Team Based learning, a Global Teaching Method, an Experience

Sudha Shivaraj*, Medha Joshi**

*Assistant Professor, Department of Pathology **Head, Medical Education Unit and Professor of Pharmacology, International Medical School, Bangalore 54, India

Abstract: Introduction: Team based learning (TBL) is a student centred, active learning strategy designed to support the development of cooperative learning. It facilitates the development of individual accountability, problem solving, communication, teamwork and organizational skills. In TBL, students solve complicated case scenarios based on real life-like situations in a three-phase approach consisting of Preparation phase, Readiness assurance phase and Application phase. The objective of the present study was to evaluate the impact of TBL in promoting active learning by comparing the scores of Individual Readiness Assessment Test (IRAT), a measure of individual student performance and Group Readiness Assessment Test (GRAT), a measure of performance of students in teams. Method: Three TBL sessions based on the essential components proposed by Michaelson were conducted in pathology for second year MBBS students. Result: The median scores of GRAT are higher when compared to IRAT in all the TBL sessions. This difference is statistically significant (P<0.001) which shows that TBL promotes active learning. Conclusion: TBL is an active learning strategy that delegates the students with greater responsibility and provides opportunity for higher level learning. It facilitates the development of individual accountability, problem solving, communication, teamwork and organizational skills. [Shivraj S Natl J Integr Res Med, 2019; 10(3):55-59]

Key Words: Active learning, peer evaluation, problem solving, small group teaching, team work

Author for correspondence: Dr. Medha Joshi, H.O.D. Allied Health Sciences, Ramaiah University of Applied Sciences and Director Medical Education Unit, International Medical School, MSRIT Post, New BEL Road, Bangalore 560054 Ph: 9611936104, e mail: medhajoshi11@yahoo.com

Introduction: Didactic lecture is the oldest and the most common instruction method employed in medical schools to teach a large group of students. A well organised lecture can deliver a large amount of information, stimulate interest and be modified to meet the needs of students. However due to minimal interaction between the lecturer and students, the student is a passive listener and there is less chance for exchange of ideas and clarification of doubts. These drawbacks can be overcome by employing active learning strategies in medical education

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"Tell me, I'll forget. Show me, I'll remember. Involve me, I'll understand", is a Chinese proverb which reflects learning at its best. Studies have shown that active involvement of students in the classroom enable them to learn better by promoting deeper level of thinking, facilitating retention and retrieval of the information. According to Knowles' latest tenet of androgogy, internal factors such as enthusiasm, self-direction and confidence is motivating to the learners when compared to external pressure.(1)Active learning is currently being promoted in medical institutions by small group teaching (SGT) methods, such as small group discussion (SGD), problem-based learning (PBL), role-play, tutorials and case studies.[2] TBL, developed by Professor Larry Michaelsen in the 1970's as an instructional method in business school at the University of Oklahoma has gained popularity in medical education in the recent years. As defined by Parmelee and colleagues, TBL is a small group instructional method which allows students to apply theoretical knowledge through a series of activities that includes individual work, team work followed by immediate feedback.(3)Team learning is an advancement in large-group teaching as it combines the strength of small-group interactive learning with teacher-driven content delivery.[4] In TBL, role of the instructor shifts from being an instructor to a facilitator.

The essential components of this instructional strategy include

1) Advanced preparation: The instructor allots topics of the TBL session to the students prior to the class.

2) Team formation: The instructor divides the class into teams of 5-7 students ensuring all the teams have members from diverse background, skills and abilities.

3) Readiness assurance: The students answer an MCQ test independently at the beginning of the session for which they are assigned scores.

This Individual Readiness Assessment Test (IRAT) is a measure of individual students' preparation and performance. IRAT is followed by Group Readiness Assessment Test (GRAT) where students answer the same MCQ question in

teams for which a group score is generated. During GRAT, the group members have an opportunity to discuss the answer and arrive at a consensus.4) Group application exercise: In this phase, the students work in teams and solve complex case-based problems requiring analytical skills. This is followed by discussion of the case by the facilitator. 5) Peer evaluation: Students evaluate their team members for his/her contribution to learning in their respective teams[5]

At International Medical School Bangalore, students learn using the modular system which integrates the paraclinical subjects of Pathology, Microbiology and Pharmacology in the second {Citation}year. Lectures are combined with interactive teaching learning methods such as small group discussion, case-based learning, problem-based learning, tutorials and flip classes. During exams, student assessment is carried out with questions based on higher Bloom's taxonomy that require application, analytical and diagnostic skills, essential in a practising physician.[6,7]

Material and Methods: The study was conducted as a part of institutional directive to introduce student-cantered learning methods. Hence permission from the Head of the institution was obtained prior to the commencement of TBL, and the Institutional Review Board was not deemed necessary. The students were aware of various active teaching learning methods and their oral consent was taken. Our study population consisted of 43 second year MBBS students. Nine TBL sessions were organized with three each in pathology, microbiology and pharmacology. TBL sessions in pathology was conducted in fundamental, hematopoietic and gastrointestinal module. These sessions based on the essential components proposed by Michaelson et alincluded:

Team formation: Students were randomly allotted to seven teams with each team having six students and one team having seven students. They were explained in detail about the new learning method, its advantages and role of the students and instructor.

Preparation phase: One week prior to TBL, the students were assigned reading material (maximum of 50 pages from the 9th edition of Robbins Basic Pathology) with web references and learning objectives to help them focus on the assigned reading.

Readiness assurance phase: Readiness assurance phase and application-based exercise were conducted over a period of two hours with two teachers as facilitators. At the beginning of the session, the students were asked to select a leader, time keeper and scribe within their group and explained the role of each member.

The leader had to motivate and ensure the team members actively participated in the discussion; the scribe made a note of the answer chosen by the team with justification for the same while the timekeeper ensured the team was ready with the answer within the allotted time. Readiness assurance phase included Individual Readiness Assessment Test (IRAT) and Group Readiness Assessment Test (GRAT) where the students answered ten single best option multiple choice questions (MCQ's). The MCQ's focussed on concepts the students needed to understand in order to solve the application exercise. It included four simple recall and six higher Bloom taxonomy questions that required analysis and application of knowledge. In IRAT, the students answered questions individually with the time allotted for each question being one minute. After submitting IRAT answer sheets, students took GRAT where they answered the same MCQ questions as a team, after discussion with their team members. The time allotted for each MCQ during GRAT was two minutes. Once the teams submitted their GRAT answer sheets, faculty discussed the MCQ's. The teams had to answer questions and defend their choice while the teachers cleared doubts and clarified misconceptions. This phase ensured the students were ready for application-based exercise.

Application based exercise: Three clinical case scenarios based on complex case-based problems that required higher level thinking, discussion, application analysis, and problem-solving skills was given to the students. To create and implement effective group discussion, application-based exercise was framed on the **4 S's** principle of TBL that include: 1. Significant: The problem was significant; 2. same: All the teams worked on the same questions; 3. Specific choice: The teams had to arrive at a specific answer; and 4. Simultaneous: The choice is reported by the teams simultaneously. The teams were given ten minutes to analyse the case, arrive at a consensus opinion and substantiate

their choice. At the end of ten minutes, the teams simultaneously displayed their choice using a color-coded, lettered placard. The instructor randomly selected one or two groups to substantiate their choice which was followed by in-depth discussion of the case. During the application exercise, the instructor walked around the classroom, listening to the discussion of students, cleared doubts and provided input if necessary. By the end of this step, the students had understood the application of course contents to real life problems. In addition, the team members had become more cohesive and committed to success of their teams. It was seen that team learning fostered interaction, ownership and enthusiasm among the learners.

Peer evaluation: Peer evaluation (PE) is an integral part of TBL where students evaluate their team members for his/her contribution to the team's productivity. The students were explained the importance of PE and requested to be precise, honest and relevant during the feedback. PE was taken in an anonymous manner using printed forms and conducted three times during the academic year. Our PE forms were a combination of Finks and Koles method and had a quantitative and qualitative component. The quantitative component included questions grouped under three headings: co-operative learning skills, self-directed learning and inter-personal skills. The students had to answer these questions by grading their peers from zero to three. They were also asked to distribute 100 points among their team members depending on their contribution to the success of the team. The qualitative component included questions on the most important contribution of the team member and one behaviour the person was required to alter to be a more useful team member.

Result: The data was entered in M S Excel and analysed using IBM SPSS Version 18.0. Descriptive statistical methods using Median and Inter Quartile Range (IQR) were used to analyse the data. Non-Parametric test (Mann Whitney U test) was used to compare the median scores of IRAT and GRAT (Table 1). P- Value <0.05 was considered statistically significant.

The IRAT median (IQR) score in the first module was 7(6-8) compared to 9 (8-9) in GRAT and this difference was statistically significant (P<0.001). Similarly, the median score in the second and third modules was higher in GRAT compared to IRAT and this difference too was statistically significant (P<0.001).

Regarding validation of the questionnaire, face validity was done by investigators to ensure the respondents understanding of the questions and obtain a subjective view to the survey. Content validation by experts confirmed that the questions targeted the aim of the study.

Table: 1 Comparison of Median IRAT and GRAT scores

Module	IRAT Median (IQR)	GRAT Median (IQR)	P-Value
Module I (fundamental module)	7 (6-8)	9 (8-9)	<0.001
Module II (hematopoietic module)	5 (4-6)	8 (8-8.5)	<0.001
Module III (gastrointestinal module)	6 (5-7)	9 (9-10)	<0.001
IRAT: Individual Readiness Assessment Test GRAT: Group Readiness Assurance Test IQR: Inter Quartile Range			

Discussion: Team-based learning addresses professional competencies, makes the students responsible for their learning and understand the importance of team work to solve complex problems.

Thorough pre-class preparation maximises the benefits of individual and team-based learning.[8] This results in improved and in-depth discussion during the session. Random selection of team members fosters better exchange of ideas.[9]Teams consisting of five to seven members was found to maximize team dynamics and ensure intellectual resource required to promote effective discussion[10].

The readiness assessment phase includes assessment of individual's grasp on the content followed by team assessment of the same[11]. RAT and application exercises ensure team members are accountable for their individual work and team work. Team work promotes communication, critical thinking and problem-solving skills. By working in groups, students are exposed to multiple viewpoints and

perceptions.[12] According to Thompson, Schneider, Haidet, Levine et al, it is observed that students exposed to TBL tend to assimilate the content better when compared to others.[13] Group assignments encourage students to apply their theoretical knowledge to solve clinical problems thereby bridging theory and practice.[14]

A study by Neider et al showed that 91% students agreed that course concepts are learnt better by TBL.[15]Adam et al. showed that 84% students agreed or strongly agreed that critical reasoning and clinical problem-solving skills are enhanced by TBL compared to other active methods of teaching and learning.[16]

In contrast to traditional courses where students are responsible only to their instructor, students are answerable to their instructor and peers in group based instructional methods such as TBL[17].As only team members have adequate information to evaluate the involvement of their peers, peer assessment and evaluation are extremely important in TBL.[18]
A powerful incentive for the students to prepare well and play an active role during the session is awareness that they will be evaluated by their peers. Increase in self-confidence, improved learning outcomes, opportunity to compare their work and improve their performance through critical analysis of the work of others are the other benefits of peer assessment.

Conclusion: Active learning strategies entrust students with greater responsibility and provide opportunity to engage in higher level learning which enhances student satisfaction and perceived learning. Supplementing didactic lectures with TBL has the ability to enhance student engagement, mastery of course content and performance. To conclude, with a well-executed TBL session, the class time can be used productively for active learning.

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