DOI: 10.7860/JCDR/2023/61590.17714

Original Article

Education Section

Perception of Undergraduate Medical Students and Faculty towards Team Based Learning as a Teaching Tool- A Cross-sectional Study

AMIT KUMAR JAIN[1], NAVEEN JAIN[2], SEEMA JAIN[3]

ABSTRACT

Introduction: In India, the fast-changing medical education scenario needs to differentiate the meaningful learning from rote learning into the medical practice. Team Based Learning (TBL) is a dialectic form of learning where students learn in small groups or teams.

Aim: The present study was conducted to introduce TBL methodology in ophthalmology subject as learning strategy among undergraduate medical students and to evaluate the perceptions of students and faculties towards TBL methodology.

Materials and Methods: This cross-sectional study was conducted in a tertiary care teaching hospital of Uttar Pradesh, India, from December 2019 to February 2020. Total 120 Bachelor of Medicine and Bachelor of Surgery (MBBS) students of 3rd year part 1 participated in the study. Main TBL sessions were conducted in two phases, wherein during preclass preparation the topic glaucoma was assigned to the students. In phase 1 individual Readiness Assurance Test (iRAT) and team Readiness Assurance Test (tRAT) were conducted using MCQs. In phase 2, tRAT was conducted for real-life clinical situations on glaucoma. Data were analysed using Statistical Package for Social Sciences (SPSS) 20.0 software version.

Results: In all 120 participants with the 100% response rate, mean score of iRAT, tRAT in phase 1 and tRAT in phase 2 was 18.9±5.24, 26.16±3.89 and 27.91±4.56, respectively. Majority of students perceived that TBL helped in understanding the glaucoma well and improved teacher student relationship. Almost all faculty members agreed that TBL was an innovative teaching method to develop critical thinking and imbibe subject knowledge in students.

Conclusion: TBL as an innovative Teaching Learning (TL) method was well implemented and accepted among medical students and teaching faculty because TBL established rationale thinking and problem-solving skills.

Keywords: Individual readiness assurance test, Teaching learning method, Team readiness assurance test

INTRODUCTION

Traditional lecture-based learning is most common instructional approach used across the India and was considered an efficient as well as cost-effective method to transmit knowledge to students or learners. However, lecture-based learning is teacher centered where teacher introduce and explains the course material to the students i.e. there is no active participation of students during the learning process. Furthermore, one way communication, tiring long lectures, inactiveness of students and fast forgetting the concepts are the major disadvantages associated with traditional teaching method [1]. Medical education throughout world is transmitting from conventional classroom teaching approach to virtual internet based teaching approach, so that the existing gap between quality of medical education and recommended teaching learning methods can be minimised [2].

Learning without understanding the meaning of topics was easily forgotten in a very short duration, because it was difficult for the learner to apply the knowledge gained from lectures in future reasoning. In India with fast changing medical education scenario, it is necessary to differentiate the meaningful learning from rote learning. Rote learning is memorisation of new information by repetition without understanding the concept of what is learned. While in meaningful learning the learner completely understands the new information and is able to relate this new information to previous knowledge. Thus, the rote learning leads to memorising the course content and meaningful learning causes implementation of knowledge into the practice of medicine. Hence, to improve meaningful learning, several classrooms based active learning strategies such as co-operative learning, problem-based learning, TBL, case-based learning, ability-based education and assessment-as-learning etc., have been instigated for learners [3].

TBL is a special form of dialectic learning developed by Larry Michaelson at a business school in 1970 [4]. In TBL method students work in small groups or teams which help them to relate theoretical knowledge through discussions within small groups and thus, enhance the problem-solving skills of learners/students as well as encourage teamwork among students. In India undergraduate class strength is typically from 150-200 students where small group teaching like problem-based learning, case-based learning are difficult, however TBL allows a single teacher to manage multiple small groups simultaneously in a large class [5-7].

For successful implementation of TBL strategy four important elements include: i) creation of groups or teams made deliberately and managed appropriately; (ii) accountability i.e., students are accountable for their individual and group performance; iii) feedback, i.e., students must get regularly and timely feedback on their performance; and iv) assignments i.e., team based exercises must be planned to encourage learning and team building [3,8].

In United States and many other countries, the TBL was introduced to educate the physicians and nursing health care professionals and the results showed that TBL developed critical thinking, better quality discussions in class, team work enhancement and optimal learning outcomes [4]. Globally, the facilitators accepted the TBL as teaching learning tool for medical and nursing institutes, however, the data for effectiveness of TBL as an active learning methodology from the perspectives of students and teachers received is insufficient and results are also conflicting [9].

In previous studies, improvement in academic outcomes and examination scores was found in subjects of anatomy and psychiatry however, very few researchers have included TBL in ophthalmology subject [10-13]. With this background the present educational research project was done to introduce the TBL in ophthalmology

subject as learning strategy among undergraduate students of our institute and also to find out the perception of medical students and faculty members towards TBL method.

MATERIALS AND METHODS

This cross-sectional study was carried out in the department of Ophthalmology of a tertiary care teaching hospital at Bareilly, Uttar Pradesh, India. Approval for the study was obtained from Institutional Ethics Committee of the institute (IEC/2019/12/ER05). Study was conducted during the period from December 2019 to February 2020.

Inclusion criteria:

- Undergraduate students of 3rd year part 1 pursuing MBBS course;
- Students who were willing to participate in the study.

Exclusion criteria: MBBS students of 3rd year part 1 who were not willing to participate in the study.

Study Procedure

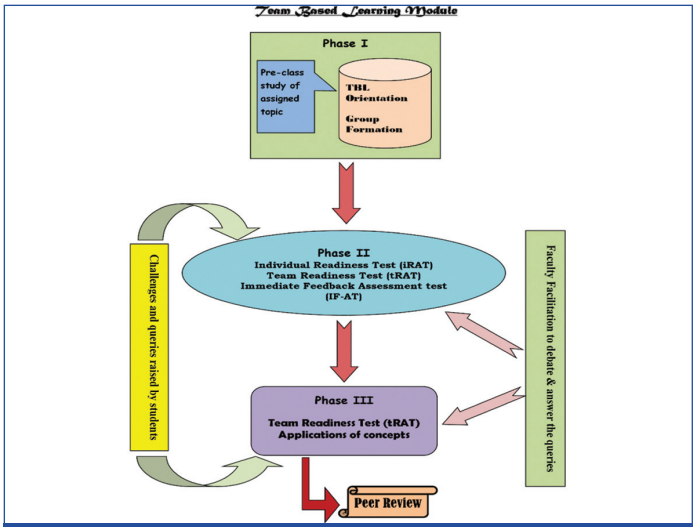
Out of 150 students, 30 students were not willing to participate in the study as they had not passed their second professional examination and were engaged for preparation of university examination. Thus, total 120 undergraduate medical students of 3rd year part 1 who were willing to participate were enrolled for study. In addition, 10 faculties of ophthalmology, community medicine and pharmacology departments involved in study were also enrolled. Objectives of present study were explained to all the participants and written informed consent was obtained from each participant for the participation and publishing of the findings.

Preclass preparation on formation of teams and for assignment of glaucoma topic was done. Main sessions for team-based teaching learning method were implemented in two phases.

Preclass preparation: All 120 enrolled students were divided into 24 teams forming five students in each team. Students were distributed in teams according to their class roll numbers based on alphabetical stratification system. One week prior to TBL phase 1, plan for the study and procedure to be followed for TBL session was explained in detail to all the participants including faculties. Topic glaucoma was selected to educate students through TBL strategy. Prior conduction of TBL sessions, all students were provided preparatory material including learning objectives and learning resources (recommended text and books, videos etc.,) related to glaucoma. Students were asked to prepare for TBL session and study the given material related to glaucoma thoroughly.

Phase 1: TBL session was carried out in two steps i.e., iRAT and tRAT [8]. For iRAT, all enrolled 120 students were individually given an exercise related to the topic glaucoma. Exercise comprised 25 Multiple Choices Questions (MCQs) of two marks each to be solved in 20 minutes time. After 20 minutes, MCQ papers were collected from each student and correct MCQ answers were awarded two marks whereas, incorrect answer were given 0 marks. Thus, for iRAT each student got individual score out of total score of 50 marks (25 MCQs with each of 2 marks) and highest marks or lowest marks obtained by individual student was also documented. For tRAT, the same set of iRAT consisting 25 MCQs was distributed among 24 preformed teams (5 students per team) and team members of each team were instructed to discuss among themselves and answer these questions in 40 minutes duration. The answers of all MCQs attempted by each team were collected simultaneously after 40 minutes duration and scores of each team was evaluated by awarding two marks for every correct answer. Thus, in phase 1 tRAT each team score was recorded out of total 50 marks and the highest marks or the lowest marks obtained by team was documented. Subsequently, scratch cards containing the correct answers for each MCQ were distributed to all the teams. Teams were also instructed to complete the Intermediate Feedback Assessment Test (IF-AT) within 30 minutes duration. The challenges and queries raised by various teams were answered with explanation of correct response for each MCQ was given by faculty members in additional 30 minutes time [4,8]. Mean score for phase 1 iRAT and tRAT was calculated by taking the mean of marks obtained by all 120 students and 24 teams, respectively.

Phase 2 was conducted after two days gap of phase 1 and the same preformed 24 teams were provided with twenty structured type MCQs of 2.5 marks each. These MCQs were related to real-life clinical situations where students can apply their knowledge and critical thinking to solve clinical problems in 60 minutes time, called as tRAT. Response from each team for these 20 MCQs was recorded simultaneously after 60 minutes duration. Scores of phase 2 tRAT for each team was calculated by awarding 2.5 marks for every correct answer for MCQ. Thus, in phase 2 tRAT, each team got their scores out of total 50 marks (20 MCQs with each of 2.5 marks) and these scores were documented for evaluation purpose. Mean score for phase 2 tRAT was calculated by taking the mean of marks obtained by all 24 teams. Any challenges and queries on questions raised by students were addressed by faculty members after completion of the test [Table/Fig-1] [8].



[Table/Fig-1]: Team Based Learning Module [8].

After completion of phase 2 TBL session, to assess perception towards TBL, students were given a pre-structured questionnaire rated against Likert scale (1-5 points). The questionnaire was prepared by considering similar previous studies done on TBL methodology [4,8,10]. Questions were mainly focused about the TBL covering concepts, improvement in learning and scope of TBL in the future. In addition, the faculty members who attended the sessions of TBL were also provided a separate set of pre-structured questionnaire to be answered on Likert scale to assess their perception towards TBL. The questionnaire for faculty members was also devised taking into consideration the similar previous studies conducted on TBL [4,9,10]. These questions were mainly directed about the role of TBL in enhancement of conceptual knowledge and its future scope as teaching learning method.

STATISTICAL ANALYSIS

Scores of MCQs of iRAT of phase 1 and tRAT of phase 1 and 2 were compiled in excel sheet for calculation in terms of percentage, mean and standard deviation (SD). One-way Analysis of Variance (ANOVA) with post-hoc Tukey's test was used to compare the mean±SD scores of iRAT of phase 1 and tRAT of phase 1 and 2. The results of perception analysis of students and faculty members for each item of questionnaire were calculated in numbers and Mean±SD. Data were analysed using SPSS 20.0 software version. The p-value of <0.05 was considered as statistically significant.

RESULTS

Total 120 MBBS students of 3rd year Part 1 participated in this study. Out of 120 students, 68 were males and 52 were females. The mean age of study participants was 23.1±1.2 years [Table/Fig-2].

Demographic characteristics	Values
Gender	
Male n (%)	68 (56.66)
Female n (%)	52 (44.44)
Age (years)	
Male (Mean±SD)	23.44±1.04
Female (Mean±SD)	22.67±1.26
Total (Mean±SD)	23.1±1.2
Age groups (years) n (%)	
20-21	8 (6.66%)
22-23	62 (51.66%)
24-25	50 (41.66%)

[Table/Fig-2]: Demographic profile of study participants.

Assessment of score of phase 1 and phase 2 sessions: Results of MCQs score of iRAT of phase 1 TBL session showed that the mean score obtained by students was 18.9±5.24 with lowest score of 10/50 and highest score of 32/50. However, analysis of MCQs score of tRAT of phase 1 showed that students performed well in team with mean score of 26.16±3.89 with lowest team score being 20/50 and highest team score of 34/50. Mean score obtained in tRAT of phase 2 session was 27.91±4.56. The lowest and highest team scores obtained in this phase were 24/50 and 40/50, respectively. Mean score p-value compared between iRAT and tRAT of phase one and phase two was statistically highly significant (p<0.001). However, the p-value compared between tRAT of phase one and phase two was not statistically significant (p=0.161) [Table/Fig-3]. Only 21.66% of students in iRAT phase 1 scored ≥25 marks however, when students performed in teams in tRAT of phase 1 and phase 2, 62.5% and 83.34% of students, respectively scored ≥25 marks.

Variable	Lowest score	Highest score	Score (Mean±SD)	One way ANOVA test p-value
Phase 1				iRAT vs. tRAT(phase 1):p<0.001 iRAT vs tRAT(phase 2):p <0.001 tRAT (phase1) vs tRAT(phase2):p =0.447
iRAT (n=120)	10	32	18.9±5.24	
tRAT (n=24)	20	34	26.16±3.94	
Phase 2				
tRAT (n=24)	24	40	27.91±4.55	

[Table/Fig-3]: Performance of students in iRAT and tRAT phase of team-based learning.

Perception of students towards TBL: All the students responded to questionnaire with response rate 100% and mean Likert score of 3.361. Analysis of questionnaire on perception of students showed that 38.34% students agreed that most of the time they were attentive during TBL sessions however, 46.67% of the students had a neutral opinion about their span of attention during sessions. Majority (76.6%) of the students felt that tRAT helped them to understand the assigned topic well and only 5.8% students disagreed with this point. A 40.84%, and 39.16% of students agreed that TBL developed team working/critical thinking and was in coordination with course elements, respectively whereas, 20.84% and 30.84% students, respectively, disagreed with the same. A 42.5% of students agreed that TBL helped them to understand the difficult course mate rial by hearing their classmates however, 19.16% students disagreed to this statement. Majority (72.5%) of students perceived that TBL session helps to improve teacher student relationship however, 11.67% students disagreed from this perception. A 45.84% of students agreed that TBL is an innovative TL method to impart knowledge, opinion of 39.16% students remained neutral and 15% students disagreed. 70.84% students felt that more TBL sessions should be conducted in future and only 11.67% students disagreed with this statement [Table/Fig-4].

Questionnaire	Number of students responses on Likert Scale 5	4	3	2	1	Likert score Mean±SD
During the TBL discussion, I paid attention most of the time.	27	19	56	13	5	3.41±1.08
Team readiness assurance test (tRAT) helped me in understanding the assigned topic well	38	54	21	4	3	4.0±0.92
TBL develops team working and critical thinking	19	30	46	15	10	3.27±1.13
TBL is in coordination with other course elements (lectures, clinical and practical skills)	26	21	36	24	13	3.19±1.28
TBL helped me in understanding difficult material by hearing my classmates	11	40	46	7	16	3.19±1.12
TBL reduced my stress and developed leadership qualities	9	19	32	29	31	2.55±1.24
TBL improves the teacher student relationships	14	73	19	8	6	3.67±0.94
Mistakes were improved by my peers without causing any embarrassments during TBL session	3	42	41	14	20	2.95±1.11
TBL is an innovative teaching method to impart knowledge in students	39	16	47	12	6	3.58±1.18
More TBL sessions should be implemented in future	17	73	21	5	4	3.78±0.86

[Table/Fig-4]: Perception of students about TBL sessions.
Likert Scale Response (5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly disagree)

Perception of faculty members towards TBL: All 10 (100%) faculty members completed the questionnaires related to perception towards TBL with Likert score mean response of 3.66. A 7/10 (70%) faculty agreed that TBL sessions were well framed in coordination with other course material whereas, 20% faculty members remained neutral and 10% members disagreed for this statement. A 40% faculty agreed and 40% remained neutral on statement of questionnaire that TBL helped in improving the teacher student relationship however, 20% disagreed on this statement. Majority (80%) faculty felt that TBL was conducted within time frame and it covered all information on the suggested topic. A 50% of the faculty members agreed that more TBL sessions should be conducted in future whereas, 30% members remained neutral and 20% members disagreed for this statement [Table/Fig-5].

Questionnaire	Number of Faculty responses on Likert Scale 5	4	3	2	1	Likert score Mean±SD
TBL was well framed in coordination with other course elements (lectures, clinical and practical skills)	3	4	2	1	0	3.9±0.99
TBL is an innovative teaching method to develop critical thinking and imbibe subject knowledge in students	2	4	2	2	0	3.6±1.07
TBL helps the teachers to improvise their relationship with the students	1	3	4	2	0	3.3±0.94
TBL was conducted well within time frame and it covered all information of the topic	4	4	1	1	0	4.1±0.99
More TBL sessions should be implemented in future	2	3	3	1	1	3.4±1.26

[Table/Fig-5]: Perception of Faculty about TBL sessions.
Likert Scale Response (5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly disagree)

DISCUSSION

In recent years, a variety of teaching learning methods such as problem-based learning, case-based learning, TBL, etc., have emerged as innovative methods to increase learning interest and

collaborative spirit among learners [12,14]. Worldwide, many countries in their institution have adopted TBL as education strategy as it helps to enhance problem solving skills of students and encourages them to integrate problem solving skill into clinical practice [15,16]. Therefore, present study was undertaken to introduce TBL among the students of 3rd year part 1 medical students in the subject of ophthalmology as well as to find out perception of students and faculties towards implementation of this new teaching learning method. Results of study indicate that response of the students as well as of faculty members were positive towards implementation of TBL strategy. Analysis of scoring of different phases of TBL method showed that performance of students significantly improved when they performed in team as there was a significant improvement in the scores of tRAT of both phase 1 and phase 2 when compared with iRAT of phase 1. Similar to the present study, previous studies also showed that there was significant improvement in the performance of students when they completed the given task in groups or team [10,12,17,18]. The mean score of iRAT and tRAT/GRAT in studies done by Huang Z et al., was 63.78±9.30 and 75.65±7.40 and Fujikura T et al., was 70.9±7.84 and 80.8±5.4, respectively [10,17]. Wu W et al., also reported that the proportion of incorrect answers was significantly lower when students performed in team [12].

In present study, more than 85% of students (mean±SD:3.41±1.08) agreed that they paid attention most of the time during TBL session. In one study, Harakuni SU et al., also found that 62% students in their study felt that they were actively engaged during TBL session [5]. In another study, students responded (mean±SD:3.87±1.11) that they were able to focus for longer duration during TBL session than lecture-based classes [19]. In the present study, >76% students felt that TBL helped them to understand the assigned topic well. Similarly, Santana VC et al., Moore-Davis TL et al., Gray J et al., Bengü E, and Alwahab A et al., also found that 97%, 85%, 80%, 62% and 65% of students, respectively responded that TBL helped them to understand the main concept better after completion of TBL sessions [20-24]. On contrary, in a study done by Okubu Y et al., only 4% of students felt that TBL was an effective method to increase their understanding of topic [25]. Another study [12] in China compared TBL with traditional didactic lectures in ophthalmology among students and reported that TBL was preferred and acceptable by most medical student in their study.

About 40% of students perceived that TBL improved their existing knowledge on concepts by hearing their classmates and also was useful for clinical problem-solving skills both as an individual and as a team. Similarly, Harakuni SU et al., observed that 66% of students in their study felt that TBL session provided additional knowledge acquired through lectures while in another study 62.35 students agreed that TBL helped me to obtain a higher level of knowledge [5,10]. Other studies by Okubu Y et al., and Yang LH et al., also showed that 50% and 66% students, respectively in their studies agreed that they achieved discussion skills on clinical problem solving through TBL session [25,26]. Discussions occurring among students during the tRAT sessions develop a critical thinking skill and also made students think in depth about the topic, which cleared their concepts and retention of knowledge was also of longer duration.

On team work related questionnaire, 37.5% (mean score 2.95±1.11) of students stated that during TBL session their mistakes were improved by peers without causing any embarrassments. Previous studies have also reported almost similar findings for this statement with mean score of 4.25±0.92 [19] and 3.89±0.92 [23]. Thus, TBL gave a platform to the students to improvise their small doubts, mistakes on topic and/or poor understanding of subject by discussing with their peers and debating the answers with the faculty members.

In present study, 71% of students agreed that more such TBL sessions should be conducted in future to cover various other topics. Similarly, Altintas L et al., in their study found that 76% students agreed on further conduction of TBL sessions [11]. About two third (mean score 3.6±1.07) of our faculty members perceived that TBL is useful to develop critical thinking and also imbibe knowledge among students. Similar to our study in other studies done by Chhabra N et al., and Schynoll G et al., 96% and 80% faculties, respectively agreed that TBL was very helpful in achieving depth of understanding [9,27]. Fujikura T et al., in their study also reported that instructors felt usefulness of TBL in acquiring the factual knowledge (mean score 3.72±0.73) [17].

Regarding perception of teachers towards improvement in relationship between teacher and students by TBL, only four (40%) faculty members felt that TBL helps to improvise relationship of teachers. Contrarily, Chhabra N et al., found 100% faculty perceived that TBL developed rewarding relationship with the students [9]. The time and efforts of faculty members needed to implement the TBL was much higher than the routine lecture-based classes but the relationship building with students was also higher by TBL. Half (50%) of the faculty members agreed that more such TBL sessions should be planned in future at the institute similarly, 80% faculty in a study done by Chhabra N et al., perceived that TBL can be successfully conducted for large classes [9]. In the present study, positive experience with the implementation of TBL and high evaluation results of students and faculty perception was in coordination with previous studies conducted in several countries across the globe [11,22,27-30].

To summarise the findings of this study, TBL is a cost-effective active TL methodology which improvises the critical thinking, analysis skills, problem solving methodology and clinical scenario reasoning of students by focusing on the applied clinical knowledge and developing skills among them to analyse the difficult clinical case scenario. TBL utilises the power of small group learning in a large classroom setting facilitated by a single faculty.

Limitation(s)

This study has some limitations. The present study was performed in only one department using only one topic i.e., glaucoma. Additionally, in present study no comparison was done on implementation of TBL method with other innovative TL methods such as case-based learning or problem-based learning. Thus, in future more studies with multidisciplinary approach and inclusion of other teaching learning methods for comparison can be planned to ascertain effectiveness of TBL teaching strategy.

CONCLUSION(S)

The TBL was successfully introduced among undergraduate students and faculty members at our institute. Students enjoyed and participated well in all the TBL sessions as reflected by the significant improvement in their scores on given assignments. Majority of students remained attentive during TBL sessions and responded that TBL helped them to develop critical thinking and their concepts on assigned topic became more comprehensible when they performed as team. Another advantage with TBL is that one teacher can manage several small groups of students in a large classroom to conduct TBL sessions, so this TL methodology can be used to fill the gap of shortage of faculty in many institutes. In addition, students and faculty also felt that more such sessions should be implemented in future. Hence, it is recommended that TBL strategy can be implemented for teaching of students to improve learning outcomes as well as for skill development of them.

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PARTICULARS OF CONTRIBUTORS:
1. Associate Professor, Department of Ophthalmology, Rajshree Medical Research Institute, Bareilly, Uttar Pradesh, India.
2. Postgraduate Trainee, Department of Ophthalmology, Rajshree Medical Research Institute, Bareilly, Uttar Pradesh, India.
3. Professor, Department of Pharmacology, UCMS and GTB hospital, New Delhi, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Amit Kumar Jain,
3/68, Sector-5, Rajender Nagar, Sahibabad, Ghaziabad, Uttar Pradesh, India.
E-mail: dramitjain75@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Dec 03, 2022
- Manual Googling: Dec 29, 2022
- iThenticate Software: Jan 17, 2023 (8%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Nov 19, 2022**
Date of Peer Review: **Dec 17, 2022**
Date of Acceptance: **Jan 24, 2023**
Date of Publishing: **Apr 01, 2023**