

Original Research Article

Modified case-based learning as supplement to bedside teaching-why, how and what next?

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Received: 22 April 2025

Revised: 14 May 2025

Accepted: 23 July 2025

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ABSTRACT

Background: Competency based medical education requires the teaching learning methods and assessment to conform to the framework of competencies. The pandemic disrupted medical education; but led to modifications and innovations in teaching methodologies. We adopted modified CBL for third year part 2 students, alongside bedside teaching to explore its efficacy in terms of improving clinical reasoning, group dynamics, summarizing, presentation and to highlight perceptions of students regarding CBL and its adoption as a regular teaching learning activity.

Methods: CBL sessions were taken every afternoon by faculty from department of medicine, trained by department of Health Professions Education; who used real life authentic cases. At the end of each posting, evaluation was planned based on Kirkpatrick hierarchy. Google form, focussed group discussions and content analysis, OSCE stations, bedside case presentation and MCQ based tests were used.

Results: Learning assessment tools showed that CBL enhanced learning. Feedback from students revealed that CBL encouraged discussions and critical thinking and through FGDs they suggested the need for advance topic information, more pre-reading time, blending CBLs with lectures when relevant and selecting specific topics to be taught through CBL.

Conclusions: Our study demonstrates that modifying CBL-based teaching and including it in clinical postings as a substitute/ supplement to bedside teaching during times when there is lack of clinical material is feasible and effective, as shown by the performance of students in the MCQs. It also appeals to the students and the clinical case scenarios mirror real-world situations, enhance learning and facilitate the clearing of concepts.

Keywords: Case based learning, Clinical competence, CBME, Medical education, Modified CBL

INTRODUCTION

The national medical commission of India, planned and implemented competency based medical education in 2019, to promote outcome-based learning, aligning teaching and assessment with defined competencies, to produce globally competent doctors (National Medical Commission (NMC), n.d.). Soon after the pandemic disrupted the medical education in an unprecedented manner.¹ Clinical subjects, taught from year 2 and emphasized in year 3 and 4, rely on bed side teaching with student-doctor method, where learners are to be provided

with experience of longitudinal and hands on care of patients in OPD/IPD. The pandemic and post pandemic era saw a drop in patient load reducing clinical exposure and limiting bedside teaching. While didactic lectures continued for “must know” topics, they have been criticized for being passive and cognitively heavy. Interactive lectures, despite technological tools, lack collaboration and problem solving due to infrastructural and environmental limitations. Multiple essential skills for survival in the 21st century include problem solving, creativity, computer and information literacy, collaboration.² In order to achieve the competencies, small

group learning methods like problem-based learning (PBL), case-based learning (CBL) and team-based learning (TBL) have evolved. These methods promote student centered learning through authentic clinical cases, active discussion, knowledge activation and application.³

CBL, recommended by NMC, fosters peer learning, structured clinical reasoning and facilitator-guided feedback. It aligns with the lower levels of Miller's pyramid (knows and knows how), assessing knowledge and competence.⁴

Experience-based learning (ExBL), proposed by Dornan et al suggests that learning is fostered through organizational (curricular alignment), pedagogic (supportive mentors) and affective (inclusive environment) factors.

Given these insights, CBL has potential as a supplement or substitute for bedside teaching. Considering our infrastructure, trained facilitators and student readiness for self-directed learning, we adopted a modified CBL approach for third-year Part II students alongside bedside teaching. The study aimed to assess its efficacy in enhancing clinical reasoning, group dynamics, summarizing, presentation, peer teaching and feedback. It also aimed to capture student's perceptions of CBL as a regular teaching-learning method.

CBL links theory to practice using clinical cases and inquiry-based learning. When well implemented, it supports knowledge, skills, behaviour and attitude development aligned with CBME goals. It is also adaptable when clinical material is limited.

METHODS

Setting

The study was a mixed- methods, quasi- experimental study conducted at Pramukhswami Medical College, a well-established NMC recognized rural medical college, in Gujarat to evaluate the effectiveness of a modified Case-Based Learning approach on clinical learning outcomes and student perceptions. The participants were two batches of students of final MBBS attending clinical posting in the department of medicine of 8 weeks duration each from March to July 2023.

Students attended clinical sessions in wards and OPD from 8:30 am to 12:00 noon and participated in CBL from 2:00 pm to 5:00 pm. Faculty across departments had been trained through workshops conducted by the Health Professions Education department at Bhaikaka University. Authentic real-life cases were developed for the modified CBL sessions.

Planning of the case-based learning sessions

Faculty shortlisted topics from the NMC's 'must know' list, focusing on clinically relevant areas. Out of the

shortlisted topics, those with strong clinical core and high relevance in clinical practice were finalised to be taken as CBL sessions. Multiple clinical case scenarios were created to highlight presentation, diagnosis, investigations, treatment and complications and symptom based approaches. Each case ended with questions aimed at developing clinical reasoning and management skills.

Conduct of the case-based learning sessions

WhatsApp groups were created for each batch including students and faculty. The CBL schedule was shared in advance. Students were divided into 3 groups of 8-10 each. Case scenarios were shared a few hours to a day before the session for preparation. Sessions of 3 were conducted in spacious lecture halls.

Session structure

Topic introduction with chalkboard method or Power point presentation by faculty. Presentation of the clinical case. Group discussion, with students encouraged to ask questions and answer the ones at the end of the case. Faculty moderated the session, guided discussions and corrected students. Students were encouraged to share what they would do in the given clinical situation. A final Q&A session was held, where opportunity of clarifying doubts and misconceptions was provided. Power point presentation was shared via WhatsApp group for reinforcement. This process was followed for all batches and topics.

Facilitation

Facilitators included senior residents, professors in medicine and nephrology consultants. Their varied expertise enriched the discussions and student learning.

Evaluation

Evacuation followed Kirkpatrick hierarchy, a globally recognized method of evaluating the results of training and learning programs.⁵

A Google form captured student feedback at the end of the posting, using 5-point Likert scale. The questions assessed CBL content, design, implementation and perception of students regarding its use in clinical application. They also assessed skill development, team dynamics, peer learning and faculty interactions. Open ended responses were also collected for improvement suggestions.

This measured level 1 (reaction) of Kirkpatrick hierarchy. For deeper insights, Focus Group Discussions were held with randomly selected students. Content analysis of responses was performed. To assess level 2 (learning) of Kirkpatrick hierarchy, OSCE stations and bedside case presentation were conducted. An MCQ (15 questions equally distributed across topics) followed under faculty supervision. Level 3 (Behaviour) could not be assessed

immediately due to students moving to new postings. It will be evaluated when they return for exams. Level 4 (Results) will be assessed by comparing university exam performance with the previous batch.

RESULTS

Multiple choice questions

All students responded to 15 MCQs covering CBL topics. To ensure consistency and avoid bias, the analysis focused on 8 questions on topics taught by the same faculty for both batches. MCQ scores are summarised in Figure 1.

Focussed group discussion

Faculty from the department of health professions education (SG) conducted focused group discussions with a representative sample of students selected by unit faculty (JM). Questions and responses are highlighted in Figure 2.

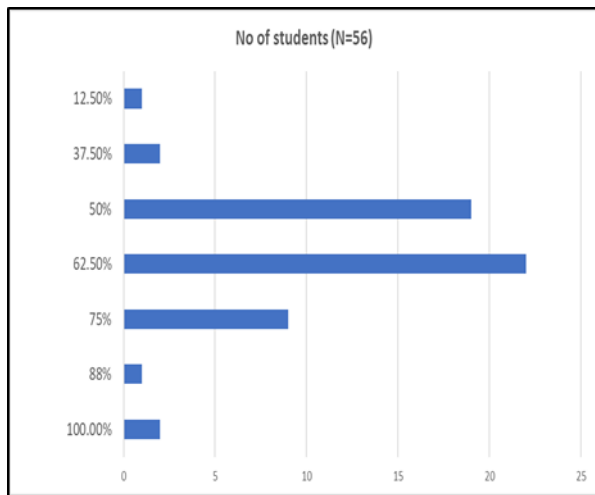


Figure 1: Scores obtained in the MCQ test.

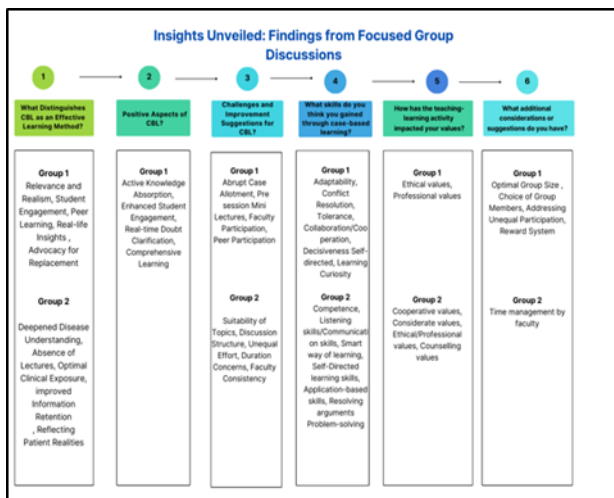


Figure 2: Responses obtained during focussed group discussion.

Feedback from both groups offered key insights into various aspects of CBL.

Question 1: What distinguishes case-based learning as an effective learning method?

Both groups identified key strengths of CBL, including realistic clinical scenarios and its relevance, active engagement, peer learning, real-life insights from faculty and its potential to replace traditional lectures. Group 2 emphasized deeper understanding, absence of lectures, optimal clinical exposure, improved information retention and the ability of cases to reflect real-life patient scenarios.

Question 2: Positive aspects of case-based learning?

Group 1 cited active knowledge absorption, increased engagement, on-the-spot doubt resolution and learning beyond textbooks, aiding the recognition of atypical presentations.

Question 3: Challenges and improvement suggestions for case-based learning?

Group 1 noted abrupt case allotment, lack of pre-reading time, limited faculty engagement and uneven peer participation. Suggested improvements included pre-reading time, mini-lectures, faculty involvement and a reward system.

Group 2 highlighted topic suitability, discussion structure, group effort imbalance, session duration and faculty consistency. Suggested solutions included lectures for complex topics, flexible session durations and standardized faculty approaches.

Question 4: What skills do you believe you have acquired through the teaching-learning activity, particularly in the context of case-based learning?

Group 1 reported gains in adaptability, conflict resolution, tolerance, collaboration, decisiveness, self-directed learning and curiosity. Group 2 added competence, communication, smart learning, self-directed learning, application, resolving arguments and problem-solving.

Question 5: In reflecting on the teaching-learning activity, how do you believe it has contributed to the following values in your life?

Group 1 reflected on ethical and professional growth, while Group 2 emphasized cooperation, consideration, ethics and counselling values.

Question 6: What additional considerations or suggestions do you have?

Group 1 proposed smaller groups, self-selection of members, addressing unequal participation through

questioning and rewards tied to attendance rather than scores. Group 2 emphasized faculty time management.

Overall, both groups provided comprehensive feedback on CBL's strengths, challenges and areas for improvement.

Student feedback

Feedback was collected via Google forms using a 5-point Likert Scale. Key responses are summarized below.

Question 1: session evaluation

Formats mirroring real world clinical experience

94% strongly agreed or agreed that CBL mirrors real-world clinical experience, indicating a high level of alignment with practical scenarios. 4% were neutral; while 2% disagreed.

Effectiveness in understanding a particular topic

90% found CBL effective in understanding specific topics. 10% had a neutral perspective and none disagreed.

Context of problems in important and common diseases

94% agreed or strongly agreed that CBL covers important/common diseases. 4% were neutral, while 2% disagreed.

Opportunities for relating basic mechanisms to clinical conditions

83% agreed that CBL links basic mechanisms to clinical conditions. 17% were neutral and none disagreed.

Better understanding of a particular system and associated clinical condition

85% felt that CBL improved understanding of systems and conditions. 15% were neutral and none disagreed.

Integration of different systems and subjects appropriately

85% agreed or strongly agreed that CBL helps integrate different systems and subjects appropriately. 12% expressed neutrality and 4% disagreed.

Opportunities for self-directed learning

79% agreed or strongly agreed that CBL sessions provide ample opportunities for self-directed learning. 19% were neutral and 2% disagreed.

Exchange of valuable ideas in group discussions

71% agreed or strongly agreed on valuable idea exchange; 27% were neutral and 2% disagreed.

Adequate tutor guidance whenever needed

88% agreed or strongly agreed that tutor guidance was adequate. 8% were neutral and 4% disagreed.

Preceded by a didactic classroom lecture

63% agreed or strongly agreed that CBL sessions are preceded by a didactic classroom lecture. 21% were neutral and 15% disagreed.

Wrap-up session

71% agreed or strongly agreed that CBL sessions have a wrap-up session; 19% were neutral and 10% disagreed.

Question 2: skill development

Enhanced critical thinking skills

92% agreed or strongly agreed that multiple CBL sessions enhanced their critical thinking skills. 8% were neutral and none disagreed.

Improved summarizing skills

87% agreed or strongly agreed that CBL sessions improved their summarizing skills. 12% were neutral and 1 participant 2% disagreed.

Enhanced ability to produce patient problem list:

75% agreed or strongly agreed that CBL sessions enhanced their ability to produce a patient problem list. 21% were neutral and 4% disagreed.

Improved ability for an appropriate differential diagnosis

85% agreed or strongly agreed that CBL sessions improved their ability to form an appropriate differential diagnosis. 12% were neutral and 4% disagreed.

Improved ability to propose appropriate investigations

87% agreed or strongly agreed that CBL sessions improved their ability to propose appropriate investigations. 12% were neutral and 2% disagreed.

Improved ability to propose effective management plans

81% agreed or strongly agreed that CBL sessions improved their ability to propose effective management plans for patients with common problems. 15% were neutral and 4% disagreed.

Overall, students reported positive outcomes in understanding and skill development through CBL, with suggestions for further improvement.

Additional comments and suggestions from students

In addition to the above questions, students were invited to share their thoughts on various aspects such as the quality of the case, session conduct and post-session wrap-up. Seventeen students provided open comments, offering valuable insights. Their suggestions included:

Preparation and learning materials

Requests included starting with a lecture, video or presentation; better student preparation, more time for complex topics and pre-reading materials.

Pace and coverage

Some requested slower sessions and topic reviews for clarity. Suggested revisiting topics covered by residents for better understanding.

Student participation

Concerns were raised about unequal participation. Suggestions included incentives or penalties to improve engagement.

Some of the representative quotes are presented below.

“Abrupt giving of cases-difficult to carry on discussions-pre-reading time and material provided would be better.” “Real-life experience sharing by faculty - adds on to our knowledge. Should be used in place of lectures.” “Doubts could be cleared on the spot.” “We read from textbooks the signs and symptoms, but not able to actually make out how they are and how they can vary from patient to patient-this helps us in better identification - mirroring of textbook information.” “Peer effort lacking in some cases-some reward system to be attached, but not test scores to motivate them to participate.” “9/group is a large number. Some students do not perform at all and remain silent throughout. Reduce the number to 5/group even if the number of groups increases; it will ensure thorough participation from all.” “Some professors do not participate wholly, so it will be better if professors share more practical knowledge with us.” These quotes encapsulate diverse perspectives from students, reflecting on the challenges faced, the value gained from real-life experiences and suggestions for improvements in group dynamics and professor involvement

DISCUSSION

CBME necessitated a shift in teaching methods, emphasizing early clinical integration. During clinical postings, bedside teaching is irreplaceable, but this was most affected during the pandemic. Surveys revealed students felt the pandemic hindered medical education, kept them clinically underprepared and limited bedside teaching.⁶⁻⁸ This highlighted the urgent need for innovative methods to ensure quality education during such times.

Among these, CBL stood out. CBL has been used in different forms before, during and after the pandemic—bedside CBL in midwifery education and online case based learning in teaching of clinical anesthesia for residents to name a few.^{9,10} Students viewed it positively as it reinforces basic concepts, relates them to clinical scenarios and aids conceptual consolidation.¹¹ Hence, CBL was a natural choice to substitute or supplement bedside teaching when ward patient load was low. CBL has been compared to traditional lectures, which often reduce students to passive listeners and limit clinical context, hindering readiness for real-world situations.

Literature review shows varied findings. George et al, in a tertiary teaching hospital in South India highlighted the preference of undergraduates and postgraduates for interactive teaching methods like CBL.¹² Another crossover study among first-year students showed CBL improved and retained anatomical knowledge better.¹³ Zinski et al, found first and second-year undergraduates preferred lectures.¹⁴ A pathology study among Indian medical graduates found CBL promoted student-centred exploration of cases and logical, analytical, clinical and collaborative skills, but could not replace lectures. It was effective as a supplement bridging preclinical and clinical subjects.¹⁵ Shrivastava suggested, incorporating CBL simplifies and authenticates learning.¹⁶ Sartania et al, introduced collaborative CBL with small groups and reported improved outcomes-more participation, confidence, discussion and higher scores.¹⁷ James et al, used digital tools to deliver collaborative CBL with TBL, addressing future doctor’ needs.¹⁸ A global review concluded that CBL ties theory to practice, adds relevance and induces deeper learning.¹⁹

However, no studies have used modified CBL to supplement bedside teaching in clinical postings, which our study addresses. Few studies assess both effectiveness and student acceptance. From study design to setting and feedback methods, our study is distinct. Assessment (MCQs) and feedback (FGDs, Google Forms) provide a comprehensive view. The study shows that incorporating modified CBL in clinical postings is feasible and effective, as reflected in MCQ performance. It also appealed to students, as evident from FGDs and feedback. Students felt clinical scenarios reflected real-world situations, enhanced learning, clinical reasoning and facilitated clearing of concepts. They also encouraged discussions and critical thinking, suggesting the need for advance topic information, more pre-reading time, blending CBL with lectures and topic selection.

CONCLUSION

Optimizing CBL with prior student communication, pre-reading, integration with lectures, small groups, topic selection and experienced faculty can make it highly effective in clinical settings. In resource-limited times, modified CBL can supplement or substitute bedside teaching. Limitations include the need for multiple

sessions in large classes and significant faculty involvement. CBL cannot replace lectures unless students independently cover CBL content. Still, it enhances higher-order thinking and psychomotor skills needed for better patient care. It will be valuable to explore if extending this approach to second and third-year postings or other colleges yields similar results. Long-term impact on competence may be assessed during internships. In conclusion, comprehensive medical education should blend didactic teaching, CBL, skills training and bedside learning to ensure holistic integrated student development.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Mannari JG, Bhende PV, Ghosh S. Modified case-based learning as supplement to bedside teaching-why, how and what next? *Int J Res Med Sci* 2025;13:3222-7.