

ORIGINAL ARTICLE

EFFECTIVENESS OF CASE-BASED LEARNING COMPARED TO LECTURES AND TUTORIAL SESSIONS IN MEDICAL EDUCATION: GENDER AND CLINIC BASED PERSPECTIVES

Mamoon Ahmed, Kamil Asghar Imam, Muneebur Rehman, Ahmed Hassaan Malik

Army Medical College, National University of Medical Sciences, Rawalpindi, Pakistan

Background: Trends in medical education have shifted away from didactic teaching and towards contextual or problem-based learning (PBL). Our study attempted to explore effectiveness of case-based learning (CBL) sessions in medical education when compared to traditional lecture based learning and tutorial sessions based on gender and pre-clinical/clinical years of undergraduate medical education. **Methods:** This study was carried out at Army Medical College, National University of Medical Sciences (NUMS), Rawalpindi, Pakistan from 15th Dec 2012 to 20th Feb 2013. Participants of the study included 500 randomly selected undergraduate medical students of pre-clinical/clinical years. A questionnaire investigating six different aspects of CBL was distributed among 2nd, 3rd, 4th and 5th year students. Fifty male and 50 female students were included from 2nd and 3rd year, while 75 male and 75 female students were included from 4th and final year. **Results:** Feedback was received from 466 out of 500 (93.2%) students. Male students exhibited general trend of better adapting to CBL sessions compared to female students. There was skewed response on the basis of pre-clinical/clinical years of undergraduate medical education. **Conclusions:** Although all students were inclined towards CBL as a better learning option, male students had more positive opinion regarding all six aspects of case-based learning included in questionnaire of present study. Furthermore, clinical students regarded CBL as more effective tool of learning as compared to pre-clinical students. Students in pre-clinical years ranked CBL higher for 'evoking creativity', 'favouring small group discussions', and 'strengthening interpersonal skills' while clinical students rated CBL higher for 'inducing problem solving capacity', 'providing proper attention of facilitator' and 'providing hands-on approach'.

Keywords: Case based learning, clinical years, gender, pre-clinical years

Pak J Physiol 2016;12(1):42-6

INTRODUCTION

Pedagogy is in constant evolution. New learning methods are being pioneered to refine outcomes and to improve net results.¹ In a similar fashion, teaching methodologies are also undergoing metamorphosis. Medicine is taught and practiced as an art. Critical and self-directed learning is the focus of educators who are constantly searching for worthwhile methods to impart these indispensable qualities to medical students. Medical students guided by teachers not only recite, define, describe and list facts, they must also learn to analyse, infer, synthesise, evaluate, think and rethink.² Over the last decade rapid expansion of biomedical knowledge has been witnessed. Trends in medical education have shifted away from didactic teaching and towards contextual or problem-based learning (PBL), justified by studies showing superiority of PBL in improving reasoning and communication skills.³

Traditionally, lecture based learning has been the sole method of transferring knowledge from teacher to student. Subsequently, tutorial sessions were introduced in which students learned a topic and teacher questioned them in the form of small groups. Problem based learning (PBL) sessions provided breakthrough in teaching methodology. In PBL sessions, a vignette was given to students and they were encouraged to identify

the problem and to find solutions themselves. Facilitator was designated as silent observer who did not stop the students in case of divergence from actual topic. Case based learning (CBL) session is the latest strategy in rapidly evolving teaching methodologies. It takes modified form of PBL session, in which students are given a vignette and they discuss it after preparation. Facilitator's presence is utilized and he/she is supposed to intervene whenever students diverge from the actual problem related to vignette.⁴

Lectures are still widely employed as mode of instruction, although their advantages remain debatable. Students regard lectures as poor mode of teaching resulting in wastage of time and resources as they mostly fail to remain attentive throughout the lectures. Students acquire more knowledge about a particular topic with their preferred style of learning. Majority of students agree that effectiveness of teaching depends largely on factors like topic under discussion, presentation of the lecture, ability of teacher to reach out to the audience and use of active learning techniques.⁵ Conversely, studies show that some students still prefer lecture based learning.²

PBL provides an open inquiry approach. Students are given a problem and they independently try to find relevant solutions. Facilitators don't guide

students through the discussion and act as silent observers. PBL encourages creativity and lifelong learning but it is time inefficient and expertise of facilitator are wasted as passive observer.⁴ There is growing evidence that medical graduates of PBL curricula demonstrate equivalent or superior professional competencies compared to graduates of more traditional curricula.⁶

On the other hand, in case based learning which provides guided inquiry approach, students benefit from facilitator who guides them throughout their discussion and intervenes when they start exploring the tangents. Students are given a problem; mostly a clinical scenario to prepare. CBL therefore provides structured approach, helps in exploration of new ideas and facilitator remains actively involved in the session. Conversely, critics argue that CBL suppresses curiosity in students and spoon feeds them.⁴

Modern teaching methodologies have far reaching impact on medical education and are now being used in many medical schools in the United Kingdom and worldwide.⁷ While most Asian medical students are positively inclined to adapt to problem based learning (PBL) and other innovative strategies in their curriculum⁸, studies have also shown no differences in graduates from PBL vs traditional curricula.⁷ In view of the above, present study was designed to analyze and compare the perception of efficacy of case based learning (CBL) sessions among undergraduate medical students when compared with traditional lecture based learning and tutorial sessions. The data was also used to assess the appreciation of CBL sessions among students of pre-clinical years (2nd and 3rd year) and clinical years (4th and 5th year) of undergraduate medical education.

MATERIAL AND METHODS

A survey questionnaire highlighting six aspects of an effective interactive teaching method was designed. It was randomly distributed among 500 medical students at Army Medical College, National University of Medical Sciences (NUMS), Rawalpindi, Pakistan. Fifty copies each were given to male and female students of 2nd and 3rd year, while 75 copies each were distributed among male and female students of 4th and 5th year. Thus, 250 students were included in the study. Students of first year were not included in the study.

Respondents were asked to rate following aspects of CBL sessions on a scale of Average, Good, Excellent, or Outstanding.

1. Evokes Creativity
2. Strengthens interpersonal skills
3. Induces problem solving capacity
4. Provides hands-on approach
5. Provides proper attention of facilitator
6. Favours small group discussion

RESULTS

Out of 250 male students included in the survey, 220 returned filled questionnaire showing return rate of 88%. On the other hand, 246 out of 250 female students returned filled questionnaire depicting return rate of 98.4%. Among students in pre-clinical years of medical education, 194 out of 200 (97%) returned questionnaire while 272 out of 300 (90.67%) students in clinical years provided feedback.

Figure-1 shows response regarding the ‘evokes creativity aspect’ of CBL session compared to traditional lectures and tutorial sessions. Figure-2, 3, 4, 5, and 6 show the response of students regarding ‘strengthens interpersonal skills’, ‘induces problem solving capacity’, ‘provides hands-on approach’, ‘provides proper attention of the facilitators’, and ‘favours small group discussion’ aspect of CBL sessions respectively as an effective tool of learning.

Male students rated CBL as much better tool of learning than their female counterparts. Proportion of male students considering CBL to be outstanding and excellent learning methodology is much higher than the female students.

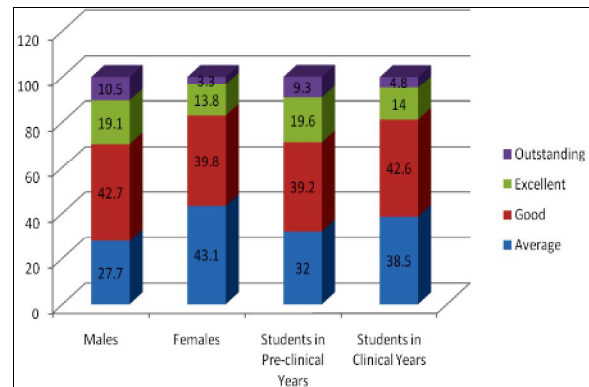


Figure-1: Response regarding ‘evokes creativity’ aspect of CBL sessions compared to lectures and tutorial sessions

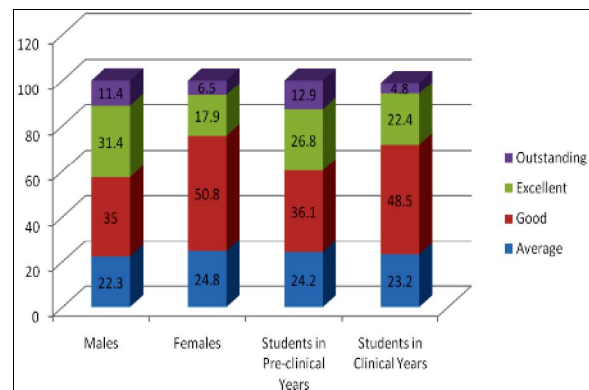


Figure-2: Response regarding ‘strengthens interpersonal skills’ aspect of CBL sessions compared to lectures and tutorial sessions

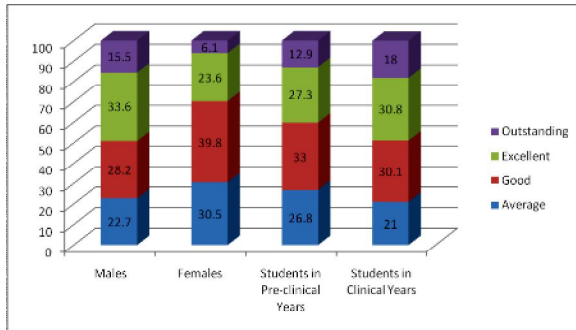


Figure-3: Response regarding ‘induces problem solving capacity’ aspect of CBL sessions compared to lectures and tutorial sessions

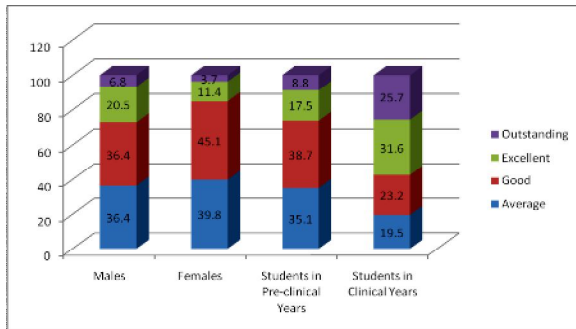


Figure-4: Response regarding ‘provides hands-on approach’ aspect of CBL sessions compared to lectures and tutorial sessions

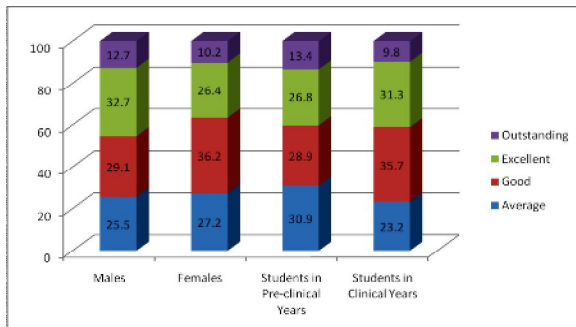


Figure-5: Response regarding ‘provides proper attention of facilitator’ aspect of CBL sessions compared to lectures and tutorial sessions

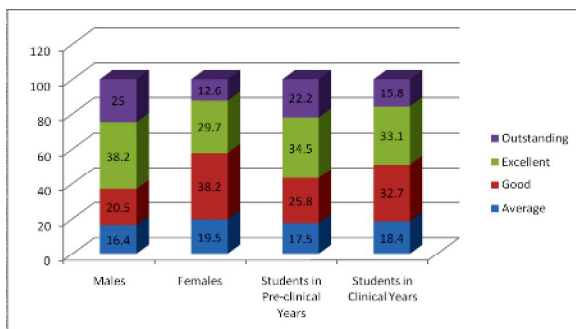


Figure-6: Response regarding ‘favours small group discussion’ aspect of CBL sessions compared to lectures and tutorial sessions

DISCUSSION

We attempted to explore the acceptance of CBL sessions as learning tool in medical education on the basis of gender. To our knowledge this is the first gender based study aimed at analysing the effectiveness of CBL sessions as a teaching methodology. Our study revealed, interestingly, that male students rate CBL sessions significantly better as compared to their female counterparts. The reasons behind this conundrum need to be explored.

College of Medical Sciences, NUMS, Rawalpindi attracts students from all areas of Pakistan. It has over 950 students enrolled in MBBS program. However, CBL is not the primary curriculum structure, rather it is supplemental case study method; lectures are primary method of imparting knowledge. Similarly, tutorial sessions are also conducted as secondary supplement. Hence, students of college can easily judge efficiency of CBL sessions in contrast to other methods of learning as they observe all of these. We excluded students of first year from our study because at our medical college CBL sessions formally start six months after the commencement of first year class and at the time of our study first year undergraduates were two months into training program.

Instilling self-directed learning is hallmark of CBL. Educational constructivism posits that students actively construct or reconstruct their knowledge networks, create meaning and build personal interpretations of the world based on individual experiences and interactions.⁹ Adults are primarily motivated to learn from an internal need to know and resist being told what they have to know by an outside authority or a subject-centred syllabus.¹⁰ CBL sessions therefore provide opportunities to practice higher order thinking.¹¹

When attempting to deliver comprehensive knowledge of a subject via cases, one is faced with the choice of either using an inordinate number of authentic cases to cover the scope of topic under discussion or creating relatively few perfect cases. In the literature dedicated to construction of effective case problems in PBL, the bias seems to be towards creating ideal cases.¹² A commonly referenced method is to build case around a topic tree reflecting educational objectives of the exercise.^{13,14}

Although developing self-directed, lifelong learners is a desirable outcome, it does not follow that the method to achieve this is to rely on self-teaching during formal education. This confusion of means and ends with respect to self-directed learning has been strongly criticised by Philip Candy (summarised by Milfin¹⁵) who advocates constraint on the degree of self-directed learning during introduction to complex bodies of knowledge. Cobb¹⁶ echoes this point, lamenting that

the theoretical commitment to analyse generation of knowledge as a process of construction is frequently transformed into the prescription that teachers should not tell students anything because they have to construct their own understandings.¹⁴

CBL uses ideal cases to learn a specific topic and as ideal scenarios are rare in clinic, CBL critics also raise this point. Critics opine that manufactured cases are destructive when it comes to handling real patients as contrived cases are potentially misleading.¹⁴

Having strong interpersonal skills is a *sine qua non* for a good doctor. The doctor must be able to communicate effectively with the patients in order to completely understand their problems and to efficiently explain treatment plans to them. Similarly, he must be able to converse skilfully with his counterparts. Studies prove that CBL inculcates better collaboration skills.¹⁷

Problem solving capacity is an art which can only be perfected through practice.¹⁴ Some people opine that information about a subject is not a prerequisite for problem solving¹⁸, whereas others believe that without proper knowledge of the subject students mostly digress from the topic and are misguided which leads to failure of proper concept building¹⁹. As students in pre-clinical years do not possess the required knowledge and have no basis for problem solving compared to students in clinical years, they do not gain much from CBL in terms of ability to solve clinical problems.¹⁴ Our study is aligned to this fact, as students of clinical years gave a higher mean score to problem solving capacity aspect of CBL compared to students in pre-clinical years.

Hands-on approach is an important aspect of knowledge acquisition. CBL sessions allow hands-on activity and facilitate to connect course content with real life scenarios. They not only make retention of information much easier but also learning experiences more enjoyable.²⁰ Our study also proves that CBL sessions provide hands-on approach and hence students prefer to learn through such sessions. As students in clinical years happen to see patients in wards so they are more likely to have a better practical approach. Our results are in agreement, students in clinical years gave a better mean score to this aspect compared to students of pre-clinical years. Studying a case standing on bedside may help retain the information for longer time.

PBL sessions were modified into CBL sessions to benefit from expertise of faculty. In CBL sessions, both students as well as facilitators actively participate in discussion, the faculty helping the students to reach main cause of problem. Facilitator also stops the students from exploring tangents.⁴ As this aspect covers a second party, i.e., the facilitator who is expected to remain unbiased during session, our study also showed that male and female students were almost equally satisfied with the role of facilitator and gave mean average scores almost equivalent to each other.

Small group discussion is quite an arguable issue when it comes to teaching methodology. Critics argue that small groups are not cost-effective and hence impractical. Differences in ability, motivation and grading practices among tutors have been cited as drawbacks of small groups.¹⁴ On the other hand, proponents are of the view that small group method is important when it comes to making concepts. Slavin states that students can benefit either in the role of tutor through the opportunity to elaborate ideas or in the role of tutee guided by a more capable peer who is likely operating within zone of proximal development.²¹

CONCLUSIONS

Medical students generally prefer CBL sessions as an effective tool for learning as compared to lecture-based learning and tutorial sessions. Male students had an overall better opinion regarding CBL sessions compared to the females. Students in clinical years regarded CBL as more effective tool of learning compared to students in pre-clinical years. Students in pre-clinical years gave higher scores to 'evokes creativity', 'favours small group discussion' and 'strengthens interpersonal skills' aspects of our questionnaire. Students in clinical years preferred 'induces problem solving capacity', 'provides proper attention of facilitator', and 'provides hands-on approach'.

REFERENCES

1. Albanese MA, Mitchell S. Problem based learning: a review of the literature on its outcomes and implementation. *Acad Med* 1993;68:52-81.
2. Rana IN, Aijaz A, Hayat A, Rana MN. Evaluation of undergraduate teaching methodologies. *J Rawalpindi Med Coll* 2012;16(2):177-9.
3. Epstein R. Learning from the problems of problem-based learning. *BMC Med Educ* 2004;4(1):1.
4. Srinivasan M, Wilkes M, Stevenson F, Nguyen T, Slavin S. Comparing problem-based learning with case-based learning: effects of a major curricular shift at two institutions. *Acad Med* 2007;82(1):74-82.
5. Najmi RS. Lecture as a mode of instruction in undergraduate medical education. *J Pak Med Assoc* 1999;49(2):30-3.
6. Neville AJ. Problem-based learning and medical education forty years on. A review of its effect on knowledge and clinical performance. *Med Princ Pract* 2009;18(1):1-9.
7. Wood DF. ABC of learning and teaching in medicine. Problem based learning. *BMJ* 2003;326:328-30.
8. Khoo HE. Implementation of problem-based learning in Asian medical schools and students' perceptions of their experience. *Med Educ* 2003;37(5):401-9.
9. Dolmans DH, De Grave W, Wolfhagen IH, van der Vleuten CP. Problem-based learning: Future challenges for educational practice and research. *Med Educ* 2005;39(7):732-41.
10. Knowles MS, Holton III EF, Swanson RA. *The Adult Learner*. 6th ed. Burlington, Mass: Elsevier; 2005.
11. Dori YJ, Tal RT, Tsaushu M. Teaching biotechnology through case studies—Can we improve higher order thinking skills of nonscience majors? *Sci Educ* 2003;87(6):767-93.
12. Dolmans DH, Snellen-Balendong H, van der Vleuten CP. Seven principles of effective case design for a problem-based curriculum. *Med Teach* 1997;19(3):185-9.

13. Majoor GD, Schmidt HG, Snellen-Balendong HA, Moust JH, Stalenhoef-Halling B. Construction of problems for problem-based learning. In: Nooman ZM, Schmidt HG, Ezzat ES (Eds). *Innovation in medical education: An evaluation of its present status*. New York NY: Springer Publishing Co; 1990. pp.114–22.
14. Shanley PF. Viewpoint: Leaving the ‘empty glass’ of problem-based learning behind: New assumptions and a revised model for case study in preclinical medical education. *Acad Med* 2007;82(5):479–85.
15. Mifflin B. Adult learning, self-directed learning and problem-based learning: deconstructing the connections. *Teach High Educ* 2004;9(1):43–53.
16. Cobb P. Theories of knowledge and instructional design: a response to Colliver. *Teach Learn Med* 2002;14(1):52–5.
17. Cornely K. The use of case studies in an undergraduate biochemistry course. *J Chem Educ* 1998;75(4):475–8.
18. Neufeld VR, Barrows HS. The ‘McMaster Philosophy’: an approach to medical education. *Acad Med* 1974;49(11):1040–50.
19. Kassirer JP, Kopelman RI. *Learning Clinical Reasoning*. Baltimore, MD: Williams and Wilkins; 1991.
20. Rybarczyk BJ, Baines AT, McVey M, Thompson JT, Wilkins H. A case-based approach increases student learning outcomes and comprehension of cellular respiration concepts. *Biochem Mol Biol Educ* 2007;35(3):181–6.
21. Slavin RE. Research on cooperative learning and achievement: What we know, what we need to know. *Contemp Educ Psychol* 1996;21(1):43–69.

Address for Correspondence:

Mamoon Ahmed, House 391, Lane 1, Aslam Shaheed Road, Lalazar, Rawalpindi Cantt. **Cell:** +92-331-5005539

Email: mamoonmalick@gmail.com

Received: 21 Jan 2016

Reviewed: 22 Mar 2016

Accepted: 28 Mar 2016