparation**
TBL starts with assigned learning materials for students to self-study prior to coming to the TBL session. This material can be in various forms such as voice-over PowerPoint files, videos, journal articles, or textbook chapters. Learning outcomes are provided for each topic to indicate what students are expected to learn from the material.

**Readiness Assurance Process (Consisting of individual and team tests)**

**Readiness Assurance Process (RAP)**
The RAP consists of both individual Readiness Assurance (iRA) and team Readiness Assurance (tRA), followed by a facilitated class-wide discussion that is guided by the TBL facilitator. The purpose of the RAP is to hold students accountable for reading the TBL preparatory material and ensure that students are prepared for the Application Exercises (AEs) that follow.

**Individual Readiness Assurance (iRA)**
This is a set of 20 to 25 multiple-choice questions that students complete individually when they come to class. The questions focus on important concepts that students have studied in the TBL preparation material. These questions usually take the form of a 30-minute closed-book test and is done on the students’ iPads.

**Team Readiness Assurance (tRA)**
The tRA questions are the same ones that the student answered individually in iRA. However, tRA questions...
have to be answered by the team collectively. The teams discuss and build consensus around the best answer, and receive immediate feedback (via the Scratchie tool) on whether they selected the correct answer. The tRA discussion helps students improve their decision making, communication and critical thinking skills. This is usually a 30-minute closed-book test that is also done on the students’ iPads.

Scratchie
This is an electronic tool that gives students immediate feedback about their answers during tRA. A tick or cross will appear on their iPads to indicate if the team’s selected response is correct. If teams get the wrong answer, they are able to select again until they get the correct answer. Data on student and team performance is made available immediately, allowing teaching staff to rapidly identify teams or students who may need additional help.

Burning Questions Session
After completing tRA, teams have an opportunity to reflect, discuss within teams and write down specific questions which they would like further clarification on. Teams then answer each other’s questions and are given time to look up the answers with available resources. After this, a facilitated inter-team discussion is held to address the questions.
Application Exercise (AE)

Next is an in-class activity where students, in their teams, are presented with clinical or scientific scenarios that are similar to the types of problems they will encounter as a medical doctor. The teams will answer questions that challenge them to apply the concepts learnt and make appropriate judgements. Each team may be called upon to explain or defend their choice to the class. This is an open book process.

Simultaneous Report of AE

Teams present their AE answers simultaneously using various technological tools designed for LKCMedicine’s innovative e-learning environment. This simultaneous reporting process creates an exciting environment which highlights differences in answers. This encourages teams to critique each other’s answers, justify their decisions and explain their thought process. The facilitator guides the discussion and the content expert steps in to address misconceptions. The teams go through repeated cycles of working on AE and simultaneously report their answers in every session. Teams engage in this process for two to three hours.
AFTER CLASS

Student Voice
This is the system for gathering course evaluation and feedback. After each TBL session, students will be asked to provide feedback on either the curriculum, TBL process, TBL facilitator or content experts. Teams are asked to provide feedback in rotation via a link on the iPad.

Appeal
After class, teams may request that the content experts consider an alternative answer to the one designated as best answer in the iRA, tRA or AE. Teams must either provide a clear and usable re-write of the question if they think it was poorly worded, or a rationale with references as to why their choice was as good as the answer provided by the content experts. Only a team that takes the steps to write an appeal is eligible to receive credit for a particular question.

Peer evaluation
This is an out-of-class individual activity where each student has to assess the contributions of each of his/her teammates to the team’s success and their own learning. This is a formative process in which students get to practise giving constructive feedback to one another.
What does a TBL class look like?

Replacing lecture theatres, the Learning Studios at LKCMedicine, which can sit 150 or more for TBL lessons, is equipped with state-of-the-art IT systems, including screens hung from the periphery of the studio to give students a good view of learning and discussion materials. Despite its size, the circular design of the Learning Studio allows students to see each other no matter how far apart. To further increase engagement and facilitate team discussion within teams, the School has chosen to fit the Learning Studio with small tables around which students gather during TBL lessons.
Who is involved in TBL?

Content Expert
An educator who specialises in, or who has a deep understanding of, the subject matter. S/he may be a clinician or scientist who is responsible for assigning the preparation materials and the development of questions that are essential to the learning process within TBL. There is often more than one content expert present in each TBL session.

TBL Facilitator
An educator who is an expert in the TBL process. S/he ensures that the TBL process is followed and facilitates productive student discussions between students and the content experts.

Students
Students are at the centre of the TBL process. They learn in teams of five to seven and remain in the same teams for at least one year. Their feedback and interaction with the faculty help improve the curriculum and make the learning experience an exciting and rewarding one.

How are TBL teams formed?
Good TBL teams are teams that are as diverse as possible. At the start of each academic year, students are assigned to teams. By design, each team will be balanced to have a good mix of students with different characteristics and learning experiences. The objective of creating diverse teams is to promote better collaborative learning. Members in a team share different perspectives, allowing incorporation of various ideas, skills and knowledge to the learning activities.
Top 5 reasons for using TBL at LKCMedicine

- More efficient use of teaching time [Michaelsen, Davidson & Major 2014; Johnson et al. 2014]

- Higher student satisfaction and engagement with the learning process [Sisk 2011]

- Students learn application of knowledge, communication, critical thinking and problem-solving skills [Hrynchak & Batty 2012]

- Increases academic scores through better retention of information and knowledge [Koles et al. 2010; Fatmi et al. 2014]

- Important to learn to work in teams as “the practice of medicine is increasingly becoming both inter-professional and team-oriented” [Parmelee et al. 2012]

References


Starting a new medical school gave us the unique and enviable opportunity to design the ideal learning environment for our students; informed by both sound educational principles and best evidence in medical education, and unencumbered by institutional baggage to hold back innovation.

When it came to large group teaching, we looked at the evidence and made the choice to do away with the typical lecture and tutorial format. Instead, we sought a much more active approach to teaching, where learning in class happened through interactions with peers and faculty, and where the emphasis was on solving authentic problems instead of just memorising information. We also knew that whatever approach we chose had to be scalable to much larger student cohort, and had to make the best use of our knowledgeable clinician and scientist faculties. We considered a number of approaches, but TBL which was rapidly establishing itself in health education was a natural choice. This choice dovetailed well with NTU’s mandate to enhance teaching and learning with technology and the strong scientifically grounded pre-clinical curriculum from Imperial College London.

Today, we continue to innovate and improve on our approach to TBL. Something impossible without committed teachers, management and students, who come together to make it work!
**Students’ views on TBL**

**Tan Xuan Hao**  
Class of 2018

“TBL has been the most independent mode of learning I have experienced so far. It requires individuals to come for lessons fully prepared to clarify, discuss and research topics which posed problems for most of us. On top of that, having covered the basic theory on our own free time, we are able to venture into exploring the clinical relevance of the content during each session.

TBL sessions are fun but tiring at times. However, the rewarding outcome from each session is worth the effort that one puts in. Coming prepared for each session can be very tedious at times, especially when the content is really heavy. However, it is worthwhile to come together with our teammates to share our knowledge and explore the clinical relevance of what we have learnt by piecing bits of information together.”

**Aric Lee Wei Zheng**  
Class of 2019

“TBL focuses more on the process of learning than the knowledge gained, ensuring that we have the opportunity to work on developing our thought processes as well. Our group discussions provide much motivation to always be on the ball, since the emphasis is following the discussion and formulating our own ideas.

TBL has helped me become more comfortable with differing viewpoints, even if they are of polar opposites. I have thus developed the habit of having concrete reasons or examples before I voice an opinion, and to think from multiple perspectives. TBL also serves as useful aid in our scientific learning, because there are often points that we may gloss over or miss during our pre-readings, but that other team members may bring up and explain. It is also a place where we can draw all the concepts together and apply them as how we might in the clinical context.

Although discussions may sometimes go off-topic and result in time less well spent, I believe even this is a skill we need to hone - to bring ourselves back to what is relevant. TBL has been a positive experience for me, and it has continued to become more useful as we discuss more challenging subject matter and case studies.”
As a student of the Lee Kong Chian School of Medicine, I am fortunate to be spared the despair of trudging to school for an 8am lecture with a heavy backpack of textbooks. Instead, with narrated lectures and eBooks on my iPad, I am empowered to prepare for classes anywhere and anytime, before we convene for the scheduled sessions held twice a week.

The robust feedback system promotes continuous improvement on how the sessions are run, promising a more fruitful learning experience each time.

Specific features of TBL, such as being notified in real time on our answers in tRA is different from an ordinary quiz because with instant feedback we can clarify our doubts right away. The same can be said for AEs.

Interaction with experts in the field at an early phase in our education is beneficial in that we can ask questions about current practices at the front line. Furthermore, hearing their experiences is inspiring. All in all, TBL has revolutionised the process of learning as well as empowered us to fulfil our School’s vision of redefining medicine and transforming healthcare.”
Faculties’ views on TBL

Associate Professor Naomi Low-Beer
Vice-Dean, Education

“When LKCMedicine first began exploring the possibilities offered by TBL for undergraduates, Professor Larry Michaelsen, widely considered to be the founder of TBL, was invited to conduct workshops for faculty and students at Imperial and here in Singapore. My own experience of taking part in these workshops convinced me of the effectiveness of TBL. We now see that in practice at LKCMedicine, with our own students motivated, engaged and taking a mature, collaborative approach to their learning.”

Associate Professor Tham Kum Ying
Assistant Dean, Years 3 & 5 and Lead for Emergency Medicine

“During student and faculty interaction, students learn from Year 1 onwards how to phrase and present their answers and arguments, and defend their stand in the manner that senior doctors-content experts understand and expect i.e. it is not just the content of their answers, it is the manner in which the content is communicated that adds to the enriched learning. This is another part of the informal curriculum that has a positive impact too.

The content experts’ interaction with the students and with one another is much richer and helps students to build their knowledge and confidence that a traditional lecture-tutorial system is not able to.

There are more pros than cons in using TBL in LKCMedicine. My teaching experience has been very positive and I have adopted and adapted TBL to almost all my Tan Tock Seng Hospital teaching activities involving cognitive knowledge.”
“TBL allows students to work collaboratively to tackle important areas of their learning. The main issue is to train teachers and learners to try out a new method of learning.”

“I would recommend TBL as a teaching methodology because the methodology itself engages students in active learning. TBL also supports healthier team dynamics.

I was initially very skeptical about TBL, even slightly hostile! After 20 years in academic medical centres, I have seen educational fads come and go. But we still have to deal with the aftermath, doctors in training who are the product of these medical education systems.

On the other hand, I’ve experienced conventional systems – seeing students doze through PowerPoint lectures or skip lectures entirely. With TBL, student attendance rates are over 90% and students are actively engaged – which can only help them retain knowledge.

TBL uses an open-book setting, with students working through clinically relevant applications. During TBL, we may have five groups think A is the correct answer, three groups argue D is correct, and one group stick up for their answer B. As groups reason with each other, we see students acknowledge honestly when they get it wrong, and learn when to stick to their guns if they are right. TBL certainly provides for lively learning sessions!

The critical skill is not regurgitating facts for an exam – it is applying knowledge to solve complex medical problems. They do need to learn those facts – there’s no getting around that. But for the brave new world these young doctors are entering, TBL teaches them to think on their feet, and to function as healthy teams.”
Ramani Saravanan  
Assistant Director, Lead for Practical Skills / TBL Facilitator

"TBL does not only enhance team spirit but also provides students the opportunity to discuss theories, challenge each other’s reasons, juxtapose content with the content experts and communicate their thoughts in an explicit manner.

The uniqueness of TBL is that it results in the holistic growth of a student in such that s/he learns different ways of thinking and adapts him/herself to various skill sets including social and cross-cultural skills."

Dr Claire Canning  
Lead for Introduction to Medical Sciences / TBL Facilitator

"I enjoy engaging both students and faculty in the process of TBL. It is also very rewarding to witness how this educational approach is contributing to our students learning."

For more information, please visit the LKCMedicine website [www.lkcmedicine.ntu.edu.sg].