

Original Article

A comparative study on perceptions of medical students from the different curriculum on team-based learning

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ABSTRACT

Objectives: Our medical school followed the traditional curriculum earlier, and due to a large amount of content embedded in each discipline, which had less scope for active and deep learning. To overcome this, we adopted an integrated curriculum and introduced a few active teaching/learning (T/L) methodologies, which promote deep learning and problem-solving skills. One such T/L methodology we introduced was team-based learning (TBL). Before implementing this active T/L methodology in the integrated curriculum, we evaluated the effectiveness of TBL in medical students from the traditional curriculum and aimed to determine students' perceptions. Furthermore, we aimed to explore the perception of TBL in students who underwent integrated curriculum to evaluate the difference in their perception compared to the traditional curriculum.

Materials and Methods: This cross-sectional study was conducted in RAK Medical and Health Sciences University on the 1st year medical students from the traditional and integrated curriculum. Institutional ethical committee clearance and informed consent were obtained before starting the study. A pre-validated 5-item survey questionnaire comprising questions related to the content, process, and teamwork was used to obtain perceptions of students' on TBL.

Results: The students positively perceived the teaching-learning experience using TBL and understood the concepts better. Even the students with integrated curriculum had the same positive impact on their learning attitudes. The majority of students in both cohorts agreed that discussion among their teams helped them to learn better. Around two-thirds (66%) of students from the traditional curriculum and one-third (39%) of students from integrated curriculum wanted TBLs as T/L methodology over didactic lectures.

Conclusion: TBL helped to learn better and understand the subject and promoted self and peer engagement, which facilitated their learning by clarifying the doubts with peers. Due to this positive TBL experience, most students from both curriculums recommended its use as a T/L method over lecture. Hence, TBL sessions in medical schools can be used as an effective T/L method to facilitate meaningful learning.

Keywords: Teaching-learning, Team-based learning, Integrated curriculum, Traditional curriculum

INTRODUCTION

Since Flexner's days, the traditional medical curriculum implies that students need to learn basic sciences first and then move to clinical sciences.^[1] The curriculum is simply a stack of separate courses which are discipline based and teacher centered.^[2] Our medical school followed a traditional curriculum earlier, and due to a large amount of content embedded in each discipline, which facilitated less scope for active and deep learning. In addition, the use of lectures as a

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predominant teaching-learning method and lack of active learning strategies do not provide enough opportunity for the students to engage in self-directed learning. In the long run, this caused difficulty for students to apply basic science knowledge in clinical years. To overcome these deficiencies of a traditional curriculum, medical schools worldwide regularly transform or modify their curricula to offer students optimal preparation for their work in the changing world of the health professions.

The vital aspect of teaching/learning (T/L) is applying theoretical knowledge in clinical years, which could be best achieved by integrating the different subjects. Therefore, medical education has undergone numerous changes in recent decades to promote integrated curriculum further and provide comprehensive support for active learning.^[3] An integrated approach in this curriculum allows active involvement of students in learning and understanding the concepts in a better way and encourages them to think like doctors. Considering the benefits and popularity of integration in medical education, we have changed from traditional to integrate. The proposed integrated curriculum included more active learning strategies based on current educational theories and principles. Integration of curriculum also helps to adopt competency-based medical education (CBME) approach to ensure the development of competencies in medical graduates to fulfill patient and societal needs. CBME has several advantages such as greater accountability, flexibility, and learner centeredness. The learner centeredness can be inculcated in early years in medical schools by introducing more active T/L methods and decreasing the didactic lecture (DL). We have minimized the lectures in the proposed integrated curriculum, and active T/L methods such as case-based learning and team-based learning (TBL) were included in the study. Integrated small-group learning methods were adapted, facilitating adequate interaction of the students with their peers and tutors. This approach was found to be effective in motivating deep learning. In addition, this approach helps students to develop soft skills such as critical thinking, communication skills, and teamwork, which are highly valued attributes needed for their future practice.^[4]

Before implementing the active T/L methodologies in the integrated curriculum, we wanted to evaluate the effectiveness and determine students' perceptions of these new methodologies' educational experience. Hence, we used TBL to cover one of the anatomy topics for medical students in a traditional curriculum.

TBL has gained popularity in medical education, maintaining small-group teaching, student interactions, immediate feedback, self-directed, and deep learning.^[5] It is a student-centered teaching modality that requires individual and group accountability to solve the problem and ensure a successful

and enjoyable teaching-learning experience. Accordingly, it requires active participation and a lot of preparation. It also helps the students to apply their knowledge, master the course content, develop critical thinking, and apply their learning concepts to solve clinical problems.^[6] More importance is given to small-group interactions in TBL, and existing knowledge is used to solve different problems/cases.^[7] Many studies have demonstrated that TBL is a valuable strategic approach that employs active learning, which helps students to learn the concepts individually and socially interacting with their peers and construct those concepts in solving the cases.^[4] This enhances student adaptability in problem-solving situations.

Conventionally, TBL is conducted in three phases: Phase 1, pre-class preparation or out-of-class preparation by the students such as reading materials, recommended textbooks, or recorded lectures. Phase 2 begins in class, where students' individual knowledge of pre-reading is assessed through an individual readiness-assurance test (i-RAT). In Phase 3, the team readiness assurance test (t-RAT), where students work in teams on the same set of questions given in i-RAT, and then, the clinical problem-solving activity is done. Here, students again work in the same teams through interactions and analyses by consolidating their prior knowledge through discussion. TBL is a strategy that facilitates active learning in a large-group setting using limited faculty resources.

With this background, we have designed this study to explore the perception of students who underwent traditional curriculum after implementation of TBL in one of the topics and students who are in integrated curriculum with TBL as an integral part of their curriculum.

MATERIALS AND METHODS

This cross-sectional study was conducted in RAK Medical and Health Sciences University on the 1st year medical students of different cohorts. Cohort 1 students were in traditional and Cohort 2 in the next academic year had an integrated curriculum. Institutional ethical committee clearance was obtained before the start of the study, and informed consent was obtained before administering the survey. A total of 200 students (100 students from each cohort) were involved in the study. Traditional curriculum class was grouped as Cohort-1, and integrated curriculum class was grouped as Cohort-2 hereafter. The students were clearly explained about the TBL process and its importance.

Learning outcomes of the topic dealt through TBL and related reading materials were sent to the class a week before the session. Team formation was done before the session, and each team had 5–7 students. Each team had a heterogeneous set of students grouped based on their performance in their examinations or at the school levels. Faculties involved in the TBL set up the learning outcomes and plan of the session.

The lesson plan was made based on the nine instructional events proposed by Gagne.^[8]

One-best answer questions that include a mix of recall, comprehension, and application types were prepared for i-RAT and t-RAT. In addition, few case scenarios were prepared for the clinical problem-solving activity to facilitate applying the acquired knowledge. Students work in their teams through interaction and discussion in this activity, construct new knowledge, and analyze by consolidating their prior knowledge.

Providing feedback is essential and has a powerful influence on learning. The effectiveness of the feedback depends on the type, timing, and the way it is given.^[9] Here, we utilized four levels of the feedback mentioned in the article "Power of feedback." It includes input on the task, process, and team level. Self-regulatory level feedback is self-explained through the performance in the i-RAT.^[9]

A pre-validated 5-item survey questionnaire was used to get students' feedback about the TBL. The face and content validity of the questionnaire was verified by colleagues who are not part of this study. The questionnaire was modified based on their comments. Following that, the questionnaire was administered to ten 3rd year medical students and timings for the survey completion, and their feedback was obtained. Again, the content was validated based on their feedback before administering it to the study group. The survey included questions related to the content, process, and teamwork to obtain the students' perceptions involved in the TBL. After completing TBL, the students were given this questionnaire and asked to complete it at the end of TBL. The data obtained were entered into Microsoft Excel and analyzed using SPSS version 24. The descriptive statistics were done to know the distribution of various parameters, and responses for each item were expressed in percentage. A Chi-square test was used to compare the responses between the groups using SPSS. $P < 0.05$ was considered statistically significant.

RESULTS

The responses of students from each cohort are depicted in Table 1. The study showed that most students in both cohorts agreed that they could learn and understand concepts (69% and 68%, respectively). The majority of students in both cohorts agreed that discussion helped them to learn. About 66% of students from Cohort-1 wanted to use more TBLs as teaching methodology over lectures, whereas 39% of students from Cohort-2 opined in favor.

A majority (54% from Cohort 1 and 49% from Cohort 2) opted neutral in terms of difficulty. Both the cohorts agreed that the most useful aspect of TBL was team learning (36% from Cohort 1 and 43% from Cohort 2) followed by others.

In comparison, we found a significant difference among groups for the response to understanding the subject and replacing lectures with TBLs among the TWO groups, as shown in Table 2.

The students were given the option of opened ended response, and their details are mentioned in Table 3.

DISCUSSION

This study was initiated to assess the perception of TBL in two cohorts who underwent two different curricula that are traditional and integrated. In traditional curriculum, the most common teaching methodology was didactic lectures, whereas, in the integrated curriculum (vertically and horizontal), it was a mixture of lecture and active teaching-learning methods. The teacher-centered DL provides an up-to-date summary of the topic, and the knowledge is spoon-fed with limited student engagement, interaction, and feedback. Studies have shown that this approach is passive, resulting in low receptivity and superficial learning.^[10]

In contrast, active T/L sessions like TBL have a blended approach with student engagement inside and outside the classroom.^[5] It focuses on solving the problems using course concepts, providing them with conceptual and procedural knowledge.^[11] The TBL was introduced to medical students with a traditional curriculum to know the effectiveness of this teaching methodology. The students in our study had a positive perception of the teaching-learning experience using TBL and understood the concepts better. Even the students with integrated curriculum had the same positive impact on their learning attitudes. This is in accordance with other studies where students agreed that the TBL is a better learning strategy, facilitates consistency in their study, reinforces self-directed learning, and promotes critical thinking, problem-solving, and examination preparation.^[6,12-15] A comparative study done using MCQ-based tests showed improved students' test scores after the TBL session compared to didactic lectures.^[12]

TBL is grounded in multiple educational theories such as adult learning theory, constructivism, and social learning theory. The key principle of adult learning theory is "Adults learn most efficiently through experiential techniques such as discussion or problem-solving in a flexible environment."^[16,17] In our opinion, this principle states that learning is efficient if there are more interaction and discussion about a concept or a problem. The debate occurs if the learners are comfortable and feel, the environment is safe to express their views. Learners can recognize their learning needs, identify the resources, and mutually plan the methods by organizing their prior experiences. This kind of learning occurs by internal and external motivation. Medical education is effective if the

Table 1: The responses of the students from two cohorts to questionnaire.

Questions	SA (%)	A (%)	N (%)	DA (%)	SDA (%)
I was able to learn and understand the anatomy concepts using the TBL method					
Cohort 1	18 (26)	30 (43)	12 (17)	7 (10)	3 (4)
Cohort 2	11 (13)	46 (54)	12 (14)	12 (14)	4 (5)
Discussing the answers to the questions with my group helped me to understand the material well					
Cohort 1	21 (30)	31 (44)	11 (16)	4 (6)	3 (4)
Cohort 2	16 (19)	37 (46)	16 (19)	13 (15)	1 (1)
We should use TBL to replace more lectures					
Cohort 1	13 (19)	33 (47)	10 (14)	7 (10)	7 (10)
Cohort 2	9 (11)	23 (28)	22 (27)	17 (21)	11 (13)
The anatomy TBL was	Very Easy	Easy	Neutral	Difficult	Very difficult
Cohort 1	0	5 (9)	32 (54)	10 (17)	12 (20)
Cohort 2	1 (1)	8 (10)	39 (49)	29 (36)	3 (4)
What were the most useful aspects of TBL activity?	Team learning	Tutorial	Testing	Feedback	Pre-class preparation
Cohort 1	36 (36)	10 (10)	32 (32)	10 (10)	12 (12)
Cohort 2	42 (43)	16 (16)	16 (16)	7 (7)	18 (18)

SA: Strongly agree, A: Agree, N: Neutral, DA: Disagree, SDA: Strongly disagree

Table 2: The mean and SD of various parameters in the groups.

Questions	Cohort 1 Mean ± SD	Cohort 2 Mean ± SD	P-value
I was able to learn and understand the anatomy concepts using the TBL method.	2.24 ± 1.08	2.34 ± 0.93	0.013 (S)
Discussing the answers to the questions with my group helped me to understand the material well.	2.10 ± 1.03	2.31 ± 0.96	0.244 (NS)
We should use TBL to replace more lectures	2.45 ± 1.2	2.97 ± 1.21	0.012 (S)
The anatomy TBL was	3.12 ± 0.53	3.35 ± 0.79	0.439 (NS)
What were the most useful aspects of TBL activity?	2.52 ± 1.38	2.42 ± 1.53	0.194 (NS)

Table 3: Open-ended question responses in the groups.

Questions	Responses
What were the least useful aspects of TBL activity?	<ul style="list-style-type: none"> • Group discussion was noisy and confusing • t-RAT was more organized • Select easy topics • Pre-knowledge need to prepare • Lot of time wasted • Collaborating with others found difficult
What changes would you make to improve the TBL activity?	<ul style="list-style-type: none"> • Want 50% marks for both sessions. • No need for negative marking • More references needed • Need more improvement in discussion • Can have pre class lecture • Need more TBLs • Some concepts were very hard • More time for i-RAT • Need more interaction with others in t-RAT • Give topic of clinical importance

learning environment is conducive to the learners so that they have active involvement in developing their learning needs. The TBL allows collaborative learning in which the learners interact with the tutors and their peers, which facilitate deep learning. Previous experience acts as building blocks for knowledge and understanding, which can be applied to their future practice to solve problems. The key principle of constructivism is "New knowledge is constructed on existing knowledge by socially interacting with their peers."^[18] This principle states that new knowledge is built and elaborated by interpreting the prior knowledge through interactions and discussions.

In our study, the majority agreed that TBL helps them learn and understand the subject, and they were encouraged to have team discussions to clarify the doubts. Most of the students in both the curriculum were of the opinion that team discussion and learning with their peers was beneficial. This positive attitude about working with peers was in acceptance and noted in other studies as well,^[6,12,19] however, few studies reported that the students did not value teamwork in TBL and were reluctant to accept the mixed gender teams.^[13,15] In our study, few students commented in the open-ended feedback that they had difficulty collaborating with their teammates and felt team discussion was noisy and confusing.

Experts opine that teams or groups are diverse and work better if there is heterogeneity, which means each team has students with different personalities and learning styles. Students' learning styles are based on different sensory modalities.^[11,13,15,20] We have considered these factors while forming the teams. We believe this positively impacted student engagement during group discussions, which favored a positive learning experience.

Michaelson *et al.* mentioned four essential elements of TBL: Well-formed group with excellent dynamics, student's accountability for their individual and team performance, frequent and immediate feedback, and good team assignments to promote learning and team development.^[11] One of the challenges of TBL is student involvement and prior preparation. Some students may not be involved in the discussion, which can impact team performance and group dynamics. To overcome this, our facilitators kept a check on each team during the discussion phase, which facilitated each team to engage with peers during tRAT and problem-solving activities.

Most students have noted TBL activities to be more engaging, effective, and enjoyable than conventional didactic lectures. Teachers may act as facilitators and use constructivist learning theories, which result in an improved learning process.^[21] The faculties involved in TBL retain the control of content and act as facilitator and content expert, unlike other forms of active learning.^[22] Facilitators ensure that the students will have effective interactions, help them construct a meaningful, coherent model, and support each student's unique learning style. They should guide the discussions so that specific learning outcomes are met.^[23] To enhance the facilitation ability, we have conducted workshops and training on TBL to train the facilitators and tutors to conduct the session successfully.

The students in the traditional curriculum expressed a higher level of agreement for replacing didactic lectures with more active learning strategies like TBL. However, students in an integrated curriculum with more active teaching-learning sessions expressed mixed levels of agreement. This we relate to more time required for self-directed learning, and students in the integrated curriculum have to work more on pre-class preparation. Another reason was that 5% of total iRAT and tRAT scores of all TBLs conducted in the year were counted for the final grade calculation for Cohort 2 students. Hence, a minority of students, particularly the low achievers, preferred didactic lectures instead of TBL. This was reported in other studies where students who had difficulty in self-directed learning supported lectures when compared to TBL.^[6,24,25]

In our study, some students expressed that few concepts dealt with through TBL were difficult and suggested having pre-TBL lectures or easy topic inclusion. These findings were in line with the previous studies in which authors suggested

mini-lectures that emphasized essential and complex concepts along with active learning strategies.^[20]

CONCLUSION

Our experience of using TBL as a T/L method is positive for students who underwent a traditional and integrated curriculum. It created an enjoyable and conducive learning environment. In addition, TBL facilitated active and collaborative learning, critical thinking, and problem-solving ability among students. Hence, TBL can be used as one of the effective teaching-learning methods in both types of curriculum. Further qualitative and quantitative studies can be planned in multiple cohorts of students to substantiate these findings.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

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