

Case Based Learning- A method of active learning in Microbiology

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Abstract

Active learning happens when students are given the opportunity to develop more interactive relationship with subject, encouraging them to generate rather than simply receive knowledge. Case Based Learning (CBL) is one method where students are motivated towards self-learning and to develop analytic and problem solving skills. Didactic lectures on Tuberculosis and lower respiratory tract infections were conducted. Facilitators training program was conducted. Students were divided in small groups. A paper based case scenario of pulmonary tuberculosis was given to II MBBS students in two sessions. A pretest and posttest was conducted. An attitude survey of the students and teachers was done using a Likert scale ranging from strongly disagrees to strongly agree. There was a significant improvement in students' performance when pre and posttest scores were compared ($p =$). The students opined that CBL helped them for better retention of knowledge and to better relate clinical conditions with basic sciences. CBL sessions helped them to significantly improve in soft skills, like communication skills, group dynamics and also promoted a better teacher student relationship. Faculty members opined that CBL promoted self-study and problem solving abilities of the students. To conclude our experience indicated that CBL session enhanced active learning in Microbiology, and such session would not only help students to gain requisite knowledge in microbiology but also enhance their communication and analytic skills.

Key Words: Case Based Learning, Microbiology, Active learning

Introduction

Medical education is changing rapidly, with more than half of American medical schools engaged in curriculum reforms⁽¹⁾. Many courses use case studies in their curriculum to teach content, involve students with real life data or provide opportunities for students to put themselves in the decision maker's shoes. There is an emphasis in many Indian medical schools to decrease the quantum of rote memorization and adopt learning strategies that enhance critical thinking among students⁽²⁾. Learning methods have been classified as teacher –controlled and learner-controlled method. Learner controlled method promote self-directed learning. Self-directed learning is a process in which learners take responsibility for their learning. Giving greater responsibility to students for their own learning increases motivation.⁽³⁾

In self-directed learning, learners are involved in selecting learning resources and learning methods and self-assessment of learning outcomes with teachers acting as facilitators.⁽⁴⁾ Self-directed learning is increasingly used in medical curricula as it is thought to promote lifelong learning in medicine.⁽⁵⁾ The emerging trend all over the world is to have a problem-based, integrated student-centered medical curriculum, demanding active participation from the students and facilitating self-directed learning.⁽⁶⁾ Working effectively within teams has been recognized by medical educator as an important competency for learners. Teams are increasingly being used in medical education to enhance active learning and foster better interpersonal communication skills.⁽⁷⁾

The changing needs of society, advances in scientific knowledge, and innovations in the field have prompted the Medical Council of India to adopt a need based curriculum towards self-directed learning for undergraduate medical education in India. The Medical Council of India, in the recent *Vision 2015* document, recommended curricular reforms for undergraduates that included foundation courses toward the orientation of students to national health scenarios, learning skills and communication, integration both horizontal and vertical to bridge the gap between theory and practice, and an emphasis on early clinical exposure in the form of introduction of case scenarios for classroom discussion/case-based learning (CBL). This will done as a coordinated effort by pre-, paraclinical, and clinical faculties (MCI Vision document)

Conventionally teaching of undergraduate students is done by didactic lectures, practicals and tutorials in paraclinical subject like Microbiology, however these techniques lack in the development of problem solving or reasoning skills of the students.

Case based learning (CBL) is an active learning strategy closely related to the problem based learning (PBL). CBL in fact incorporates many traits derived from PBL.⁽⁸⁾ The main difference between CBL and PBL is that in CBL problem or case scenario was given after didactic lecture of respective topic whereas in PBL problem or case scenario was given directly without didactic lecture of respective topic. Case based learning (CBL) can be used as an effective teaching tool in medical colleges as an adjunct to other teaching techniques especially in para-clinical subjects.

This study was planned keeping in mind the para-clinical subjects like microbiology in MBBS (Bachelor of medicine & bachelor of surgery). The study was undertaken with following aims and objectives:

1. To motivate students to learn a problem solving approach by relating paraclinical subjects with clinical scenario.
2. To develop communication skills and learn principles of group dynamics.
3. To motivate teachers to adopt new teaching learning methods.

Thus the study was mainly focused toward developing problem solving or reasoning skills among the students.

Methodology

It is an experimental study. II year Bachelor of Medicine, Bachelor of Surgery (MBBS) students ($n = 150$) from NKP Salve Institute of Medical Sciences and Research Center (Nagpur, India) were chosen for this study. Permission was obtained from the Institutional Ethics Committee (approval no. 41/2010). A meeting of teachers from the Departments of Microbiology and Medicine was arranged, and a case describing Lower respiratory tract infection was designed. A facilitator training program was undertaken in the department under the guidance of Secretary of the Medical Education Unit of the institute. The "facilitators" were Microbiologists. II MBBS Students [$n = 150$] were included in the study.

A facilitator training program was undertaken under guidance of Medical Education Technology Unit. Faculties who volunteered to be a part of this teaching program were sensitized about CBL which included Microbiologists. Students were informed about the new intervention and informed consent was taken. An overview about lower respiratory tract infections was given in a didactic lecture. Students were divided into smaller groups of about 15-20 each with one facilitator for each group. A paper based case scenario was given in two sessions one week apart.

Students discussed the case among them and were asked to frame learning objectives based on cues. References were given to them to prepare for the next session. In the next session, investigations report was

given and they were asked to solve the problem completely.

The teacher present there only facilitated the learning process of each student, streamlined the thought process of the students, and clarified controversy if there was any.

A pre and posttest questionnaire with multiple choice questions, a combination of recall type and higher order type based on clinical application and problem solving was used.

An attitude survey of students was done on 9 parameters using five-point Likert scale ranging from strongly disagrees to strongly agree. A separate questionnaire to assess teacher feedback was used.

Statistical Analysis: The objective of the study was to evaluate the impact of the intervention, i.e., CBL, on the students. A 20-point questionnaire was administered to the students before the intervention.

Accordingly, a score (out of 20 totals) was obtained for each student. The same survey was again repeated after CBL, and student responses were obtained accordingly. Average pre- and post-intervention scores of all students were obtained. To assess the overall impact of the intervention, a nonparametric Wilcoxon rank-sum test was used. Statistical significance was tested at the 5% level, and the analysis was carried out using the SPSS (version 18.0) package (SPSS).

Results

There was a significant improvement in students' performance when pre and posttest scores were compared ($p < 0.001$). The students opined that CBL helped them for better retention of knowledge and to better relate clinical conditions with basic sciences.

Further analysis on percentage basis was done. Pretest and posttest knowledge percentage was 44.32% and 74.82% respectively. Total knowledge gain by CBL method was 30.5%

CBL was appreciated by students as well as teachers. Attitude survey was done based on following questions and response was taken on Likert scale ranging from strongly disagrees to strongly agree.

Questionnaire for the attitude survey

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|----|--|
| Q1 | CBL is a better method of teaching/learning than the conventional one. |
| Q2 | CBL promotes self-study and problem solving abilities of the students. |
| Q3 | CBL helps in the recall and application of basic sciences to the given clinical scenario. |
| Q4 | CBL helps in better retention of knowledge. |
| Q5 | CBL helps in improving communication skills of the students. |
| Q6 | CBL helps in understanding the principles of group dynamics. |
| Q7 | CBL deprives students of an opportunity to acquire knowledge from experienced and good teachers. |
| Q8 | CBL gives an opportunity for even staff members with poor teaching skills to be good facilitators. |
| Q9 | CBL facilitates a better and healthy teacher student relationship. |

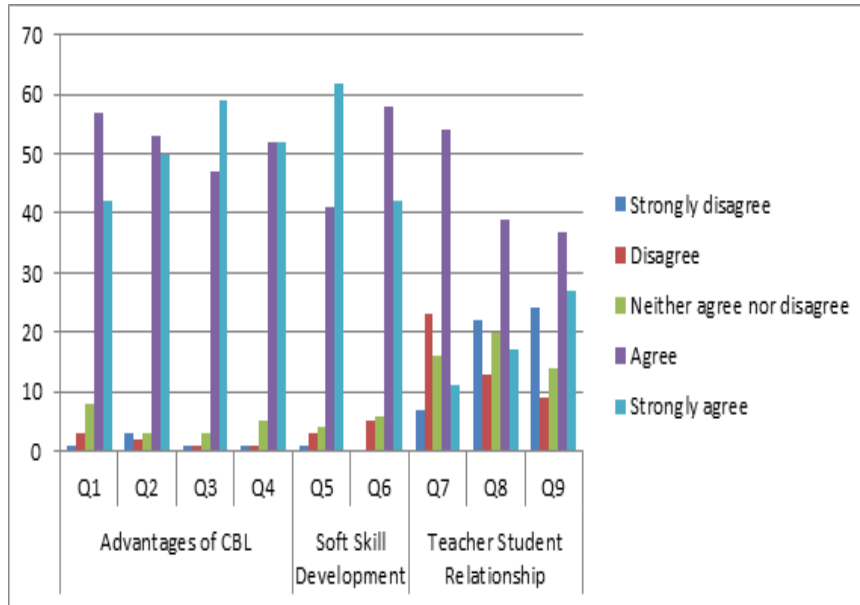


Fig. 1: Attitude survey of students, using a Likert scale

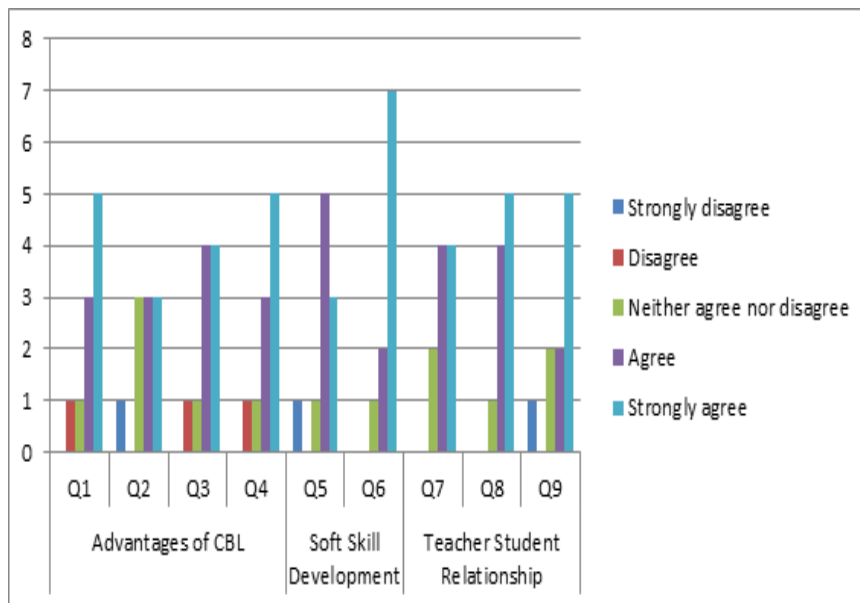


Fig. 2: Attitude survey of teachers, using a Likert scale

Faculty members even suggested topics for next sessions and showed their willingness to be a part of team to conduct CBL sessions in future.

Discussion

Conventionally teaching in Microbiology has always been through didactic lectures, practicals, and tutorials. Our institute is affiliated with a Medical University of the State (Maharashtra University of Health Sciences). We are provided with a curriculum from the university to be taught in a traditional manner, where the major portion of Microbiology is taught to students with the help of didactic lectures. Lectures are definitely effective where information is to be delivered to a large number of students quickly.

But the technique has limitations, as lectures are a passive method of learning by students and there is no problem solving approach.

It is generally accepted that the chances of retaining the learned material will be better if the learning is expected to occur around a realistic problem Case scenarios used in CBL sessions help them to apply the scientific knowledge to frame questions and to answer them. This would cultivate analytical skills and develop their decision making ability.

The results of this study indicate that the learning of students is significantly enhanced using CBL teaching learning methodology, as students were able to answer application-based questions as well. The results of the study also indicate that the assimilation of the

knowledge was also improved because discussing a case after the didactic lecture was helpful in knowledge assimilation which is seen in scores of pre and posttest questionnaire. The retention of knowledge was also better because students were required to study the same topic from all subjects simultaneously so as to integrate the knowledge to solve the given problem.

Similar types of studies have been introduced in some medical colleges in India, and the results have been encouraging^(9,10,11). The teachers who were facilitators in the CBL project admitted that with this exposure to a new teaching-learning process, their knowledge about the new teaching-learning method has increased and they are now ready to experiment with new methods of teaching.

Challenges faced.

- CBL requires teamwork; so we were required to convince each and every staff member to seek their cooperation.
- Infrastructure required for small group teaching.

Conclusion

Students felt that CBL sessions helped them to significantly improve in soft skills, like communication skills, group dynamics and also promoted a better teacher student relationship. Further case scenarios help them to practically understand the subject and its applications. Faculty members opined that CBL promoted self-study and problem solving abilities of the students.

In nutshell our experience indicated that CBL session enhanced active learning in Microbiology, and such sessions would not only help students to gain requisite knowledge in microbiology but also enhance their communication and analytic skills.

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