

ORIGINAL ARTICLE

INTRODUCTION OF CASE-BASED LEARNING IN PHYSIOLOGY
AND EVALUATION OF THE LEARNING EXPERIENCESukhjinder Kaur Dhillon, Richa Ghay Thaman, Kiran,
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Background: Case-based learning (CBL) is a long established pedagogical method, which is defined in a number of ways depending on the discipline and type of 'case' employed. Basic, social, and clinical sciences are studied in relation to the case, integrated with clinical presentations and conditions, and student learning is, therefore, associated with real life situations. This study was done to explore, analyse and synthesise the evidence relating to the effectiveness of CBL as a means of achieving defined learning outcomes in health professionals' education. **Methods:** The study was conducted in the Department of Physiology SGRDIMSAR, Amritsar India. Faculty and students were sensitised about the case-based learning. An overview about Thyroid and Pancreatic gland was given to students in didactic lectures. Paper-based case scenarios of goitre and diabetes were given to students. Then during the tutorial time cases were discussed in small groups, and one teacher acted as facilitator for each small group. After that, feedback was taken from the students and faculty using five point Likert scale. Statistical analysis was done using SPSS-14. Students were assessed with the help of MCQs after each module. **Results:** Ninety-six percent of students thought that CBL was an effective learning tool for them, and 91% opined that it improved their analytical abilities. Most (96%) students reported that CBL helps in better retention of knowledge, 93% thought the cases were appropriate to the lecture topics and 89% wanted to have more CBL sessions. Seventy-seven percent students thought that CBL improved their communication and collaborative skills and ability to work within a team. Regarding faculty perception of CBL, 86% took CBL better than conventional method, it promoted self-study and problem solving abilities (90%), recall and application of basic sciences to clinical scenario (84%), improved communication skills of students (78%), and felt that it should be done regularly. **Conclusions:** Majority of the students enjoy CBL and think that it enhances learning. The empirical data taken as a whole is conclusive as to the effects on learning compared with other types of activity. Teachers enjoy CBL, partly because it engages, and is perceived to motivate students. CBL seems to foster learning in small groups. Whether this is the case delivery or the group learning effect, is unclear. **Keywords:** Case based learning, teaching learning method, didactic lecture, active learning

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INTRODUCTION

There is no single way of learning in medicine since each method has its own advantages and disadvantages. Although the didactic lecture format may be effective for disseminating a large amount of information to a large number of students, it presents many challenges to both teachers and learners because it often promotes passive learning and fails to motivate students. Therefore, over the past few decades, a lot of attention has been paid to promoting active learning by adapting interactive student-centred approaches in undergraduate medical education, including problem-based learning (PBL), and case-based learning (CBL).¹ Active learning is a student-centred rather than a teacher-centred process; it makes learners responsible for their own learning by self-directed, peer-assisted seeking of new information.²

CBL is now an established active learning tool which aims at developing reasoning skills, based on the clinical scenarios and hence, a medical student understands the importance of the basic medical science

subjects.³ Clinical case which is given, acts as a stimulus so the learner is motivated to gain knowledge. This process is guided, as the facilitator plays a minimal role but guides the learner.⁴ This innovative learning approach was first applied in medical education by the Anatomy Department of a medical school in Newfoundland, Canada. The CBL promotes active learning by using clinical case scenarios which reflect real life experiences that students will face during the clinical phase of their medical education. Cases are generally written as problems that provide students with the history, physical findings and laboratory results of a patient. Active learning takes place when students are given the opportunity to develop a more interactive relationship with the case, encouraging them to generate rather than simply receive knowledge, organizing it in a meaningful manner and developing skills to share with other learners in a group. CBL has several advantages, including promoting self-directed lifelong learning, introducing basic medical sciences in a coherent manner closely related to topics in clinical sciences, and

reinforcing the reasoning, communication skills, and collaboration of students.^{5,6}

Inclusivity rather than exclusivity of teaching learning efforts and practice is the main theme and this may contribute towards realization of full learning potential by the students thereby resulting in better learning.

In this study, we described medical students' attitude towards implementing an innovative instructional design that incorporates CBL into a traditional lecture-based teaching.

METHODOLOGY

This study was conducted in the Department of Physiology, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar, India. Permission was taken from the Institutional Ethical Committee.

After informed consent, 150 students of First Professional MBBS were included in the study out of which 132 students finally participated in the study. Faculty sensitization program was held. All steps of CBL were strictly followed. An overview about Thyroid and Pancreatic gland was given to students in traditional didactic lectures. Paper-based case scenarios of hyperthyroidism and diabetes mellitus were given to students. Students were given one week time to study each case scenario. Then during the tutorial time students were divided into small groups of 14 each, and one teacher acted as facilitator for each group. The facilitators engaged the students in a learner centred environment and encouraged active participation to reach the final conclusion. Students discussed among themselves various aspects of the case.

After that, feedback was collected from the students and faculty using 5-point Likert scale ranging from strongly disagree to strongly agree. Percentage of responses was calculated by using SPSS-14. Proportions were compared by Chi-square test to determine statistical significance of the difference, and $p < 0.05$ was taken as significant.

Teachers' feedback had more open ended questions asking about their comments about CBL and suggestions about its further application in our curriculum. Students were assessed with the help of MCQ test after each module. Question paper had 20 MCQs with a combination of recall type and higher order type based on problem solving skills and clinical application.

Objectives of this study were to promote self-directed learning in medical students, develop analytic, communicative and collaborative skills along with content knowledge, motivate students to adopt a problem solving approach by relating basic science subjects with clinical scenario, to apply concepts of theory to clinical conditions through self-learning, and motivate faculty to adopt a new teaching-learning methodology.

RESULTS

Total 132 students returned the filled feedback questionnaire. Table-1 shows number of students obtaining different percentages of total marks in the MCQ Test.

Table-1: Marks scored by the students in MCQ test

Module	>70%	50-70%	<50%
Module 1 (Hyperthyroidism)	118	12	2
Module 2 (Diabetes Mellitus)	126	5	1

Table-2 shows responses of the students on a 5-point Likert scale ranging from strongly agree to strongly disagree. Majority (96%) of students thought that CBL was an effective learning tool for them, and that it improved their analytical abilities (91%). Most (96%) students reported that CBL helps in better retention of knowledge. Regarding cases discussed, most (93%) responders said that the cases were appropriate to the lecture topics and that they (89%) want to have more CBL sessions. A large proportion of students (77%) thought that CBL improved their communication and collaborative skills and ability to work within a team. Some of the responses in students' feedback were:

- More CBL should be conducted
- It should be conducted to increase our knowledge
- CBL is more interesting and improves our knowledge more than tutorial and classes
- Instant feedback and clarification of concepts which does not happen in regular theory classes
- Very interesting way to study, didn't get bored

Results of faculty feedback are shown in Table-3. Total 13 faculty members participated in the study and gave their feedback. CBL was appreciated by all faculty members. Sixty-nine percent of the teachers felt that CBL is a better method of teaching and learning than the conventional one, as it promotes self-study and problem-solving abilities of the students (77%). The majority (77%) of teachers felt that CBL would help in improving communication skills, understanding principles of group dynamics (69%), and will facilitate a better and healthy teacher-student relationship (85%), and 92% of the faculty wanted to have regular CBL sessions. Faculty members also gave the list of topics that can be taught by CBL in the next session and showed their willingness to be a faculty member for the CBL sessions in the next academic sessions. Some salient points from the Focus Group Discussion with the faculty after they had filled out the feedback questionnaire were:

- CBL can be alternated with tutorials regularly
- More topics like hypertension, shock, peptic ulcer and tetany etc. can be taught by this method
- Some students take it casually, they can be counselled separately

Table-2: Results of students' feedback (%)

Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
CBL better method of T/L than conventional one	64*	32	1	1	2
Promotes self-study and problem solving ability	44	47	8	1	0
Recall and application of basic sciences to clinical scenario	56*	37	6	1	0
Better retention of knowledge	60*	36	4	0	0
Improved communication skills	32	45	18	5	0
Understanding of group dynamics	25	47	21	4	3
Want to have more CBL sessions	61*	28	6	4	1
Faculty with poor teaching skills as good facilitator	40	26	24	3	7
Healthy teacher student relationship	43	44	7	2	4
Increased interest in endocrine physiology	63*	24	13	0	0

(* $p < 0.05$)**Table-3: Results of faculty feedback (%)**

Questions	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
CBL better method of T/L than conventional methods	69	15	8	8	0
Promotes self-study and problem solving abilities of students	77	15	8	0	0
Recall and application of basic sci. to clinical scenario	85	7	8	0	0
Improves communication skills of students	77	15	8	0	0
Facilitates healthy teacher-student relationship	85	15	0	0	0
CBL should be done regularly	92	8	0	0	0
Teachers become good facilitator	85	15	0	0	0
Better retention of knowledge	92	8	0	0	0
Helps to understand principles of group dynamics	69	8	15	8	0

DISCUSSION

Conventionally we are teaching undergraduate students with the help of didactic lectures, practical demonstrations, tutorials and clinics, which are mostly used as passive teaching and learning methods. However, they lack in the development of problem-solving or reasoning skills of the students. Furthermore, there is hardly any involvement of students in the teaching-learning process.⁷ Various alternate methods are being used in many medical colleges such as case-stimulated learning, problem-based learning, patient-centred learning, and multiple-format sessions to reinforce didactic lectures in endocrine physiology.^{8,9}

CBL is one method where students are motivated to learn on their own so as to inculcate the habit of self-learning and integrating knowledge from different subjects to solve problems. Hence, we thought of adopting a judicious mixture of didactic lectures and CBL sessions as a pilot project in our institute so as to retain the lectures and supplement them with a new teaching-learning methodology, which will give a problem-solving approach. Similar studies have been done in various other institutes also. We found that our students were able to answer questions related to higher levels of cognition. Our study brought positive learning outcomes like improving communication skills, group dynamics and better retention of knowledge. These findings are in agreement with various other studies.^{10,11} It proved to be an interesting study and helped the students in improving their academic performance as all students scored very well in MCQ test and it also motivated them to actively participate, with everybody giving their input.¹² In our study, points discussed during CBL enabled students to understand the

physiological disorders in integration with the clinical presentation. The results are comparable to a study in which CBL improved understanding of subject.⁴

This study helped to motivate students to adopt a problem-solving approach by relating basic science subjects with a clinical scenario and to apply concepts of theory to clinical conditions through self-learning. It helped in the development of soft skills such as communication skills and principles of group dynamics. It also motivated the faculty to adopt a new teaching-learning methodology. The study was mainly focused toward developing problem-solving or reasoning skills among the students.

LIMITATIONS

- Active faculty participation is required. Almost whole of the faculty need to be involved. It is difficult to change the mindset of some faculty members and to actively involve them.
- Time constraint is there, proper management and planning is required.

CONCLUSIONS

Physiology is rightly said the mother of medicine, so its thorough understanding is required to study medicine and pathology. As CBL motivates students toward self-directed learning and to develop analytic and problem-solving skills, it will be helpful for the students when they go for clinical postings.

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