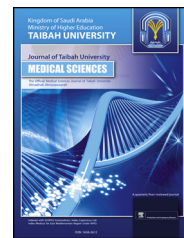




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Original Article

## Student feedback on team-based learning in a preclinical oral surgery course: A pilot study

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Received 13 November 2023; revised 13 May 2024; accepted 2 June 2024; Available online 15 June 2024



### المخلص

**أهداف البحث:** التعلم القائم على الفريق هو طريقة تركز على الطالب حيث يمكن تعزيز وتسهيل التعلم من خلال تحويل المحاضرة التقليدية إلى عملية حل مشكلات نشطة وديناميكية وأكثر جاذبية. هدفت الدراسة الحالية إلى تقييم تجربة التعلم ورضا الطلاب باستخدام طريقة التعلم القائم على الفريق في دورة جراحة الفم قبل السريرية.

**طرق البحث:** تم تصميم اثنتي عشرة جلسة تعلم قائمة على الفريق لطلاب السنة الثانية في طب الأسنان. تم إجراء ست جلسات من ثلاث ساعات في الفصل الدراسي الأول وست جلسات من ساعتين في الفصل الدراسي الثاني مع مواضيع مختلفة قبل السريرية. تم تضمين أنشطة تعليمية مثل الاختبارات والمناقشات الجماعية في الجلسات. استهدفت الاستبانة التي تم توزيعها بعد الجلسة الأخيرة معرفة آراء الطلاب ورضاهم لتقييم أربعة معايير تتعلق باكتساب المعرفة، وتعزيز المهارات الشخصية، وبيئة التعلم، وعلاقات المعلم بالطلاب.

**النتائج:** توافق معظم متوسطات الدرجات الخاصة بالردود مع العبارات المتعلقة بالمعايير الأربعة. كشفت نتائج اختبار ارتباط بيرسون عن وجود علاقة ذات دلالة إحصائية (معامل الارتباط يساوي 0.735 وقيمة الاحتمال أقل من 0.05) بين معايير الجلسات التي استمرت لثلاث ساعات وتلك التي استمرت لساعتين.

**الاستنتاجات:** أظهرت طريقة التعلم القائم على الفريق مستويات عالية من الرضا، والتي قد تعزى إلى التنفيذ السليم لمنهجية التعلم القائم على الفريق من قبل المعلم والطلاب.

**الكلمات المفتاحية:** التعلم القائم على الفريق؛ رضا الطلاب؛ ردود الفعل؛ التقييم؛ نتائج التعلم

### Abstract

**Objectives:** Team-based learning (TBL) is a student-centered method where learning can be promoted and facilitated by changing the traditional teaching lecture into an active, dynamic, and more engaging problem-solving process. The present study evaluated the student's learning experience and satisfaction using a TBL method in a preclinical oral surgery course.

**Methods:** Twelve TBL sessions were designed for second-year dental students. Six 3-h and 2-h sessions with various preclinical topics were conducted in academic Terms 1 and 2, respectively. Teaching activities such as tests and group discussions were included in the sessions. The last post-session questionnaire sought students' feedback and satisfaction to assess four parameters related to students' knowledge acquirement, interpersonal skills enhancement, learning environment, and teacher–student relationships.

**Results:** Most average scores of the responses agreed with the related statements in the four parameters. The results of the Pearson's correlation test revealed that there was a significant relationship ( $r = 0.735$ ;  $P < 0.05$ ) between the parameters of the 3-h and 2-h sessions.

**Conclusion:** The TBL method yielded positive and high levels of satisfaction, which may be attributed to the proper implementation of TBL methodology by the teacher and students.

**Keywords:** Assessment; Feedback; Learning outcomes; Student satisfaction; Team-based learning

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Peer review under responsibility of Taibah University.



Production and hosting by Elsevier

## Introduction

Team-based learning (TBL) is defined as “an active learning and small group instructional strategy that provides students with opportunities to apply conceptual knowledge through a sequence of activities that includes individual work, teamwork, and immediate feedback.”<sup>1</sup> The students’ learning abilities can be promoted and facilitated by changing their learning method from a traditional face-to-face lecture to a more effective, self-oriented, and dynamic problem-solving group of learners.<sup>2</sup> This change should always be evaluated, and providing feedback to students on such learning techniques is very important.<sup>3</sup> In TBL, learners are encouraged to collectively discuss clinical scenarios and share knowledge to reach the intended learning outcomes, keeping in mind that students’ awareness and interpersonal communication skills would also be improved via their reflection during the learning process.<sup>4</sup>

The initial components of TBL include thorough preparedness, readiness assurance, and application of course concepts.<sup>5</sup> The scientific materials would initially be assigned to students before the session so that they read and prepare their assignments on the designated topic. The learners would start their session by taking an individual brief test with single best answer (SBA) questions and short questions and answers. The same test would be retaken as a small group team. The learners would then complete the session by presenting their assignments and sharing their thoughts. At this point, active group discussion would foster the learners’ critical thinking skills.<sup>6</sup> Moreover, building a primary positive connection between learners themselves and the educator will always aid in reaching a reinforced student engagement<sup>7</sup> and thus an enjoyable teaching session that will enrich their knowledge and learning.

TBL might offer a more successful teaching approach for dentistry education at the undergraduate level. Research indicates that using TBL in undergraduate dentistry programs enhances student achievement in contrast to conventional lecture-based methods with higher satisfaction.<sup>8,9</sup>

Although there is encouraging data to date to support the use of TBL in healthcare education, the application of TBL has mainly been in the training of medical, nursing, and allied healthcare professions.<sup>10,11</sup> Furthermore, there is some evidence that TBL may be effective in delivering undergraduate dental curriculum, as highlighted in a scoping review.<sup>12</sup> Hence, the present study evaluated the student’s learning experience using the TBL method in a preclinical oral surgery course taught by the Faculty of Dentistry at Prince Sattam Bin Abdulaziz University (Al-Kharj, KSA).

## Materials and Methods

The Department of Oral and Maxillofacial Surgery and Diagnostic Sciences launched the TBL method to teach preclinical oral surgery for the second year at the College of Dentistry. This professional year is considered the preclinical foundation designed by the College of Dentistry for future real-life clinical activities. The designated course comprises two terms where Term 1 is designated for the principles of

local anesthesia in dental practice, and Term 2 is designated for the principles of exodontia.

Twelve TBL sessions were designed for second-year students (19 students in the academic year 2021–2022 and 18 students in the academic year 2022–2023).

Six 3-h sessions were conducted in Year 2 Term 1 (Y2T1); 1 h was added to the initial 2 h of learning time to conduct team activities on the maximum recommended dose and related calculations of different anesthetic agents used in dentistry. The initial subjects comprised pain theories, neurophysiology and anatomy, pharmacology of local anesthetics, pharmacology of vasoconstrictors, local anesthesia techniques, and complications of local anesthesia. On the other hand, six 2-h sessions were conducted in Year 2 Term 2 (Y2T2) where subjects comprised principles of exodontia, intra-alveolar extraction techniques, surgical extractions, suturing, postoperative care, and complications of exodontia.

One week before the activity, all of the students in Y2T1 and Y2T2 received through their institutional email the preclass preparation study material with complete information. The detailed stages including materials preparation, readiness assurance testing, and in-class problem-solving activities. Preclass readings on assigned materials were mandatory so that the students began the class ready, organized, and well-equipped.

Students were divided into teams of six, and all sessions were conducted by the same instructor in both academic years. To begin the designated lesson, students took an individual readiness assurance test (iRAT) of short answers and multiple choice questions and then they re-tested as a team (tRAT). Scenarios encouraging students to engage in group discussion were provided, and students’ teamwork activities were designed for students to learn from each other and apply knowledge learned from course content to solve complex problems that may be encountered in real life.

## Questionnaire

The cross-sectional descriptive questionnaire adopted from a previous study<sup>13</sup> was composed of 20 written questions. The same questionnaire was handed to students at the last TBL session of both Terms 1 and 2. Answers to the statement questions were unidentified, confidential, and handed back to the teacher after completion to be assessed using the 5-point Likert scoring method. The questions were designed to assess the impact of TBL on students’ knowledge acquirement, interpersonal skills enhancement, learning environment, and teacher–student relationships.

## Statistical analyses

The data were accumulated, administered, and evaluated using the SPSS statistical package, version 22.0 (IBM, Armonk, NY, USA). Pearson’s correlation coefficient ( $r$ ) was applied for statistical analysis where  $P < 0.05$  was considered statistically significant.

## Results

Thirty-six of thirty-seven students (97%) filled out the questionnaire, as one student withdrew from the academic

year 2021–2022 at the start of the second term. The range of scores of the responses to all of the evaluated statements was calculated based on the criteria shown in [Table 1](#). The statements' response scores of all four parameters are summarized in [Table 2](#).

#### Knowledge acquirement

The highest response score in Y2T1 was related to the statements “TBL enhances long-time memories” and “TBL encourages students' collaborative work,” where 92% of students strongly agreed with the associated statement. The latter statement also had the highest score in Y2T2, in which 86% of responses agreed.

#### Interpersonal skills

The highest response score in Y2T1 was related to the statements “TBL enhances problem-solving” and “TBL

encourages teamwork,” where 92% of students strongly agreed with the associated statement. The latter statement also had the highest response score in Y2T2 along with the statement “TBL develops critical thinking,” in which 90% of responses strongly agreed.

#### Learning environment

The highest response score in Y2T1 was related to the statement “TBL improves students' involvement and interactions,” in which 92% of responses strongly agreed. The latter statement also had the highest score in Y2T2 along with the statement “TBL increases in-class attention,” in which 90% of responses strongly agreed. On the other hand, most of the responses were agreed to in Y2T2 except the statement “TBL triggers recognition of the classmates' skills,” in which 82% of the responses were neutral.

#### Student–teacher relationship

The highest response score in Y2T1 was related to the statement “TBL helps students comprehend the teacher's interests,” in which 90% of the responses strongly agreed. The latter statement also had the highest response score in Y2T2, in which 84% of responses agreed. However, the statement “TBL generates a convenient student interaction with the teacher” had a neutral response in Y2T2 (80%), which was different from Y2T1 in which 88% of the responses strongly agreed.

The means of the responses of the two academic Terms 1 and 2 was calculated and compared as shown in [Table 3](#).

**Table 1: Statements' responses and related scoring range on the Likert scale.**

Response	Value	Range
Strongly Agree	5	4.21–5.00
Agree	4	3.41–4.20
Neutral	3	2.61–3.40
Disagree	2	1.81–2.60
Strongly Disagree	1	1.00–1.80

**Table 2: Calculations of the parameters according to the Likert scoring scale.**

Statement	Y2T1 mean (SD)	Y2T2 mean (SD)
<b>Knowledge Acquirement</b>		
1. TBL enhances learning in class	4.40 (0.94) SA	3.60 (1.28) A
2. TBL enhances long-term memories	4.50 (0.64) SA	3.50 (1.16) A
3. TBL enhances self-motivation for learning	4.20 (0.89) A	3.50 (1.16) A
4. TBL encourages students' collaborative work	4.50 (0.64) SA	3.90 (0.88) A
5. TBL enhances deep reading and learning	4.20 (0.89) A	3.50 (1.16) A
<b>Interpersonal Skills</b>		
6. TBL enhances problem-solving	4.50 (0.58) SA	3.50 (1.14) A
7. TBL promotes interpersonal skills	4.30 (0.88) SA	3.80 (1.10) A
8. TBL develops critical thinking	4.40 (0.84) SA	4.40 (0.52) SA
9. TBL enhances flexibility and mutual respect	4.30 (0.88) SA	3.90 (1.06) A
10. TBL increases self-esteem	4.20 (1.25) A	3.90 (1.06) A
11. TBL encourages teamwork	4.50 (0.58) SA	4.40 (0.52) SA
<b>Learning Environment</b>		
12. TBL creates further chances for questions and answers	4.40 (0.80) SA	3.50 (1.12) A
13. TBL makes a more cheerful learning atmosphere	4.30 (0.88) SA	3.60 (1.05) A
14. TBL allows better management of classroom time	4.40 (0.80) SA	3.60 (1.05) A
15. TBL increases in-class attention	4.30 (0.88) SA	4.40 (0.85) SA
16. TBL encourages punctuality	4.30 (0.88) SA	3.60 (1.11) A
17. TBL improves students' involvement and interactions	4.50 (0.58) SA	4.40 (0.52) SA
18. TBL triggers recognition of the classmates' skills	3.80 (1.07) A	3.40 (1.40) N
<b>Teacher–Student Relationships</b>		
19. TBL helps students comprehend the teacher's interests	4.40 (0.54) SA	3.60 (1.12) A
20. TBL generates a convenient student interaction with the teacher	4.30 (0.88) SA	3.30 (1.45) N

TBL: Team-Based Learning; Y2T1: Year 2 Term 1; Y2T2: Year 2 Term 2; SA: Strongly Agree; A: Agree; N: Neutral; SD: Standard Deviation.

**Table 3: Comparison of the mean (SD) of the parameters according to the Likert scoring scale.**

	Y2T1 mean (SD)	Y2T2 mean (SD)	Pearson coefficient (r)	P-value
Knowledge Acquisition	4.36 (0.81) SA	3.60 (1.20) A	0.688	0.0001 <sup>a</sup>
Interpersonal Skills	4.37 (0.85) SA	3.98 (0.90) A	0.870	
Learning Environment	4.28 (0.85) SA	3.78 (1.01) A	0.702	
Teacher–Student Relationships	4.35 (0.71) SA	3.45 (1.29) A	0.680	
Mean	4.34 SA	3.70 A	0.735	

Y2T1: Year 2 Term 1; Y2T2: Year 2 Term 2; SA: Strongly Agree; A: Agree, SD: Standard Deviation.

<sup>a</sup>  $P < 0.05$  denotes a strong and significant correlation relationship between the parameters.

Most average scores of the responses agreed with the related statements in the four parameters. The results of Pearson's correlation test revealed that there was a significant relationship ( $r = 0.735$ ;  $P < 0.05$ ) between the parameters of the 3-h and 2-h TBL in both academic Terms 1 and 2 of the preclinical oral surgery course (Table 3).

## Discussion

The findings of the current TBL study showed a significant effect on student satisfaction with all of the parameters considered including knowledge acquisition, interpersonal skills, learning environment, and teacher–student relationships.

TBL seems to be a promising teaching and learning method. It marks the values of constructivist learning theory where knowledge is regarded as a method constructed by personal understandings.<sup>14</sup> Learning through TBL can be promoted and facilitated by changing the traditional lecture into an active and self-motivated one.<sup>2,15</sup>

For the delivery of undergraduate dentistry education, TBL may offer a constructivist teaching technique that is more successful.<sup>12</sup> Students in the study agreed that TBL sessions supported them in learning more in class and memorizing the material for a considerable time. It also kept them stimulated to study and learn as well as enhanced their collaboration. The significant student satisfaction was constant in other studies,<sup>16–18</sup> which indicated that students preferred TBL to other old-style learning as they enjoyed the collaborative learning that guided them to critical thinking and better responsibility. Remarkably, the 3-h TBL sessions in this study had higher satisfaction scores than the 2-h sessions, due to the former allowing more time for in-class discussion and the teacher's productive and encouraging feedback. Students who participated in this study agreed that their communication and interpersonal skills were improved corresponding with previous studies that referred to TBL as promoting learner-to-learner engagement more than learning alone.<sup>10</sup>

The results of the study also showed the importance of group discussion in enhancing the learning process including deep reading, critical thinking, and problem-solving skills.<sup>13</sup> Moreover, the majority of participants agreed that TBL enhanced teamwork and created a competitive atmosphere between the teams, reinforcing the objectives of TBL.<sup>19</sup> Also, during TBL sessions, repeated testing using iRAT and tRAT facilitates the repositioning of new information and aids in knowledge recollection.<sup>20</sup>

Students in the current study felt that because there is more time for knowledge sharing and opportunities for debate and question-asking, TBL creates a more enjoyable learning environment. Also, students concurred that TBL enhanced peer connection and pushed classmates to be more punctual. The introduction of TBL into the preclinical course improved student performance, as seen by the increased student engagement and decreased need for faculty involvement. Furthermore, the implementation of TBL exercises will benefit second-year dental students by lowering the difference in knowledge acquisition between them and supporting those who may struggle with the course content.

In the current study, most dental students expressed satisfaction with their ability to obtain a deeper understanding of the academic material related to preclinical oral surgery along with a willingness to engage in self-directed learning. The student's initiative to take informed ownership of their own learning, creativity, and capacity for applying fundamental study and problem-solving techniques were all well-explained by TBL.<sup>21</sup>

Affective learning components are involved in the development of collaborative skills, and students meet learning objectives by interacting and responding to their peers in a group setting. In medical education, small group-based instructional strategies such as TBL are employed to foster cooperation and team learning in the application of higher-order thinking to challenging situations.<sup>22</sup> These small groups establish purposefully designed learning communities that support and optimize group members' individual and collective learning.<sup>10</sup>

Teaching strategies in TBL aim to improve students' learning by promoting the practice of finding, understanding, and assessing information on medical concepts as well as defending and presenting reasoned arguments regarding scientific findings.<sup>10,23</sup> To build a cooperative community of learners, such techniques also support the dissemination of knowledge by having students work together to ask and answer questions, share their findings, and perform on tasks or exam items. Concerning group performance, TBL pushes students to cultivate connections of support and a strong feeling of shared responsibility—either we all achieve, or we all fail.<sup>24</sup>

The participants were only male students at the time this research was conducted; the door was opened for female students the following academic year at the College of Dentistry. Hence, the interaction of different sexes is indicated for further studies. It is also worth mentioning that the study only relied on SBA questions. Hence, very short

answer questions are recommended for future studies, as they are a reliable and discriminatory alternative to encourage learners to use more authentic clinical reasoning strategies compared to SBAQs.<sup>25</sup> Furthermore, students' input on traditional teaching methods should be obtained to compare their satisfaction with other teaching modalities including TBL.

## Conclusion

The present study on the TBL method yielded positive and high levels of satisfaction with all parameters mentioned in the study as indicated in their feedback post-TBL sessions, which may be attributed to the proper implementation of TBL methodology by the teacher and students and their efforts toward this teaching modality in the preclinical oral surgery course.

## Source of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## Conflict of interest

The author have no conflict of interest to declare

## Ethical approval

The Committee of Bioethics Research at Prince Sattam Bin Abdulaziz University approved the study and was assigned the institutional review board number SCBR-066-2023. Date: 07.05.2023.

## Author's contribution

SS conceived, designed, and conducted the research; collected and analyzed the data; drafted, critically reviewed, and approved the final draft of the manuscript; and is responsible for the content and similarity index of the manuscript.

## Acknowledgments

The author would like to thank the Deanship of Scientific Research at Prince Sattam Bin Abdulaziz University for their continuous support.

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**How to cite this article:** Sakka S. Student feedback on team-based learning in a preclinical oral surgery course: A pilot study. *J Taibah Univ Med Sc* 2024;19(4):705–710.