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Team-based learning in the internal medicine clerkship didactics

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Abstract

Background: Active-learning approaches, such as team-based learning, are infrequently used in internal medicine clerkship didactics even though there is increasing evidence to suggest medical students prefer it over traditional lecture-based learning. In this study, five team-based learning sessions were incorporated into three blocks of a 12-week internal medicine clerkship.

Methods: The goal of this quasi-experimental study was to compare learner engagement, satisfaction and preference between team-based learning and lecture-based learning in the internal medicine clerkship didactics. Outcomes were compared using the Classroom Engagement Survey, a satisfaction questionnaire and the Team-Based Learning Student Assessment Instrument (TBL-SAI).

Findings: There was a statistically significant difference in the classroom engagement scores between team- and lecture-based learning ($P < 0.0001$) with a median of 39.0 and 33.0 in the team-based learning and lecture-based learning groups. For learning preference, the median TBL-SAI score was substantially above neutral. Across all team-based learning sessions, 100% of students were satisfied or strongly satisfied with the learning style as a valuable experience and as a way to learn course material, and only one student was not satisfied or strongly satisfied with team-based learning to improve problem solving skills.

Discussion: The classroom engagement and learning style preference findings were consistent with previously published data in other clerkship settings. Student satisfaction was more consistent with team-based learning than with the lecture-based learning, which may be because of the consistent format whereas lecture-based learning style was faculty dependent.

Conclusion: Students preferred team-based learning and had improved engagement and satisfaction when compared to lecture-based learning. This study provides evidence in favour of team-based learning as a strategy to incorporate active learning in clerkship didactics.

1 | BACKGROUND

Research indicates that adult learners retain only 5% of what is presented in a traditional lecture.¹ Most medical students belong to

generation Y or Z; these learners prefer technology and crave solution-oriented relationships with their mentors and peers.² A high degree of engagement is unlikely to occur in the traditional lecture-based format because there is little room for discussion between faculty and learners.³

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The US Liaison Committee on Medical Education (LCME) standard 6.3 requires the medical school curricula to include self-directed learning experiences, such as active-learning, that allow students to develop lifelong learning skills.⁴ Team-based learning (TBL) is an active-learning modality in which students ‘apply conceptual knowledge through a sequence of activities that includes individual work, teamwork, and immediate feedback’.⁵ Compared to other active-learning formats, such as problem-based learning (PBL), TBL has the advantage of requiring fewer faculty facilitators.

Other advantages of TBL include small group experience, application of knowledge to real-life problems, experience working in a team and opportunity to practise self-reflection and peer feedback.⁶ In the clerkship setting, TBL can improve in-class engagement compared to lecture-based learning.^{7–9} Some data suggest that TBL facilitates greater long-term knowledge retention a year after the clerkship is over compared to lecture-based learning.^{8,9} The mechanism by which TBL improves knowledge remains unknown. We postulate that TBL enhances students’ experiences in clinical didactics and thus increases their comfort level applying knowledge on the wards.

Despite the potential benefits of TBL in medical education, there is currently a lack of evidence to suggest that students prefer TBL over other learning modalities.¹⁰ In a systematic review of seven studies that compared TBL to a control intervention within health professions education, students favoured the TBL in only one of the studies. The mixed learner reaction was thought to be due to TBL requiring more work from students both in preparation and in participation during the didactic.

Similarly, there is a paucity of data comparing TBL and lecture-based learning in the inpatient internal medicine clerkship didactics. Only one controlled study compared TBL and lecture-based learning in the internal medicine clerkship, but the primary focus was evaluating knowledge rather than learner reactions.⁹ Moreover, the focus was in the ambulatory setting. Case Western Reserve University School of Medicine (CWRU SOM) students already have exposure to TBL during their preclinical years, but the traditional lecture format is commonly used during clerkships. The objective of this quasi-experimental study was to inform clerkship design by comparing learner engagement, satisfaction and preference between TBL and lecture-based learning in the inpatient internal medicine clerkship.

2 | METHODS

The study population was third year medical students from CWRU SOM across three blocks of a 12-week IM clerkship at MetroHealth Medical Center (MHMC).

Two faculty authors learned the fundamentals of facilitating TBL from a faculty with expertise in delivering TBL. For this study, five lecture topics were converted to TBL and followed the 4S framework.¹¹ We used the guidelines for reporting TBL activities proposed by Haidet et al.¹² However, Haidet’s model was modified by reducing the number of students to three to four in each team to accommodate the small size of each clerkship cohort (typically 12–15 students total). The faculty authors of this project only delivered TBL sessions while lecture-based learning was delivered by other Department of Medicine faculty.

Each TBL session was approximately 1–1.5 h, which is the same length as the lecture-based learning. Both were presented to the students over the course of 12 weeks during their dedicated teaching time on Friday mornings. Pre-reading assignments were provided at the beginning of the week prior to each TBL session. At the beginning of each session, the students completed an individual quiz based on the pre-work materials. They were then randomly assigned to a team to take the same test and recorded their answer on the team’s score sheet. Immediately after submitting their answers, the correct answers were revealed, and the students were able to ask questions regarding the multiple-choice questions. The facilitators allowed open discussions regarding the topic followed by a mini-lecture to clarify the concepts covered. During the application activity, the cases were presented using PowerPoint to keep all the teams in sync. The team members needed to arrive to an answer collectively. All the teams simultaneously revealed their answers using a small whiteboard. At the end of the session, the teams tallied their score on the provided score sheets, and the students were given time to ask further questions. A peer review session was not formally allotted due to time constraints, but, at the end of the session, the students were still able to give brief critique on how their team performed (Figure 1).

The TBL lectures were paired with a lecture-based learning session so that the students were exposed to both formats on the same day. The order of TBL or lecture-based learning also varied due

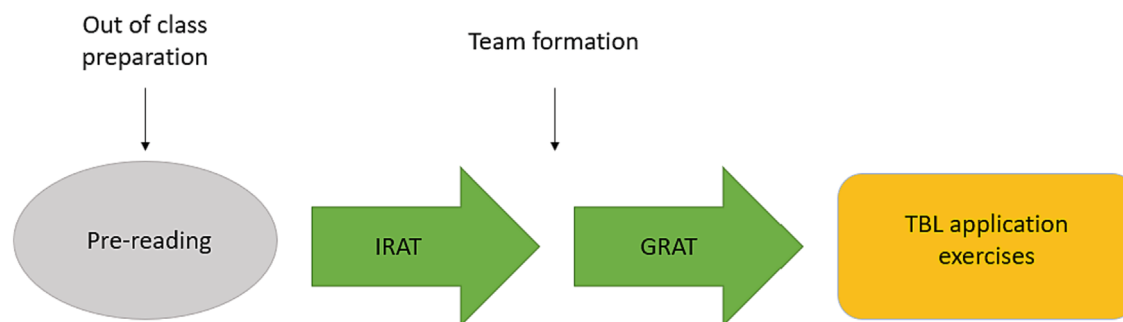


FIGURE 1 The team-based learning followed the 4S format. Structure of team-based learning lectures: Key: IRAT, individual readiness assurance test; GRAT, group readiness assurance test; TBL, team-based learning. Time spent on each section: IRAT (6 min), GRAT (6 min), and application exercises (60 min).

to scheduling issues. Some days, TBL was given first followed by lecture-based learning and vice versa on other days.

The students completed the Classroom Engagement Survey (CES) to evaluate learner engagement and an additional three questions to evaluate satisfaction at the end of each TBL or lecture-based learning session. At the end of 12 weeks, the student filled out the TBL-Student Assessment Instrument (TBL-SAI) to assess preference for TBL or lecture-based learning.

2.1 | Classroom Engagement Survey

The CES is an eight-question tool used to objectively quantify students perceived in-class engagement.¹³ It is scored on a 5-point Likert scale (1 *strongly disagree* to 5 *strongly agree*). A higher score equates to greater engagement (see Appendix A for further details).

2.2 | Satisfaction with learning style

Three questions were used to quantify satisfaction with the learning style. These items were based on a previous evaluation of a TBL session on family planning introduced into an obstetrics and gynaecology clerkship at Northwestern University.¹⁴ The questions were scored on a 5-point Likert scale (1 *strongly disagree* to 5 *strongly agree*).

1. I found participating in this learning style to be a valuable experience.
2. I found that this learning style helped me learn course material.
3. I found that this learning style improved my problem-solving skills.

2.3 | TBL Student Assessment Instrument

TBL-SAI is a 33-item instrument that assesses accountability, preference for lecture or TBL and student satisfaction. Cronbach's alpha for the total scale was 0.798.¹⁵ Each question is scored on a 5-point Likert scale (1 *strongly disagree* to 5 *strongly agree*). A higher score in each subscale indicates increased accountability, preference for TBL and satisfaction with TBL. Possible total scores range from 33 to 165, and a score above 99 is indicative of a positive experience with TBL, whereas 99 is neutral and less than 99 indicates a more negative experience with TBL.

2.4 | Analysis

Descriptive statistics were performed for all data. Pooled CES data from across the three blocks were compared between TBL and lecture-based learning using the Mann Whitney U test with a significance level of $P < 0.05$. Descriptive statistics were performed individually for the enjoyment items from the CES across the three blocks. TBL-SAI scores were compared across the three blocks. The proportion of students 'satisfied or strongly satisfied' with each TBL or lecture-based learning

session was compared for each topic across the three blocks. All five TBL sessions were included for analysis; however, only the three lecture-based learning sessions that were consistently delivered over the three blocks of the clerkship were compared.

3 | FINDINGS

Participants included $n = 11$ –14 students in Block 1, $n = 10$ –13 students in Block 2 and $n = 6$ –11 students in Block 3. Sample size varied across sessions due to variable participation in the study and attendance.

3.1 | Engagement

Throughout the three blocks, there was a wider range of CES scores in lecture-based learning (range = 15–40) compared to TBL (range = 25–40). The median CES score for each block was higher in TBL (range = 38.0–40.0) than in lecture-based learning (range = 33.0–37.0). There was a statistically significant difference in the overall CES score between the TBL and lecture-based learning ($P < 0.0001$) with a median of 39.0 and 33.0 in the TBL and lecture-based learning groups, respectively (Figure 2). A greater proportion of

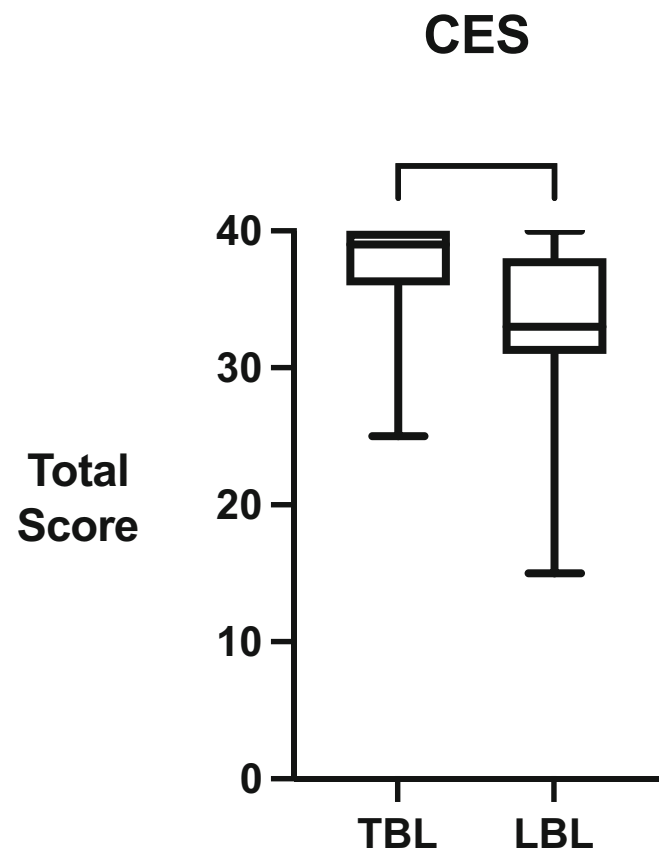


FIGURE 2 Pooled CES score across the three blocks for team- and lecture-based learning. Statistical significance of $p < 0.0001$. Maximum CES score is out of 40.

“I had fun in class today”

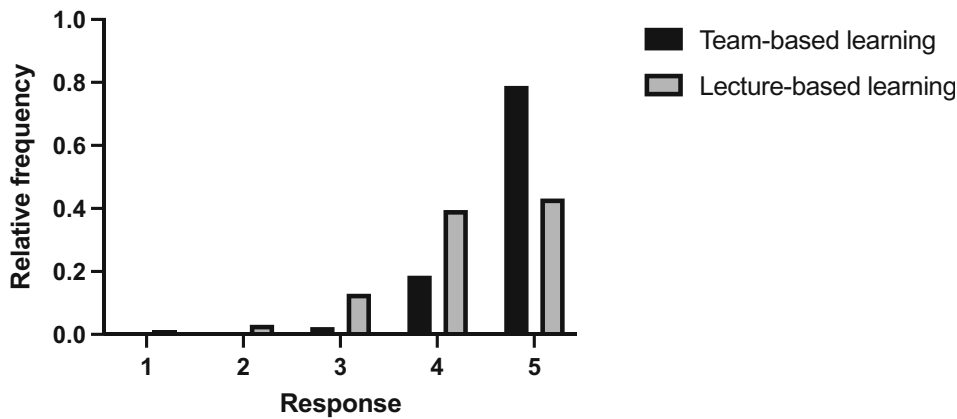


FIGURE 3 Comparison of responses to CES Item 2 ‘I had fun in class today’. Possible scores range from 1 *strongly disagree* to 5 *strongly agree*.

“I did not enjoy class”

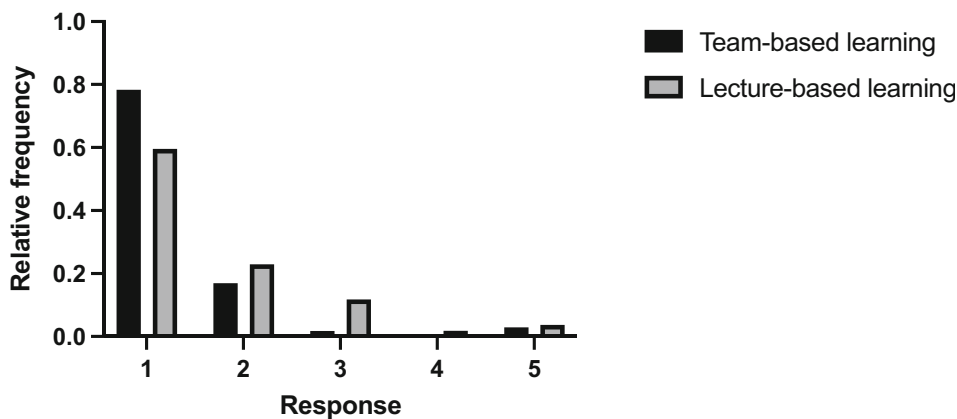


FIGURE 4 Comparison of responses to CES Item 6 ‘I did not enjoy class today’. Possible scores range from 1 *strongly disagree* to 5 *strongly agree*.

students ‘agreed’ or ‘strongly agreed’ that ‘I had fun in class today’ for TBL (98%) compared to lecture-based learning (83%) (Figure 3). Ninety-five per cent of students ‘disagreed’ or ‘strongly disagreed’ that ‘I did not enjoy class today’ for TBL compared to 83% for lecture-based learning (Figure 4).

students satisfied or strongly satisfied with the learning style as a valuable experience, to learn course material and to learn problem-solving skills ranged from 55–100%, 46–100% and 55–100%. There was a wide range in satisfaction within the same topic based on the block.

3.2 | Learning style preference

The median TBL-SAI score (Block 1 = 138.0, Block 2 = 137.0, and Block 3 = 145.0) was substantially above neutral in all three blocks, suggesting overall preference for TBL over lecture-based learning (Figure 5).

3.3 | Satisfaction

The proportion of satisfied students was compared by topic across the blocks. Across all TBL sessions, 100% of students were satisfied or strongly satisfied with the learning style as a valuable experience and to learn course material. Only one student was not satisfied or strongly satisfied with TBL to improve problem solving skills. Across all lecture-based learning sessions, the proportion of

3.4 | Qualitative feedback

Students appreciated the applicational aspect of TBL and felt the lectures were ‘applicable to cases seen on the floor’. Negative feedback centred around TBL logistics including student roles, score keeping and timing (some students felt the pace was too fast).

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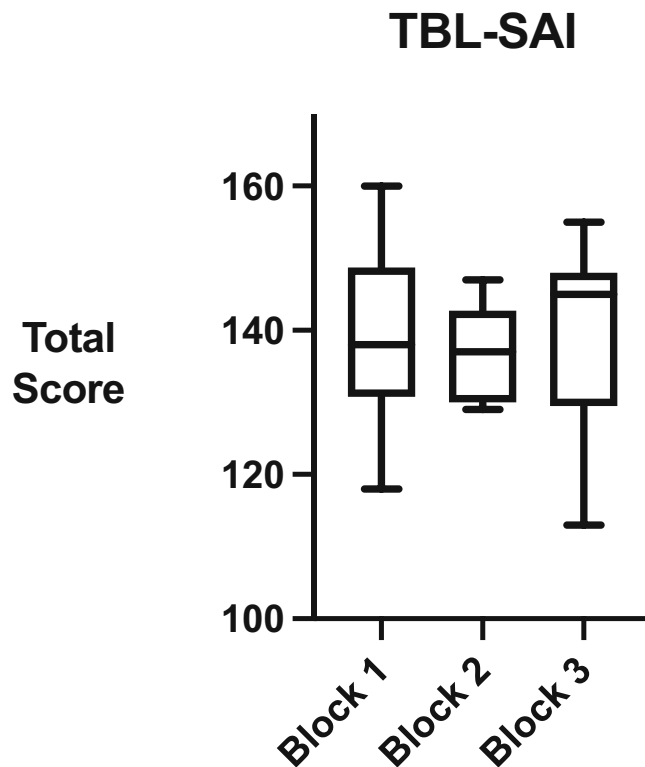


FIGURE 5 Comparison of TBL-SAI scores across the three blocks. Possible total scores range from 33 to 165. A score above 99 indicates preference for team-based learning.

Positive feedback for lecture-based learning centred around the inclusion of interactive media embedded within the lectures (imaging, EKGs). Several students stated that they wished the lecture-based learning had been more 'interactive'. One student commented that the lecture-based learning would be more interactive if students were split into groups rather than just large group discussion.

Several students stated that they wished the lecture-based learning had been more 'interactive'.

4 | DISCUSSION

The goal of this project was to compare engagement, satisfaction and preference between TBL and lecture-based learning in the internal medicine clerkship didactics. By incorporating TBL in the place of lecture-based learning, our findings showed improved engagement and satisfaction with TBL compared to the traditional format and overwhelming preference for TBL.

Our findings showed improved engagement and satisfaction with TBL compared to the traditional format and overwhelming preference for TBL.

Our results are consistent with previously published data in other clerkship settings. Warrier et al.,⁷ Levine et al.¹³ and Faezi et al.¹⁶ reported significantly improved CES scores with TBL when compared to lecture-based learning in the paediatric, psychiatry and rheumatology clerkships. In this study, most students enjoyed their experience with TBL despite the increased work required on their part to prepare for and to actively participate during the sessions. We also found similar results as Faezi et al.¹⁶ that students preferred TBL over lecture-based learning. In addition, student satisfaction was more consistent with TBL than with the lecture-based learning. This could be because the TBL followed a consistent format whereas the traditional lecture style was faculty dependent.

While knowledge retention was not included in our study, the qualitative feedback suggests that the learners in our study found skills used during TBL applicable during their clerkship. We propose that TBL improves knowledge retention by necessitating the learners to prepare, apply and expand their newly acquired knowledge during the entire session. For example, when a TBL topic arises on the wards, the students may feel more confident applying the medical knowledge they learned to delve deeper in their understanding of a case. Alimoglu et al.⁸ speculate that TBL with real patient scenarios promotes knowledge retention by fostering the 'integration of theory and practice', which would help students to apply knowledge on the wards. In their study of a TBL compared to lecture-based learning in the neurology clerkship, they reported improved engagement and satisfaction in addition to a higher mean score on an unprompted knowledge retention test administered 1 year after the clerkship was over. A unique aspect of their study was the inclusion of real patients rather than written scenarios for the TBL.

We propose that TBL improves knowledge retention by necessitating the learners to prepare, apply and expand their newly acquired knowledge.

Despite the unanimous preference for TBL over lecture-based learning in this study population, future curriculum developers should take caution in extrapolating these findings to other internal medicine clerkship settings. Active learning style lectures are more time intensive than traditional lectures to develop, thus requiring significant faculty buy-in and participation.¹⁷ There could also be a subconscious bias towards TBL in this study because these didactic sessions were primarily given by the internal medicine clerkship directors. Variation in response to the lecture-based learning sessions may be due to delivery by faculty of varying seniority and teaching background. For example, the lecture-based learning session with highest student evaluations was delivered by the chair of medicine who has won teaching awards. Moreover, personality differences can account for some variation in preference for TBL or lecture-based learning. Introverted learners might be biased against TBL. With respect to interpretation of our data, the ceiling effect should be acknowledged, because many participants had the maximum possible CES score.

Curriculum developers should prioritise identifying faculty stakeholders who are willing to devote the time required to convert and deliver lectures in this alternative format. This approach to TBL in the internal medicine clerkship could feasibly be scaled up to include a larger cohort size given that no additional faculty would be required to facilitate many small groups. Moving forward, the clerkship directors intend to use the Plan-Do-Study-Act (PDSA) model to elicit written feedback from students after each TBL session to make real time adjustments for the lectures that will be delivered the following week.

Curriculum developers should prioritise identifying faculty stakeholders who are willing to devote the time required to convert and deliver lectures in this alternative format.

5 | CONCLUSIONS

This project provides evidence that TBL is an effective way to promote engagement and satisfaction with the internal medicine clerkship didactics and thus may be worth the time investment required to transition other lectures away from lecture-based learning. In our study, students enjoyed their experience with TBL. Although our study measured enjoyment and engagement, further research is warranted to understand the relationships among these variables.

AUTHOR CONTRIBUTIONS

Madeline Garb: Formal analysis; methodology; writing—original draft; writing—review and editing. **Melissa Jenkins:** Investigation; writing—review and editing. **Elaine Cruz:** Conceptualization; investigation; methodology; project administration; writing—original draft; writing—review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no competing interest.

DATA AVAILABILITY STATEMENT

Data are available on request from the authors.

ETHICS STATEMENT

This study was submitted to the MetroHealth Institutional Review Board and was classified as exempted but as part of the IRB protocol required the authors to have all subjects of the study to sign the consent forms to participate in the study.

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REFERENCES

1. Masters K. Edgar Dale's pyramid of learning in medical education: further expansion of the myth. *Med Educ.* 2020;54(1):22–32. <https://doi.org/10.1111/medu.13813>
2. UIS Engaging Generation Z—Dr. Vickie S. Cook, Executive Director, Online, Professional & Engaged Learning [Internet]. [Cited 2022 May 9]. Available from: https://sites.google.com/a/uis.edu/colrs_cook/home/uis-engaging-generation-z
3. Graffam B. Active learning in medical education: strategies for beginning implementation. *Med Teach.* 2007;29(1):38–42. <https://doi.org/10.1080/01421590601176398>
4. Standards, publications, & notification forms|LCME [Internet]. [cited 2022 May 9]. Available from: <https://lcme.org/publications/#All>
5. Parmelee D, Michaelsen LK, Cook S, Hudes PD. Team-based learning: a practical guide: AMEE guide no. 65. *Med Teach.* 2012;34(5):e275–87. <https://doi.org/10.3109/0142159X.2012.651179>
6. Burgess A, van Diggele C, Roberts C, Mellis C. Team-based learning: design, facilitation and participation. *BMC Med Educ.* 2020;20(2):461. <https://doi.org/10.1186/s12909-020-02287-y>
7. Warrior KS, Schiller JH, Frei NR, Haftel HM, Christner JG. Long-term gain after team-based learning experience in a pediatric clerkship. *Teach Learn Med.* 2013;25(4):300–5. <https://doi.org/10.1080/10401334.2013.827975>
8. Alimoglu MK, Yardim S, Uysal H. The effectiveness of TBL with real patients in neurology education in terms of knowledge retention, in-class engagement, and learner reactions. *Adv Physiol Educ.* 2017;41(1):38–43. <https://doi.org/10.1152/advan.00130.2016>

9. Thomas PA, Bowen CW. A controlled trial of team-based learning in an ambulatory medicine clerkship for medical students. *Teach Learn Med.* 2011;23(1):31–6. <https://doi.org/10.1080/10401334.2011.536888>
10. Fatmi M, Hartling L, Hillier T, Campbell S, Oswald AE. The effectiveness of team-based learning on learning outcomes in health professions education: BEME guide no. 30. *Med Teach.* 2013;35(12):e1608–24. <https://doi.org/10.3109/0142159X.2013.849802>
11. Sibley J, Ostafichuk. Why team-based learning. 2018. [Internet] (Cited July 12, 2023) Available from: <https://learntbl.ca>
12. Haidet P, Levine RE, Parmelee DX, Crow S, Kennedy F, Kelly PA, et al. Perspective: guidelines for reporting team-based learning activities in the medical and health sciences education literature. *Acad Med.* 2012;87(3):292–9. <https://doi.org/10.1097/ACM.0b013e318244759e>
13. Levine RE, O'Boyle M, Haidet P, Lynn DJ, Stone MM, Wolf DV, et al. Transforming a clinical clerkship with team learning. *Teach Learn Med.* 2004;16(3):270–5. https://doi.org/10.1207/s15328015t1m1603_9
14. Mody SK, Kiley J, Gawron L, Garcia P, Hammond C. Team-based learning: a novel approach to medical student education in family planning. *Contraception.* 2013;88(2):239–42. <https://doi.org/10.1016/j.contraception.2012.07.012>
15. Mennenga H. Development and psychometric testing of the team-based learning student assessment instrument. *Nurse Educ.* 2012;37:168–72. <https://doi.org/10.1097/NNE.0b013e31825a87cc>
16. Faezi ST, Moradi K, Ghafar Rahimi Amin A, Akhlaghi M, Keshmiri F. The effects of team-based learning on learning outcomes in a course of rheumatology. *J Adv Med Educ Prof.* 2018;6(1):22–30.
17. Schiel K, Everard K. Active learning versus traditional teaching methods in the family medicine clerkship. *Fam Med.* 2021;53(5):359–61. <https://doi.org/10.22454/FamMed.2021.340251>

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APPENDIX A

Classroom Engagement Survey (CES) statements:

1. Most students were actively involved.
2. I had fun in class today.
3. I contributed meaningfully to class discussions.
4. Most students were not paying attention.
5. I paid attention most of the time.
6. I did not enjoy class today.
7. I participated in the class most of the time.
8. I would like more class sessions to be like this one.