

Students' Response on the Effectiveness of CBL in learning Gross Anatomy in an undergraduate course

SHAISTA ARSHAD JARRAL, FAIZA MEHBOOB, SAMAR ASHRAF

ABSTRACT

Background: Gross anatomy teaching to undergraduate students is of profound importance as it lays the foundation for subsequent understanding of clinical subjects. With the paradigm shift of medical education from teacher centered to student centered teaching and learning methods, more interactive and integrated modes of teaching are being incorporated in the medical school curricula. Case based learning (CBL) is one of these relatively new methods being introduced in a local private medical college setup.

Aim: To evaluate the effectiveness of the use of this method from the point of view of the learner by getting their feedback as students feedback is an essential tool in the process of evaluation of teaching and learning in any institution.

Method: This was conducted as an observational cross sectional study. One hundred and fifty medical students from the first year MBBS class were included in this study. A questionnaire was circulated amongst them during college hours after the completion of study course of gross anatomy of thorax where six CBL sessions were conducted, with the frequency of one per week. The questions in the questionnaire were based on the content, conduct, relevance, motivational impact, improving communication skills, student interactions during case discussions and facilitators role in the conduction of the CBL sessions.

Results: Out of 150 students, 115 returned back the questionnaires. Majority (90%) of the students were of the opinion that the CBL were useful for learning gross anatomy concepts. They found the cases to be interesting, relevant and applicable to clinical practice in future. The conduct of the session was considered to enhance motivation, communication skills, mutual interaction and cooperation amongst them. It was noted that, though majority of the students enjoyed anatomy learning through CBL sessions.

Conclusion: CBL is an effective tool and can play an important role in delivery of an effective, integrated gross anatomy course. Student's learning process can be improved if better teaching methods are adopted. CBL can be incorporated in the current curriculum as an adjunct to traditional teaching of gross anatomy to undergraduates.

Keywords: Gross anatomy teaching; effectiveness of CBL; student's response

INTRODUCTION

Anatomy has ever been the key subject in medical sciences. It is a fact that detailed knowledge of anatomy plays pivotal role in the understanding and comprehension of any other field of medicine. It is of profound importance in the appropriate execution of training of medical professionals to ensure safe delivery of health care to the communities¹. Various Teaching methods of anatomy have evolved over past few decades like other fields of education. The traditional and the most commonly used method for teaching anatomy has been the chalk and board method. During this mode of teaching the important keywords and anatomical terms are highlighted by writing them down on the blackboard and relevant sketches and diagrams are also drawn using chalk

on the blackboard. This blackboard is now replaced by a white board and chalk by different color markers². One long practiced traditional method is didactic lecture. Lecture is defined as an oral discourse on a given subject before an audience for purpose of instruction and learning. In recent past, power point presentation is also included in the traditional method. These power point presentations are more attractive to the listeners than the chalk and board method and make them more involved in the teaching session. The colorful diagrams and animation videos in the power point presentation make more strong impact on the listener's mind³. It is opinionated by the traditional teachers that no matter which type of teaching aids are used, the impact of the lecture mainly depends on the person behind the rostrum. Lecture delivery in anatomy should be carefully aided by power point presentations to meet the expectations of the students and to overcome the

*Department of Anatomy, CMH Lahore Medical College, Lahore
Correspondence to Dr. ShaistaArshadJarral, Assistant Professor
Email: shaistaarshad24@gmail.com Cell: 0302-5386167*

limitations of chalk and board method. Proper utilization of newer technologies along with the traditional teaching methods definitely leads to better understanding of gross anatomy and better performance by students. Hence the advanced teaching methodologies help in learning anatomy in a better and an easier way^{4,5}.

Dissection has been the basis of traditional anatomy learning. It has been synonymous with traditional courses, and it appears to be ideally suited to self-directed learning: students exploring a subject for themselves at their own pace, in a practical way and according to their own personal interests⁶. Dissection is a method which provides clearer concept of the anatomy of the organs to the students and this helps them later in doing surgeries⁷. Much to the disappointment of its patrons, dissection as a learning tool has been almost excluded from modern medical curricula, owing to many shortcomings of its own^{8,9}. Time spent over dissection in the traditional anatomy curriculum have been insidiously replaced by other alternatives like plastic models, prosections, palatable specimens, computer assisted learning and many other demonstration tools^{10,11,12}.

These newer teaching methods have evolved largely based on an institution's internal policies, available resources and individual perceptions of the educationists. So no single and uniform curricula can be validated for all institutions¹³. However, the one thing universal to all the new course modules is the loss of "active dissection time" from the gross anatomy course. Traditionalists strongly support detailed anatomy courses which may have been detrimental to the evolution of anatomy as a subject. Reformers on the other hand regard these traditional teaching methods to be 'old-fashioned' and not compatible with modern learning practices, perhaps ignoring many benefits of the traditional teaching approaches¹⁴.

Students believe traditional anatomy courses are based on learning anatomy through memorization and repetition, ignoring conceptual and deeper understanding of the subject. Educators can change the teaching environment, so that students take anatomy as more than just names and terminology but as a set of related structures and concepts that help make the human body what it is¹⁵.

Paradigm shift in teaching dynamics from teacher-centered to student centered has changed the face of medical education in last couple of decades. Medical education has moved the curricula in a way to make the student to be self-learner and be able to solve medical problems in collaboration with their fellows. For attaining these objectives, many learning and teaching tools are introduced like

Team based learning (TBL), Problem based learning (PBL), and Case based learning (CBL). Each of these has its own benefits and shortcomings. Experience with team-based learning in a traditional basic medical science course has been found positive in some institutions. Students were more involved with their faculty and peers in this learning method. Students found working with other students was more effective to learn concepts and practical clinical skills. It is believed that the team-based learning did help the few academically weaker students to succeed¹⁶.

The study conducted to ascertain whether the problem-based learning (PBL) as an educational strategy can be of great help in improving the quality of gross anatomy and the attitude of students towards the learning method found out the satisfaction of students with this learning method and the students' interest and ability improvement after this teaching method. The study clearly pointed out that the PBL benefits a lot for the students in the study of gross anatomy despite of the existing problems. PBL can be combined with the characteristics of traditional anatomy teaching¹⁷.

Case-based learning (CBL) is a longstanding and common educational approach, which in medical (and health professional) education helps link theory with practice. Cases are clinically focused and help students remember that they are in the process of becoming medical practitioners. There are different ways to develop and deliver cases including paper based and online. Students most commonly work through cases in groups, learning through an inquiry-guided methodology that should be student led and student centered. There are ways of making cases useful and educational. CBL complements other ways of learning and teaching anatomy¹⁸.

Case based learning is also termed inquiry based learning as a clinical case presentation is followed by clearly defined learning outcomes that are met through purposefully defined questions. The students are divided into small groups and the case is introduced to them with defined sources of study or search to answer the questions leading to meeting the learning outcomes of the subject of CBL.

METHOD

It was a cross sectional observational study. CBL sessions were conducted through the course work of cardiorespiratory module of the first year MBBS class. One CBL session was held each week during six weeks module. CBL sessions were conducted as a small group session, each group comprising six students. Clinical cases were carefully created to conform to the learning outcomes that were designed

to be addressed for that session. Each clinical scenario was followed by few questions to meet the learning outcomes of the CBL session. The group was given the CBL on first day of the week and then the discussion was held on the last day of week. Learning resources were defined. Students were allowed to choose a leader out of the group for each session which gave each member to be the leader once. Group leader organized the group dynamic to prepare for discussion session. Each member of the group participated in the discussion session, which was supported by a powerpoint presentation about the clinical case, explaining the terminology used, and relating it with the basic anatomical knowledge. While the students were presenting, discussing and questioning each other the teacher performed the job of a facilitator. At the end of session the facilitator summed up the case and gave a summary of the case, making sure the defined learning outcomes are achieved.

RESULTS

First year MBBS class of 150 students were given questionnaire, consisting of 10 questions about their experience with CBL, as a mode of learning gross anatomy. 115 students responded this questionnaire. Out of these 115 students, 55 students were male while 60 were female. 74% of male & 92% of female students agreed on the usefulness of CBL as a mode

of learning gross anatomy. 89% of male and 94% of female students found clinical scenarios interesting. 92% of male and 91% of female students found the knowledge was applicable to their future clinical practice. 74% of male and 67% of female students agreed that CBL sessions motivated them to study gross anatomy. 83% of male and 85% of female students found CBL sessions to be more effective as compared to didactic lectures. 87% of male and 87% of female students were of the opinion that CBL sessions promoted independent learning. 92% of male and 96% of female students found the CBL scenarios were relevant to real life situations. 78% of male & 97% of female students believe that CBL sessions promoted mutual interaction among students in a constructive and useful manner. 74% of male & 69% of female students found these sessions improved their communication skills. 71% of male and 83% of female students considered that teacher had very important role in these CBL sessions. Overall 81.4% of male students and 86% of female students were happy with their experience with learning of gross anatomy through CBL sessions.

Only 7% of male students and 6% of female students didn't find this mode of learning useful. Results of the questionnaire are given in table-1 and 2 for male and female students respectively.

Table 1: Result of questionnaire from male students (n=55)

Q. No	Questions	Strongly agree (A)	Agree (B)	Disagree (C)	Strongly disagree (D)
1.	CBL sessions were very useful in understanding the gross anatomy of thorax	12	29	5	4
2.	Clinical cases given in CBL classes were interesting.	19	30	5	1
3.	CBL model was useful in future application of knowledge.	25	26	3	1
4.	CBL session motivated you to learn gross anatomy.	13	28	13	1
5.	CBL sessions promoted meaningful learning than the didactic lecture.	20	26	5	4
6.	CBL sessions promoted independent learning skills during preparation of case.	23	25	5	2
7.	CBL sessions made learning more relevant to real life situations.	21	30	2	2
8.	CBL sessions helped mutual interaction amongst students better and constructive.	15	28	8	4
9.	These sessions helped us improve our communication skills.	14	27	10	4
10.	Role of teacher was very important in CBL session.	17	22	10	6

Table 2: Result of questionnaire from female students (n=60)

Q. No.	Questions	Strongly agree (A)	Agree (B)	Disagree (C)	Strongly disagree (D)
1.	CBL sessions were very useful in understanding the gross anatomy of thorax	15	36	5	4
2.	Clinical cases given in CBL classes were interesting.	14	38	4	4
3.	CBL model was useful in future application of knowledge.	15	35	6	4
4.	CBL session motivated you to learn gross anatomy.	12	25	17	6
5.	CBL sessions promoted meaningful learning than the didactic lecture.	17	30	10	3
6.	CBL sessions promoted independent learning skills during preparation of case.	17	31	8	4
7.	CBL sessions made learning more relevant to real life situations.	24	29	6	1
8.	CBL sessions helped mutual interaction amongst students better and constructive.	13	28	13	6
9.	These sessions helped us improve our communication skills.	15	23	15	7

10.	Role of teacher was very important in CBL session.	23	23	10	4
-----	--	----	----	----	---

DISCUSSION

CBL sessions are a form of small group teaching methods which promotes self-directed learning, integrating the learning of basic medical sciences with clinical cases. Our study was focused on knowing the students perspective on this newer learning approach. There was not much gender difference in the feedback opinion from the students.

More than 90% students were of the opinion that the CBL sessions were effective in understanding and learning of anatomy of cardiovascular system. CBL differ from PBL in certain respects although both of them are small group sessions integrating the basic knowledge with clinical practice. In PBL the problem is having wide ranging and vague objectives. The resources to work out the problem are not limited so the learner can be dragged away by the large amount of knowledge that he/she comes across on his/her own, as the learner is left free to explore. In CBL, however, the learning outcomes are clearly defined with guided resources in the form of text books, articles or online resources. So the learner remains focused on the case and learns the basic anatomy, integrating with the clinical scenario that he can come across in his future practical life¹⁹.

In CBL group discussion, the group works on creative problem solving, with some advance preparation. Both students and facilitators take the discussion towards predefined learning outcomes. As in the PBL format, learners have time to struggle, define, and solve the problem. However, when learners begin to lose track while exploring, the facilitators guide them back to the main learning objective.²⁰ It is found that CBL are more effective in preclinical years during basic sciences time and PBL are more beneficial during clinical years like third year onwards as now the student is well versed with basic subjects and can now move on to problem solving skills better.²¹ Our students found the CBL to present interesting and close to real life scenarios that made the learning more relevant and interest provoking. CBL proponents argue that CBL still provides for open-ended exploration of issues and encourages debate, discussion, and exploration of ambiguity while providing more structure for the learner in an efficient, goal-directed manner. Giving specific learning outcomes in CBL helps focus the learners on the key points of a clinical case, encourages a structured approach to clinical problem-solving, and allows each learner to be a "content expert" for part of the session. Faculty can moderate the influence of louder, more contributory students.

Whether it is PBL or CBL much also depends on its construction. If the scenario is too complex or twisted it seems unreal or cooked up but if we keep it simple and real like it has a better appeal for the learner. Motivation was another attribute of this mode of learning/teaching, as it involves the learner to put an effort to learn the subject. Our students found this experience motivational and pushed them towards self-directed learning, as it gave each student a chance to present his/her work in front of the group so they were trying to be better than rest of group due to peer pressure and self-esteem. It worked well as some of students who were habitually introvert, they tried to be more open and interactive. This observation of ours is supported by other worker²². There is controversy about the effectiveness of problem based learning as compared to traditional teaching. In a study conducted in an Iranian medical university, the examination performance and students satisfaction derived from their responses to a questionnaire was evaluated after the anatomy courses of first year. It was found that after the PBL better examination scores were achieved. Moreover, the students were more satisfied and believed that this method enhanced their problem solving skills²³.

In small group teaching which occurs during CBL, students work in collaborating group. Problem solving is attempted using critical thinking. The discussion is student centered and allows the students to integrate knowledge gained while exploring the case. The teacher facilitates group discussion. The teacher helps by clarifying the misunderstood concepts and by explaining more complicated and difficult concepts. The teacher does not dominate discussion. The CBL style of teaching enhances student motivation. The effectiveness of CBL seems to relate to the active learning undertaken by students and the application of knowledge acquired to different cases, thus enhancing its relevance²⁴.

CONCLUSION

CBL is an effective method in teaching and learning of gross anatomy making the basic knowledge more integrated, relevant and interesting. It may have its short comings in terms of the course content and in depth knowledge of anatomy. As some topics in core curriculum of anatomy cannot be discussed as a CBL. The effectiveness of this learning modality in terms of the academic performance is yet to be explored. In order to satisfy each individual learner no single methodology is sufficient so we conclude

that CBL should be used as adjunct to traditional teaching in a hybrid curriculum.

REFERENCES

1. Sugand K, Abrahams P, Khurana A. The anatomy of anatomy: a review for its modernization. *AnatSci Educ.* 2010 Mar-Apr; 3(2):83-93)
2. Kizlik B. Instructional Methods Information: Part 1. 2012available from:URL:<http://www.adprima.com/teachmeth.htm>.
3. Szabo A, Hastings N. Using IT in the undergraduate classroom: Should we replace the blackboard with PowerPoint? *Computers and Education* 2000; 35: 175–187
4. Benly P, Pharm J. Teaching Methodologies on Anatomy- A Review. *Sci. & Res.* Vol. 6(6), 2014, 242-243
5. Lowry R B. Electronic presentation of lectures—effect upon student performance. *University Chemistry Education*1999; 3(1): 18–21
6. Snelling J, Sahai A, Ellis H. Attitudes of medical and dental students to dissection *Clin Anat.* 2003;16:165–72. [Pub Med].
7. Aversi-Ferreira TA, Monteiro CA, Maia FA. et al. Neurophysiology study associated with three-dimensional models constructed during the learning. *Bioscience Journal*, 2008, vol. 24, no. 1, p. 98-103
8. Bergman EM, Prince KJ, Drukker J. et al. How much anatomy is enough? *AnatSci Educ.* 2008; 1 (4): 184-8.
9. Darda DM. Observations by a university anatomy teacher and a suggestion for curricular change: integrative anatomy for undergraduates. *AnatSci Educ.* 2010; 3(2): 73-75.
10. Nicholson DT, Chalk C, Funnel WR. et al. Can virtual reality improve anatomy education? A randomized controlled study of a computer-generated three-dimensional anatomical ear model. *Med Educ.* 2006; 40(11): 1081-7.
11. Pereira JA, Merı A, Masdeu C, Molina-Toma's MC, Martinez-Carrio' A. Using video clipsto improve theoretical anatomy teaching. *Eur. J. Anat.* 2004; 8: 143–6.
12. Sugand K, Abrahams P, Khurana A. The anatomy of anatomy: a review for its modernization. *AnatSci Educ.* 2010; 3(2): 83-88
13. Turney BW. Anatomy in a modern medical curriculum. *Ann R CollSurg Engl.* 2007; 89(2): 104–7
14. Shaffer K. Teaching anatomy in the digital world. *N Engl J Med.* 2004; 351:1279–82.[Pub Med.]
15. Notebaert AJ. Student Perceptionsabout Learning Anatomy:Iowa, July 2009. Thesis Supervisor: Professor Brian Hand.2009.
16. Nieder GL, ParmeleeDX,Stoffl A. andHudes PD. Team-Based Learning in a Medical Gross Anatomy and Embryology Course: *Clinical Anatomy* 18:56–63 (2005)
17. Chen C, Zhang W, Qin L , Cui H, Linghu D, Guan Y. et al. Problem-based learning in Gross Anatomy: Assessment Outcomes and Student Perceptions: *Journal of Biology and Life Science* ISSN 2157-6076 2013, Vol. 4, No. 1 .www.macrothink.org/jbls 194.
18. Thistlethwaite JE. Learning and Teaching Anatomy through Case-Based Learning (CBL). In: *Teaching Anatomy: Chan L, Pawlina W. (eds) Cham: Springer; 2015.*
19. Srinivasan M, Wilkes M, Stevenson F, Nguyen T, and Slavin S. Comparing Problem-Based Learning with Case-Based Learning: Effects of a Major Curricular Shift at Two Institutions, *Acad Med.* 2007; 82:74–82.
20. Slavin SJ, Wilkes MS, Usatine R. Doctoring III. Innovations in education in the clinical years. *Acad Med.* 1995;70: 1091–1095.
21. Pawlina W, RomrellLJ, Rarey KE, Larkin LH. Problem-Based Learning With Gross Anatomy Specimens: One Year Trial *Clinical Anatomy* 4:298-306 (1991).
22. Roberts C, Lawson M, Newble D, et al. The introduction of large class problem-based learning into an undergraduate medical curriculum: an evaluation. *Med Teach.* 2005; 27:52–53.
23. Khaki AA, Tubbs RS, Zarrintan S, Khamnei HJ, Shoja MM, Sadeghi H. et al. The First Year Medical Students' Perception of and Satisfaction from Problem-based Learning Compared to Traditional Teaching in Gross Anatomy: Introducing Problem-based Anatomy into a Traditional Curriculum in Iran; *International Journal of Health Sciences, Qassim University*, Vol. 1, No.1, (January 2007)
24. Thistlethwaite University of Queensland, Australia; Jill Elizabeth Thistlethwaite (lead reviewer), BSc, MBBS, PhD, MMed, FRCGP, FRACGP, Professor of Medical Education, School of Medicine, University of Queensland, Brisbane, Australia.