ORIGINAL ARTICLE

Team Based Learning (TBL) in Clinical Emergency Medicine Virtual Module

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ABSTRACT

Introduction: Team-based learning (TBL) is a learning strategy that activates students and can encourage critical thinking in solving patient problems. Students will be in a high-risk condition when working in a hospital during the pandemic COVID-19. Therefore, modifications were made to the emergency module by applying the TBL strategy. This was the first modification at the Faculty of Medicine, UIN Jakarta. **Methods:** This was a descriptive study of students enrolled in clinical emergency medicine virtual module. The total number of students who joined this module were 30. The number of males and females were 8 and 22, respectively. Students underwent 20 TBL sessions and MCQ summative exam in a virtual clinical emergency module. Data was analysed using JASP Version 0.15. **Results:** The mean tRAT score was greater than the mean iRAT score, and there was a statistically significant difference between both of them ($p<0.001$). In 14 TBL sessions, all students achieved the maximum tRAT score (100). There was no significant positive correlation between iRAT and the summative score ($r=0.4$; $p=0,005$). Only one TBL session showed no significant difference between the mean of the iRAT score and the mean of the tRAT score. **Conclusion:** This implementation of TBL suggests the effectiveness of TBL in achieving improved student academic performance. Further research needs to be done to look at other things like communication, collaboration skills, teamwork, and other professional behaviors.

Keywords: Team-based learning, Active learning, Online learning, COVID-19, Students

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INTRODUCTION

TBL is an active learning and small group teaching technique that allows students to apply conceptual information through a series of tasks that combine individual work, teamwork, and quick feedback. It may be used in big or small classrooms with several small groups in a single classroom. Following pre-class preparation, students must complete personal assignments (Individual Readiness Assurance Test/IRAT) then collaborate with their colleagues to discuss the group assignments (Team Readiness Assurance Test/TRAT) followed by immediate feedback from the experts (1). Professor Larry Michaelsen created TBL in the 1980s in response to growing class numbers and his concerns about the efficacy of learning from lectures to big groups in business schools in the United States (2). TBL helped us to improve teaching in an interesting way that suited to large groups of students, offered instant feedback, included students in decision-making, and encouraged active small group and class debates. TBL has gained favor in medical and healthcare education in recent years as a resource-efficient, student-centered teaching approach, and is occasionally used as a substitute for problem-based learning (PBL). TBL, in comparison to PBL, preserves the benefits of small group teaching and learning while obviating the need for a large number of teachers. TBL has been implemented in a variety of ways by a rising number of healthcare faculties throughout the world, in a range of situations and curriculum areas (3). The COVID-19 pandemic situation in Indonesia, which has not been controlled until now, has a significant impact on the implementation of the medical education learning process. All forms of teaching and learning activities on campus and in hospitals have been shifted to distance learning since last year. Implementing clinical modules, especially the emergency medicine module, during the pandemic distance-learning setting is highly difficult to do. Clinical students would be placed in high-risk conditions when working in a hospital during a pandemic. Therefore, modifications were made to the clinical emergency medicine module by applying the TBL strategy. This was the first virtual clinical emergency medicine module modification at the Faculty of Medicine, Islamic State University Jakarta.

This study aimed to observe the students' knowledge by assessing their level of achievement in an examination.

MATERIALS AND METHODS

Subject

The participant in this study were the second-year of clinical clerkship phase who underwent the hybrid offline module for the first time at Faculty of Medicine, UIN Jakarta.

Design

This was a descriptive study of students enrolled in clinical emergency medicine virtual module. Students underwent 20 TBL sessions and MCQ summative exam in a virtual clinical emergency module. A TBL session lasts approximately 2 hours. At each initial step of TBL in the classroom, students will work on iRAT questions and then tRAT questions. iRAT and tRAT consist of multiple-choice questions without vignettes, as many as 5-10 questions that are exactly the same. Multiple choice questions consist of 4 answer choices, namely 1 most appropriate key answer and 3 distracting answers. iRAT is carried out without being allowed to open a reference (closed book). It takes about 5-10 minutes. There is no discussion between students at this step. While in tRAT, students are allowed to discuss with discussion partners in a team that has been determined by the previous tutor outside the classroom. It takes about 15–25 minutes. The whole team reports the answers at the same time. The tutor provides feedback in the form of correct answers to students at the end of this step. In this step, the correct answer gets a score of 1, and the wrong answer gets a score of 0.

The summative exam is held at the end of the Virtual Emergency Medicine module. The exam consists of 100 multiple choice questions (MCQ) using all the material discussed in the previous TBL stage. It takes about 100–110 minutes. The correct answer is given a score of 1, while the wrong answer is given a score of 0.

Statistical analysis

Data was analyzed using JASP Version 0.15.

RESULTS

Total of students who joined this module were 30 students. The number of males and females were 8 and 22, respectively. The mean of iRAT score was 76.3±4.6 and the mean of tRAT score was 92.8±1.64. The mean of tRAT score was greater than the mean of iRAT score and there was a statistically significant between both of them ($p<0.001$) (Table I). In 14 TBL sessions, all students achieved the maximum tRAT score (100). Only one TBL session showed no significant difference between the mean of iRAT score and the mean of tRAT score ($p=0.086$).

Table I: The Average of the iRAT and tRAT Scores

Group	N	Mean		*P* value of mean between iRAT and tRAT
		iRAT	tRAT	
Students	30	76.3 ± 4.6	92.8 ± 1.64	$p<0.001$

The mean of summative score was 70±6. The results found that there was no significant positive correlation between iRAT and summative score (r=0.07; p=0.7). There was no significant negative correlation between tRAT and summative score as well (r-0.3; p=0.06). Meanwhile, the correlation between iRAT and tRAT score showed a significant positive correlation (r=0.4; p=0,005) (Table II).

Table II: The Summative Score's Mean and Its Correlation

Group	Mean of summative score	iRAT and summative score		tRAT and summative score		iRAT and tRAT	
		r	p	r	p	r	p
Students	70±6	0.07	0.7	0.3	0.06	0.4	0.005

DISCUSSION

The literature on Team Based Learning (TBL) as a teaching approach was quickly increasing during the Pandemic COVID-19 situation. Curriculum modifications are often described in the literature as a means of dealing with the present circumstances. Due to the suspension of face-to-face interactions in medical schools, most institutions switched to online delivery for their preclinical program, but eliminated or abbreviated the clerkship term for the clinical years. The use of alternative teaching approaches as a countermeasure, as seen by several studies published after the outbreak, demonstrates medical schools' worldwide attempts to overcome the COVID-19 pandemic's teaching constraints (4,5).

The large number of COVID-19 cases in the Hospital Emergency Room can endanger the safety of students. Therefore, the Emergency Medicine Clinical Practice Module cannot be carried out in hospitals like in the years before the COVID-19 pandemic. The Team Based Learning (TBL) learning experience method was chosen as the main method used in this module with various considerations. Learning outcomes that cannot be realized in this module are expected to be achieved during the internship.

From our results, we find that the correlation between iRAT and tRAT score showed a significant positive correlation. We found some literature that shows similar results to us. Examples such as this, as well as literature from Lochner et al. (2018), attempt to adapt interprofessional Team Based Learning (TBL) to improve patient safety. There were 39 students in the class, from five different bachelor's degree programs. Participants gave TBL high marks as a teaching model. They had a 100% response rate since completing the

pre-questionnaire was a requirement for participation and completing the post-questionnaire was required to receive the participation certificate. In the post-test questionnaire, TBL reveals that students scored better on items related to "retention" and "self-study" (84.6 and 64.1%, respectively), with the difference being significant ($p<0.05$). After that, the IRAT's mean scores were compared to the GRAT's results. All teams exceeded their individual team members' mean score, with an average mean difference of 1.41 points (10.1%). In the end, the students thought TBL was a good idea. (6) Joseph DeMasi et al. (2019) also used a modified Team Based Learning (TBL) strategy in a classroom-based vs online format to assess student learning outcomes and preferences in an upper-level undergraduate immunology course. The outcomes are comparable to ours. In all four modules, students performed equally well on the IRATs, regardless of whether they performed TBL in class or online. However, students performed better on the GRATs than the IRATs after using the TBL methodology, regardless of whether they performed TBL in class or online (7).

Same as the results we got, although the average iRAT value is quite good. However, student performance was much better during the tRAT implementation. The average value obtained is very good. We suspect several factors are the cause, including that reading material is sometimes only given the day before the TBL implementation. Then each topic consists of many sub-sections of material that must be studied in one night. The reading material obtained is still too general and less specific. When working on the iRAT questions, it turns out that the material that has been read and what is in the questions are quite different. This causes several obstacles in learning, such as not being optimal in preparing for the previous study, which has an impact on the performance of the iRAT score. Therefore, the TBL material needs to be specified and readjusted with respect to the material that will be asked during the iRAT. They also need more time to make questions and resources for this first TBL. Some teachers need more time for this.

The implementation of the module time is also limited to three weeks, so that some TBL implementations can be carried out on more than one topic in one day. This is sure to put a lot of pressure on students' time and minds to read all of the reading materials that they have been given. We also suspect that not all reading sources are well standardized. For example, what is the maximum number of readings that can be assigned to a student, and how dense must the content of each reading source be in order for each TBL to remain relevant? So, in the future, teachers should improve again when it comes to the quality of reading materials they give to their students. It should also be remembered that briefing and training have been carried out for all TBL teachers prior to this module taking place. However, we have to improve the quality of this provision so that in the future, all TBLs are standardized, both in terms of content and material delivery.

In accordance with the results we got, the tRAT value was significantly increased compared to the iRAT value. In our view, this is because the quality of their group discussions during tRAT was quite good. This is inseparable from the fact that most of the participants in this module have passed almost all clinical stations and will soon join the national examination board. So, of course, they already have good prior knowledge. They can think independently and formulate cases in the form of solid discussions.

However, one of the things we also found was that the mean summative score was 70±6. The results showed that there was no significant positive correlation between iRAT and the summative score ($r=0.07$; $p=0.7$). There was no significant negative correlation between tRAT and the summative score either. Of course, this is an interesting thing to discuss, considering the progress of student performance when iRAT and tRAT are good, even though the execution of the exam at the end does not even get satisfactory results. We suspect that one of the reasons is the quality of the questions that have not been standardized properly. Both in terms of content that has not been well synchronized with the TBL material and in terms of writing questions that are not standardized. The implementation of the TBL method, which was implemented for the first time, also made several things like this not optimally implemented.

However, we also found results like this in some literature. Susanne Skjervold Smeby et al. (2020) published a paper on the TBL technique in neuroradiology that found there were no statistically significant differences in student exam results using the TBL technique. Students expressed high levels of interest and satisfaction with TBL sessions as compared to standard lectures. Students evaluated TBL sessions higher than lectures in terms of their ability to cover difficult topics in depth, engage students, and provide feedback. A cross-over study involving 105 third-year medical students was undertaken, with two modified TBL sessions serving as the effective learning intervention and two standard lectures serving as the control. The outcomes of the neuroradiology section of the end-of-year written test were used to evaluate student learning (8).

Whittaker et al. (2015) discovered, however, that the TBL group performed much better on course assessments, scoring significantly higher. According to Park et al. (2014), there is a strong link between iRAT and test grades, showing that self-directed learning improves individual preparation by motivating students to study on a regular basis and enhances their comprehension. Despite mentioning a relationship between iRAT and test outcomes, this study found no evidence that using

the TBL approach rather than other methods of learning and teaching enhances overall exam scores (9,10).

In the self-reflection session at the end of the module, students said that TBL had made student active interactions much higher than when giving material using the lecture method. So that the students' contributions are more for active learning, looking for their own reading material and daring to express opinions in discussions. They argue that TBL needs to be continued in the future as an alternative to new learning methods.

CONCLUSION

The implementation of the clinical emergency virtual module by TBL suggests the effectiveness of TBL in achieving improved student academic performance. In the future, students say that TBL should be used as a way to learn new things. Further research needs to be carried out to evaluate other achievements such as communication, collaboration skills, teamwork, and other professional behaviors. TBL could serve as an alternative to Problem-based Learning (PBL).

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