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# Preclinical medical student satisfaction of Team-based learning in Chiang Mai University

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## Abstract

**Introduction:** Global medical and healthcare education systems are increasingly adopting team-based learning (TBL). TBL is an interactive teaching programme for improving the performance, clinical knowledge, and communication skills of students. The aim of this study is to report the learning experience and satisfaction of participants with the TBL programme in the preclinical years of the Faculty of Medicine, Chiang Mai University.

**Methods:** Following the implementation of TBL in the academic year 2022, we asked 387 preclinical medical students, consisting of 222 Year 2 and 165 Year 3 medical students who attended the TBL class to voluntarily complete a self-assessment survey.

**Results:** Overall, 95.35% of the students were satisfied with the structure of the TBL course and agreed to attend the next TBL class. The overall satisfaction score was also high ( $4.44 \pm 0.627$ ). In addition, the students strongly agreed that the TBL programme improved their communication skills ( $4.50 \pm 0.796$ ), learning improvement ( $4.41 \pm 0.781$ ), and enthusiasm for learning ( $4.46 \pm 0.795$ ).

**Conclusion:** The survey findings indicated that students valued TBL-based learning since it enabled them to collaborate and embrace learning while perhaps enhancing their study abilities. However, since this is a pilot study, further investigations are warranted.

**Keywords:** *Team-based Learning, Small Group Interaction, Medical Education, Implementation*

## I. INTRODUCTION

Team-based learning (TBL) is a form of small-group teaching which can improve student performance, clinical knowledge, and communication skills. It has been employed in medical and healthcare education in the US, Australia, Austria, Japan, South Korea, and Singapore (Burgess et al., 2014; Michaelsen & Sweet, 2008). Since 2000s, this model has been used in medical education to foster deep learning across a variety of subjects and educational contexts, benefiting teachers and helping academically weak and strong students achieve the same or better results than with conventional methods (Parmelee et al., 2012). In addition, it is more effective for engaging students than lecturing in a large class with few teachers (Burgess et al., 2020b).

The key elements of TBL include pre-class preparation to encourage self-study, teamwork, and instant feedback. These key elements promote active learning and critical thinking (Burgess et al., 2020a; Parmelee et al., 2012). The steps in TBL include pre-class preparation, individual readiness assurance test (iRAT), team readiness assurance test (tRAT), feedback, and team application (Burgess et al., 2014). In the tRAT and team application phase, students work in small groups to demonstrate the use of teamwork for problem-solving. Clinical problem-solving exercises by students lead to class discussions and instructor comments (Burgess et al., 2020a; Michaelsen & Sweet, 2008). The teacher's feedback can help clarify students' responses by discussing their answers. In the academic year 2022, TBL was implemented on second- and third-year medical students in the Faculty of Medicine, Chiang Mai

University, and self-assessment questionnaires were used to assess students' satisfaction with the TBL model. This research aims to examine the impact of team-based learning on whether or not students were able to build their own learning processes, as well as to measure student satisfaction with teaching and learning in the TBL paradigm in order to improve further TBL classrooms in the faculty.

## II. METHODS

### A. Sampling and Participants

In 2022, 387 pre-clinic medical students from Chiang Mai University's Faculty of Medicine were studied (222 from Year 2 and 165 from Year 3). Year 2 medical students studied human skin and the connective tissue system, while Year 3 medical students studied human haematology. Each TBL class consisted of 50 teams of mixed-gender and grades. Each team contained five members.

### B. Structure and Components of TBL

The TBL programme was first implemented in the 2022 academic year, covering preclinical academic Years 2 and 3 at the Faculty of Medicine, Chiang Mai University. The TBL structure comprised two major phases: pre-class and in-class. The TBL topics included automated haematology and venomous snakes for Year 3 medical students. The skin infection topic was selected for Year 2 medical students.

After TBL, the non-researcher academic team informed medical students about the study and sought volunteers to avoid a conflict of interest between the instructors and the medical students. The non-researchers urged students interested in the experiment to complete a Google Forms questionnaire outlining the study's relevance, including an explanation of the topic, data gathering, and the pros and cons of participation. If participants agreed to answer the questionnaire, they could complete the Google Form to consent and submit the questionnaire, with their personal information remaining anonymous.

For validity, a questionnaire to explore students' views on TBL was prepared via a literature study, student review (two students), peer review (faculty members from two departments), and expert opinion (a TBL expert). It also examined students' perceptions of teams and their beliefs and values in collaboration. The outcomes of the different years of student were then compared.

### C. Data Collection and Analysis

Upon completing the TBL class, participant students were invited to voluntarily take the self-assessment survey to explore their thoughts on the assertions made in the TBL literature. The questionnaire was in Thai and we used a five-point Likert scale (1 = strongly dissatisfied, 2 = unsatisfied, 3 = neither satisfied nor dissatisfied, 4 = satisfied, 5 = strongly satisfied). Students were asked about the preparation for the TBL class, including student material, classroom, teaching content, self-preparation, orientation programme, class material, and the overall programme. The self-assessment survey also asked about promoting self-understanding, including communication skills, learning improvement, and enthusiasm in learning using a five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree).

The TBL self-assessment survey data were analysed according to mean and standard deviation (SD) using STATA version 16 (STATA Corp., Texas, USA). The Pearson's Chi-square test was used to analyze the difference between second- and third-year medical students' percentages of satisfaction or agreement in each aspect. Statistical significance was accepted at  $p < 0.05$ . The reliability of the questionnaire was calculated using Cronbach's alpha.

## III. RESULTS

In years 2 and 3, Cronbach's alpha of the medical students' questionnaire was 0.869. In total, 369/387 (95.35%) participants appreciated the course structure and agreed to attend the next TBL session. Students rated the TBL class  $4.44 \pm 0.627$  on a five-point Likert scale, with 1 being severely dissatisfied and 5 very pleased. Students also liked the classroom ( $4.48 \pm 0.738$ ), TBL structure ( $4.41 \pm 0.771$ ), and self-preparation ( $4.28 \pm 0.780$ ). The orientation programme, instructional material, pre-recorded video, and handouts were also well-received. Most students (69.25%, 268/387) spent 1–2 days self-preparing before the TBL class, followed by 3–4 days (24.55%, 95/387) and 5–7 days (5.43%, 21/387), while 0.78% (3/387) did not self-prepare.

On a five-point Likert scale from 1 to 5, students assessed their self-understanding progress, stating that TBL increased their communication, learning, and enthusiasm ( $4.50 \pm 0.796$ ,  $4.41 \pm 0.781$ ,  $4.46 \pm 0.795$ ).

The student t-tests revealed no significant differences between students in years 2 and 3. Except time for preparation (Pearson's Chi-square test;  $p < 0.005$ ), medical students in years 2 and 3 had similar self-

assessment survey scores. In addition, Year 3 medical students also scored better in enthusiasm for studying

than Year 2 medical students in increasing self-understanding (Student t-test;  $p = 0.023$ ) (Table 1).

	Year 2	Year 3	<i>p</i> -value
<b>Student satisfaction towards the TBL class</b>			
Agree to attend the next TBL class: % (n)	95.95% (213/222)	94.55% (156/165)	0.519
Classroom: mean (SD)	4.49 (0.671)	4.47 (0.823)	0.903
TBL structure: mean (SD)	4.38 (0.73)	4.45 (0.822)	0.377
Orientation programme: mean (SD)	4.46 (0.628)	4.40 (0.810)	0.417
Teaching material: mean (SD)	4.67 (0.568)	4.56 (0.578)	0.064
Student preparation time: mean (SD)	4.20 (0.788)	4.40 (0.755)	<b>0.012</b>
<b>Time for preparation: % (n)</b>			
1–2 days	80.18% (178/222)	54.55% (90/165)	<b>&lt; 0.005</b>
3–4 days	14.41% (32/222)	38.18% (63/165)	
5–7 days	4.50% (10/222)	6.67% (11/165)	
No preparation	0.90% (2/222)	0.61% (1/165)	
<b>Promotion of learning skills</b>			
Communication skills: mean (SD)	4.46 (0.734)	4.56 (0.674)	0.154
Understanding of the topics: mean (SD)	4.36 (0.729)	4.47 (0.845)	0.180
Enthusiasm for learning: mean (SD)	4.38 (0.797)	4.56 (0.783)	<b>0.023</b>
Cronbach's alpha	0.869	0.869	

Table 1. Comparison between the satisfaction of medical students in years 2 and 3 towards the TBL class and agreement to the promotion of self-understanding

#### IV. DISCUSSION

TBL changes how students learn by encouraging them to become more accountable by preparing for the team assurance test and application exercise (Burgess et al., 2020a). Teacher-directed pre-class preparation for advanced tasks may involve reading textbooks, reference articles, or instructor-created material while the readiness assurance test enhances students' enthusiasm for TBL (Parmelee et al., 2012). However, students may resist TBL or active learning because it varies from passive lecture-based learning. Teachers must be aware of this and advocate TBL-style learning to improve ability and encourage students to be more prepared. This research examines the attitudes of medical students towards the two courses post-TBL and provides valuable input on TBL strategies, regardless of the course schedule.

Student feedback can improve teaching and student satisfaction. Students agreed that TBL can improve communication, learning, and passion. Second-year medical students were less motivated than third-year ( $p = 0.023$ ), implying they need to focus on the core content of the preclinical module rather than TBL preparation, while third years have more time management experience for pre-class self-study. Students liked the teaching material because, in addition to textbooks, the instructors prepared PowerPoint presentations, recorded VDOs, and documentation, allowing those with different learning styles to make the appropriate choice.

Interestingly, both classes found the TBL structure and location less satisfying, possibly because first-time students could not comprehend group activities. Students can further grasp the TBL framework and enjoy the structured process with a revamped instructional layout and additional classes. As for the classroom, the seat layout may prevent suitable group conversations, with a small-group or smart classroom being more appropriate for TBL.

The preparation time satisfaction results are significantly different, with Year 2 students being considerably less satisfied than Year 3 ( $p = 0.012$ ). Most second-year medical students spent one to two days planning, and third years one to four ( $p = 0.005$ ), primarily because the third-year course was longer. Second-year medical students attended a two-week course on human skin and the connective tissue system with a TBL class in the second week, whereas third years took a five-week haematological system course with a TBL class in the fourth week. Both classes received course material on Mondays, while the TBL was on Fridays in the same week. Second-year medical students may need to study the basic science aspects and be unable to independently assess the pre-class material, whereas third-year students had more time. Accordingly, a TBL course should last at least three to four weeks to allow medical students to understand the basic TBL instructional material and independently assess it.

This study has limitations. The questionnaire was expert-evaluated without instructor facilitation. In addition, our study focused on students' satisfaction with TBL, hence we didn't include academic outcomes to prove the value of TBL.

## V. CONCLUSION

The survey showed that students appreciated TBL-based learning since it helped them to work together and embrace learning, while potentially improving their study skills. A diversity of pre-class material allows students to choose learning tactics depending on their individual abilities. Students found the activity venue inadequate and classroom improvements would boost their satisfaction level.

## Notes on Contributors

KW reviewed the literature, designed the study, analysed data, co-wrote the manuscript, critically reviewed and edited the manuscript, and then read it through prior to final approval.

WD reviewed the literature, analysed the data, co-wrote the manuscript, and critically reviewed and edited the manuscript.

WR gave critical feedback on the writing of the manuscript.

AS and KL provided scientific insight and advice, and critically reviewed and edited the manuscript.

## Ethical Approval

This research was approved by the institutional ethics committee of the Faculty of Medicine at Chiang Mai University (Study code: PAT-2565-09243).

## Data Availability

On reasonable request, the corresponding author will provide data to support the conclusions of this study. Due to privacy and ethical considerations, the data cannot be made public.

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## Declaration of Interest

The authors confirm they have no potential conflicts of interest.

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