

TEAM BASED LEARNING IN PATHOLOGY: EFFECT ON TEST SCORES AND STUDENT SATISFACTION

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ABSTRACT

Objective: The objective of this study was to compare the impact of team based learning (TBL) on student's test scores in comparison with didactic lectures. We also wanted to assess to the level of students satisfaction regarding TBL as a teaching methodology.

Study Design: Quasi experimental study.

Place and Duration of Study: Department of Pathology, University Medical and Dental College Faisalabad, from May to July 2013.

Material and Methods: Fourth year undergraduate medical students attending Pathology course at University Medical and Dental College (UMDC), Faisalabad in year 2013 involved the portion of Haematology were divided into two halves. The first half (H-1) was covered in two TBL sessions of two hours and 15 minutes duration each. The second half (H-2) was covered in 8 lectures of 45 minutes duration each.

After completion of the course, students took test comprising of problem based SEQs regarding Hematology. The test comprised of two segments with questions of equal difficulty, representing the two halves of the topic. Students' scores in these two segments were compared by using paired sample t-test.

The students were given a validated questionnaire. This data was analyzed by using SPSS version 20.

Results: The test scores were highly significant ($p=0.000$) in TBL as compared to lecture group. In addition to positive significant relationship, majority of students also agreed that TBL motivated them to learn Pathology (71.72%), promoted better understanding of the subject matter (68.92%), helped to gain in depth knowledge of the subject (62.06%) and helped to remove misconceptions about the topic (65.51%). Sixty two percent students preferred TBL to didactic lectures.

Conclusion: Our study proved to have a significant impact of TBL on student test scores as compared to didactic lectures. Majority of the students were satisfied with TBL as a teaching methodology in Pathology and preferred it to didactic lectures.

Keywords: Active learning, Didactic lectures, Subject matter, Team based learning (TBL).

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INTRODUCTION

Competent health professionals who can integrate knowledge and apply needed skills are the need of the society¹. Medical schools must be able to refine the medical expertiseso that the health professionals can perform the duties successfully and efficiently. Successful medical teaching requires that teachers are able to address learner's needs and understand the variations in learners' styles and approaches². Teachers can accomplish these requirements while creating an

optimal teaching-learning environment by utilizing a variety of teaching methods and teaching styles². Although an array of newer instructional methodologies are available, traditional method of lectures is still the predominant mode of teaching in majority of Pakistan's medical institutions.

Lecture based instruction has been challenged over the past few decades, because of its quiescent and static form of learning³. Team learning is an approach to large-group teaching that combines the strengths of small-group interactive learning with teacher-driven content delivery⁴. Team based learning (TBL) is a relatively newer instructional strategy that has emerged over the past few years to enhance

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active learning and critical thinking. This method, first used in business education, was later applied to undergraduate medical education and postgraduate medicine clerkship⁵⁻⁹. It incorporates the strengths of small group learning in a large group setup¹⁰. TBL is a structured form of cooperative learning a form of active learning in which small groups of students work together on an issue¹¹. Thus proper planning, timely and active feedback to students is the key to a successful TBL¹². TBL provides opportunities to the team members to develop cooperative thinking at the same time improving social and communication skills¹¹. The aim of TBL is to achieve higher levels of cognitive learning using personal knowledge within a collaborative environment¹¹.

The beneficial effects of TBL on student learning are quite evident from literature. However, effect on assessment scores is a major concern for all stakeholders while adopting a new teaching methodology¹³. Moreover, satisfaction of students regarding a teaching methodology is also fundamental to its successful implementation¹⁴. Therefore we planned to study the effect of TBL on student's test scores and to determine the level of student satisfaction with this methodology.

SUBJECTS AND METHODS

A quasi experimental study was conducted with fourth year undergraduate female medical students (strength 98) attending a course on haematology at University Medical & Dental College (UMDC) Faisalabad, Pakistan, from January to March 2013. UMDC follows a 5 year discipline based curriculum for MBBS program. Pathology is taught in years 3 and 4 using different instructional methods such as lectures, tutorials and practical demonstrations, followed by assessment of each topic. Haematology is taught in fourth year using the same teaching methods.

Prior to launching TBL, a faculty development workshop was conducted for the faculty of Pathology by the Department of

Medical Education to increase awareness regarding TBL. The subject of haematology was divided into two sections. First section (H-1) included the topics of anemia and leukemia while the second (H-2) included lymphomas and bleeding disorders. Multiple choice questions (MCQ) addressing the cognitive levels of recall C1, interpretation C2 and problem solving C3 were prepared by the faculty members according to a table of specifications¹⁴. These were then reviewed for technical appropriateness by the DME faculty and improved. For each TBL 10 MCQ's of C1 & C2 and 4 MCQ's of C3 level were selected. The C3 level MCQ's focused on higher level of cognition that could initiate a consensus building discussion. The aim was to test the understanding of the concepts rather than just memorizing the facts.

The learning outcomes and the topics along with resources such as reference books with page numbers specified and websites were displayed on the notice board 10 days before the start of the TBL. The hand-outs of the lectures on the topics were also available in the library in case the students were interested in using them.

Students were randomly assigned to a total of 14 different groups consisting of seven students each based on the roll numbers using computer software. The same groups were kept in both the sessions so that they could evolve into functioning teams over the course of time.

The content of first section of hematology (H-1) was explored in two TBL sessions of 2 hours and 15 minutes duration each (total duration 4 hours 30 minutes). The second half (H-2) was covered in 8 lectures of 45 minutes duration each (total duration 6 hours).

The students were oriented to TBL by the Principal Investigator (PI) and Co-investigator one week before starting the TBL. This was followed by a mock TBL which was duly supervised by the researchers and all queries by students addressed. The TBL session was conducted according to Lary Michaelson model¹². The session started with individual readiness

assurance test (iRAT), where students had to attempt a test independently comprising of 10 MCQs. This was followed by team readiness assurance test (tRAT) in which they attempted the same questions after discussion in teams. During the time the students attempted the t-RAT in groups; the facilitator marked their-RAT and identified the questions in which majority of the students were having difficulties. The next segment was a mini lecture by the facilitator explaining those concepts where students had faced difficulty.

After this discussion the teams were given four MCQs of C3 level to be solved in 10 minutes. Students showed their answers simultaneously by raising cards with the alphabet of the option

written test comprising of problem based, short answer questions (SAQ) regarding hematology, to test application of knowledge. The test comprised of two segments with questions of equal difficulty, representing the two halves of the topic.

Data Analysis

Data analysis included data of 61 students who attended all lectures and both sessions of TBL. Data of students who missed any teaching session were excluded. The data were analyzed using SPSS version 20. Descriptive statistics were used to determine frequency, percentage, mean and standard deviation of scores in H-1 and H-2 groups. These were compared by using paired

Table: Questionnaire to assess satisfaction of students about team based learning.

No	Questions	A/SA (%)	U (%)	DA/SDA (%)
01	It motivates me to learn pathology	71.72414	7.5862069	20.689655
02	It promotes better understanding of the subject matter	68.96552	8.2758621	22.758621
03	It help to gain an in-depth knowledge about the subject	62.06897	13.103448	24.827586
04	TBL help to reduce my misconceptions about the topic	65.51724	10.344828	24.137931
05	TBL stimulate my thinking	67.58621	10.344828	22.068966
06	TBL improve my reasoning skills	71.72414	6.8965517	21.37931
07	This type of teaching helps me to relate pathological principles to real life situation	62.75862	11.034483	26.206897
08	I feel TBL and case studies should be included in pathology curriculum	59.31034	6.2068966	34.482759
09	I prefer this type of teaching to didactic lectures	62.06897	8.9655172	28.965517
10	It helps to improve team working skills	73.10345	7.5862069	19.310345

A/SA: Agree/Strongly Agree, U: Unequivocal, DA/SDA: Disagree/ Strongly Disagree

selected. The facilitator then discussed the case with all students discussing each and every option. The students were also given the right to make an appeal in case there was any problem with any MCQ¹⁰.

After each TBL session, the students were given a validated questionnaire to assess their satisfaction about TBL.

After two TBL sessions on anemia and leukemia, the topics of bleeding disorders and lymphoma were covered in the form of lectures. After completion of the course, students took a

sample t-test. A *p*-value of less than 0.05 was taken as significant.

RESULTS

The results are based on analysis of test scores from students who attended both TBL sessions and lectures, *n*=61. They were all girl students ranging in age from 21-22 years. 32 students (52.1%) of H-1 group and 28 students (46%) of H-2 group scored more than 50% marks. The test results of the students were compared with regard to TBL (mean=12.94 ± 4.65) and lectures (mean=11.65 ± 4.20) using paired sample

t-test. The test scores were significantly higher ($p=0.000$) in TBL group as compared to lecture group (fig).

In addition to positive significant relationship with TBL, majority of students agreed that TBL motivated them to learn pathology (71.72%), promoted better understanding of the subject matter (68.92%), helped to gain in-depth knowledge of the subject (62.06%) and helped to remove misconceptions about the topic (65.51%). Sixty two percent students preferred TBL to lectures. Sixty-seven percent were of the view that it stimulated their thought process. Seventy one percent stated that it improved their reasoning skills. TBL also helped

students. The knowledge of pathology-based content learned using the TBL strategy was compared with questions assessing pathology-based content learned via other methods and was found to be significant ($p .001$, t-test). Moreover, students whose overall academic work placed them in the lowest quartile of the class improved more from TBL than did those in the highest quartile¹⁵.

In another study by Brandler and Laser, TBL was introduced in Pathology residency training program. In this particular program four TBL sessions were held and individual and team readiness assurance tests (iRAT/tRATs) were performed. Residents scored higher on the

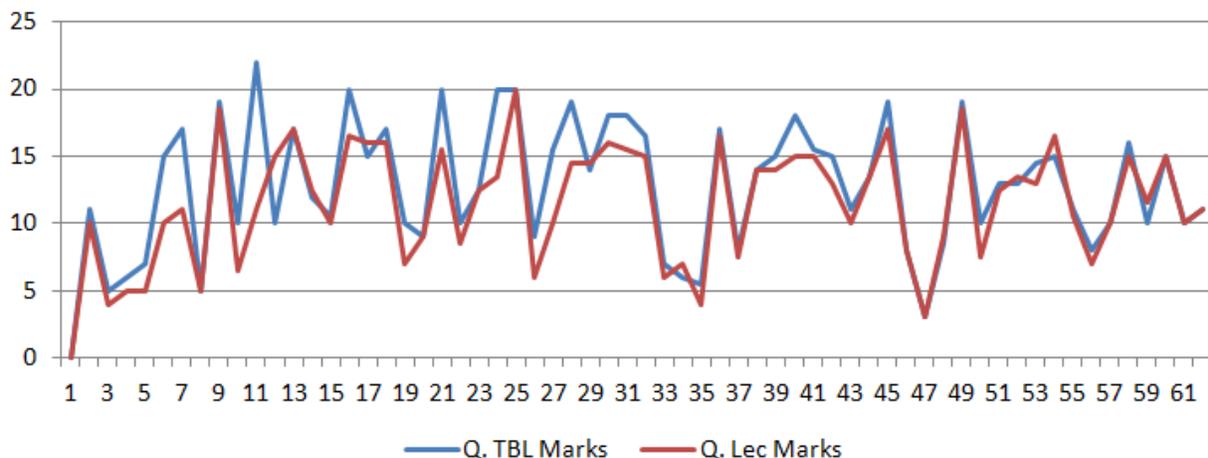


Figure: Comparison of results in haematology test covered by team based learning and by lecture.

them to relate pathological principles to real life situation (63%) and improved team work (73%). Fifty nine percent felt that TBL and case studies needed to be included in pathology curriculum (table).

DISCUSSION

In our study the difference in scores of the material taught by TBL and the lectures was significant. This is consistent with the findings from the study by Koles, where the performance of second-year medical students over two consecutive academic years (2003–2004, 2004–2005) at the Boonshoft School of Medicine was assessed. This study was conducted on 178

readiness assurance tests when working in teams, demonstrating the vigor and potency of team learning and achievement¹⁶. Our study as compared to this was conducted on undergraduate students but had the same result.

Nigel et al also conducted a controlled study of team-based learning for undergraduate clinical neurology education at National University of Singapore. This study compared TBL to passive learning measuring the knowledge as the primary outcome. The TBL encouraged self directed learning through the process of peer discussion and self-reflection to reinforce and retain the knowledge¹⁷. Our study aroused

interest in the students and helped them to learn the subject of pathology autonomously.

In Pakistan, a study conducted at Lahore Medical and Dental College, in 2011 employing the modified TBL technique over 4 weeks showed that fourth year MBBS students test scores improved after TBL sessions were introduced in comparison to traditional didactic lecture session ($p < 0.001$). Majority of the respondents noted that TBL session was a better learning strategy compared to lectures¹⁸. This finding correlates with our work which also showed improvement in the test results by TBL.

Considering students level of satisfaction, majority of the students in our study agreed that TBL motivated them to learn Pathology. This is similar to the findings from another study on first-year medical students of Chonnam National University Medical School where most students perceived TBL activities to be more engaging, effective and enjoyable than conventional didactics¹¹. In this study the tRAT scores were significantly higher than the iRAT scores, demonstrating the effect of co-operative and group learning. In addition, TBL improved student performance, especially that of academically weaker students.

Similarly, results from a study in Iran revealed that student satisfaction from team-based learning in neurology was far higher as compared to traditional lectures¹⁹.

Another study in a neurology clerkship course in China showed that TBL created an active classroom atmosphere, enhanced learning motivation, strengthened teamwork spirit, and improved students ability to solve real clinical problems. TBL was highly accepted by the majority of students²⁰. A systematic review by Jalali et al concluded that most students have come to regard TBL as a more engaging, effective and enjoyable teaching method than the conventional didactic approach in medical schools. Also the students who came to sessions prepared were more engaged in this type of learning²¹.

CONCLUSION

Our study proved to have a significant impact of TBL on student test scores as compared to didactic lectures. Furthermore, majority of the students were satisfied with TBL as a teaching methodology in Pathology and preferred it over didactic lectures.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

REFERENCES

1. Epstein RM, Hundert EM, Defining and assessing professional competence. *JAMA* 2002; 287(2): 226-35.
2. Vaughn L, Baker R. Teaching in the medical setting: balancing teaching styles, learning styles and teaching methods. *Med Teach* 2001; 23(6): 610-12.
3. Nandi PL, Chan JN, Chan CP, Chan P, Chan, LP. Undergraduate medical education: comparison of problem-based learning and conventional teaching. *Hong Kong Med J* 2000; 6(3): 301-6.
4. Haidet P, O'Malley KJ, Richards B. An initial experience with "team learning" in medical education. *Acad Med* 2002; 77(1): 40-4.
5. Hernandez SA. Team learning in a marketing principles course. Cooperative structures that facilitate active and higher level thinking. *J Mark Educ* 2002; 24: 73-85.
6. Tan NC, Kandiah N, Chan YH, Umapathi T, Lee SH, Tan K. A controlled study of team-based learning for undergraduate clinical neurology education. *BMC Med Edu* 2011; 30(11): 2-8.
7. Haidet P, Fecile ML. Team-based learning: a promising strategy to foster active learning in cancer education. *J Cancer Edu* 2006; 21(3): 125-8.
8. 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.
9. Thompson BM, Schneider VF, Haidet P, Levine RE, McMahon KK, Perkowski LC, et al. Team-based learning at ten medical schools: two years later. *Med Edu* 2007; 41(3): 250-7.
10. Steinert Y, Snell SL. Interactive lecturing: strategies for increasing participation in large group presentations. *Med Teach* 1999; 21(1): 37-42.
11. Jafari ZA. Comparison of conventional lecture and team-based learning methods in terms of student learning and teaching satisfaction. *Med J Islam Repub Iran* 2014; 28(1): 9-36.
12. Michaelsen LK, Parmelee DX, McMahon KK, Levine RE. Team-Based Learning for Health Professions Education. A guide to using small groups for improving learning *J Chiropr Educ* 2009; 23(1): 47-48.
13. Khalil Mk, Kibble JD. Faculty reflections on the process of building an integrated preclerkship curriculum: a new school perspective *Adv Physiol Educ* 2014; 38(3): 199-209.
14. Niffeler K, Frédérickx S, Niessen MH. Becoming a pro in writing multiple-choice questions: students enrich the question pool [Internet]. 2014 Available from: <https://projects.switch.ch/export/sites/projects/eduid/.galleries/documents/D6.1.3-User-Documentation.pdf>.
15. Koles PG, Stolfi A, Borges NJ, Nelson S, Parmelee DX. The Impact of Team-Based Learning on Medical Students' Academic Performance. *Acad Med* 2010; 85: 1739-45.

16. Brandler TC, Laser J, Williamson AK, Louie J, Esposito MJ. Team-based learning in a pathology residency training program. *Am J Clin Pathol* 2014; 142(1): 23-8.
 17. Tan NCK, Kandiah N, Chan YH, Umaphathi T, Lee SH, Tan K. A controlled study of team-based learning for undergraduate clinical neurology education. *BMC Med Edu*. 2011; 11: 91.
 18. Hashmi NR. Team Based Learning (TBL) in undergraduate medical education. *JCPSP* 2014; 24(8): 553-6.
 19. Chung EK1, Rhee JA, Baik YH, A OS. The effect of team-based learning in medical ethics education *Med Teach* 2009; 31(11): 1013-7.
 20. Yang LH, JiangLY, Xu B, Liu SQ, Liang YR, YeJ H, et al. Evaluating team-based, lecture-based, and hybrid learning methods for neurology clerkship in China: a method-comparison study. *BMC Med Edu* 2014, 14: 98.
 21. Brahmifarid NB, Sutherland S, Jalali AR. Investigating the applications of team-based learning in medical education. *J Med Educ* 2012; 4(2): 7-12.
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