ORIGINAL ARTICLE

HOW CASE BASED LEARNING PROMOTES DEEP LEARNING IN PRE-CLINICAL YEARS OF MEDICAL STUDENTS?

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Background: The study was conducted at Army Medical College, Rawalpindi to explore the factors in Case Based Learning (CBL) session responsible for promoting deep learning approach in medical students. **Methods:** A mix method research methodology with explanatory sequential design was adopted. In the quantitative part, the data was collected through a survey of second year medical students in which learning approaches were assessed using the Approaches and Study Skills Inventory for Students (ASSIST). Students were scored separately for the three approaches: surface, strategic and deep approach. In qualitative part; semi structured interviews were conducted with deep learners to explore the factors which help in promoting deep learning through Case-Based Leaning (CBL) guided inquiry approach. Interview data was transcribed, coded and thematic analysis was carried out. All quality assurance procedures of qualitative research such as credibility, trustworthiness, transferability, dependability and confirmability were ensured during the research. **Results:** Deep learners were identified by analyzing the ASSIST-inventory results. Qualitative analysis has revealed six main themes: active participation of the students in the CBL session, relevance of the case with their clinical practice, complexity of the case for future practice, intrinsic motivation, guided inquiry approach with tutor's involvement, role playing and changes in learning approaches of the students were found responsible for inculcating deep learning approach in medical students in their pre-clinical years. **Conclusion:** The study concluded that by ensuring the factors that promote "deep learning approach" in medical students through Case Based Learning; it can be used as an effective strategy in teaching the content of basic science subjects during the pre-clinical years of medical students.

Keywords: Deep learning; Case-Based Learning; Participation; Motivation

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INTRODUCTION

In Pakistan, many medical and dental schools still follow the didactic modes of teaching but a shift has resulted from teacher-centered and subject-based teaching to the use of interactive, student-centered learning with the use of various innovative teaching methods.[1] Case Based Learning (CBL) is a student-centered approach[2] based on guided enquiry process where the facilitator guides the learner[3]. The clinical case acts as a trigger and compels the students to a patient-centered thinking mode. The learner is motivated to gather knowledge by utilizing different sources[4] and pays attention to the medical history of a patient and finds the link with the case in the light of basic sciences' knowledge[5] by generating discussion in the group.

Three different approaches to learning have been identified and studied in students[6]: deep approach (DA), surface apathetic approach (SAA) and strategic approach (SA). In DA, students are able to understand the basic concepts, organize and relate ideas. It is the preferred style of learning in medical education. Students using DA are found to be high achievers and able to achieve feelings of great satisfaction from their studies.[7,8] Case Based Learning has been found to be helpful in the consolidation of concepts and stimulates deep learning approach in students.[9,10] The study aimed to explore the factors which promote deep learning approach in medical students through CBL sessions in pre-clinical years of MBBS".

MATERIAL AND METHODS

The study was conducted at Army Medical College, Rawalpindi. The institute was selected to conduct the study because it is mature in using Case-Based Learning as one of its teaching tools. To find out how it affects students' learning approaches and what contributing factors are behind this, was the actual purpose of this study. And for this purpose, explanatory sequential design was preferred; where initially quantitative data was collected by a survey, results were analyzed, followed by exploration of those results by qualitative analysis.

All 200 students of 2nd year MBBS participated in the quantitative, the first phase of the study. For quantitative research cross sectional survey was conducted by using a validated, reliable questionnaire-ASSIST.[11,12–14] After analysis, the students who were found as 'deep learners' were offered participation in the qualitative research to make it a purposeful sampling.

All (200) students of 2nd year MBBS were provided with the 52 items-questionnaire and given one-hour time to fill it in the college premises. Questionnaires were collected and checked. Only 129 questionnaires were found completely-filled and were included in the analysis. Scores were measured for the items identified for the surface, strategic and deep approach.

The questionnaire comprises 52 questions, each scored 1 (low) to 5 (high). The scores for sets of four questions were combined to yield subscales, and the resultant 13 subscales were then grouped to give each respondent a score for deep, strategic and surface approaches.[11,12] (Table-1 Distribution of ASSIST Items according to Subscales)

In the second phase; the qualitative phase semi structured, one on one interviews were used as the data collection method. The students were interviewed until the saturation point was reached. Before the interviews, the questionnaire was sent to seven medical educationalists for expert validation through email. The questions were modified and rephrased in the light of their feedback and suggestions. In the present study member checking was also done as transcripts were sent to five participants. No reservations or objections were found in the transcripts. All interviews were conducted in a safe, secure and comfortable environment. Anatomy museums and the tutorial rooms in the institution were utilized for interviews. Leading questions were not asked in order to reduce biases. The true ideas, views, opinions, feelings, experiences and perspectives of the respondents were obtained.

Ethical review board permission was taken from the university and the head of the institution. Informed consent was obtained from all participants. They were told that their participation is voluntary and they can leave anytime if they want. Students who had given written consent were included in the study. They were assured of anonymity, confidentiality and secrecy of information.[15] They were not promised of any reward or payments.

RESULTS

The students filled a 52-item questionnaire: The Approaches and Study Skills Inventory for Students (ASSIST). Questionnaires were provided to all the students of 2nd year MBBS class. A total of 153 questionnaires were received and 129 were found completely filled. Students were scored separately on the basis of their preferred learning approach as surface, strategic or deep learners. Only 40 students were found to be deep learners**.** In students who were found deep learners, 26 students were females and 14 were male students. The age of the participants was ranging from 18–21 years. Mean age was 19.59 years.

All students who were found Deep Learners were asked for interviews. Semi-structured interviews were conducted containing questions which revolved around the experience of the participants regarding CBL sessions in their institute. All interviews were audio-recorded in the presence of a moderator and were transcribed with separate code names. Manual analysis was done where thematic analysis of data was carried out. Six themes were generated from the selective codes. These themes represent research question and elaborate how they play a role in promoting deep learning approach in medical students.

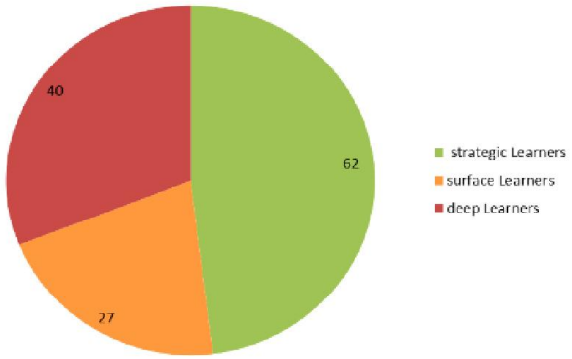

Figure-1: Descriptive analyses, percentage of students in deep, surface and strategic learner groups.

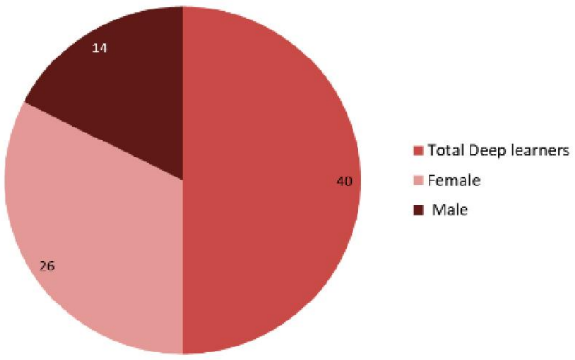

Figure-2: Demographic analyses (deep learners)

Table-1: Main themes derived from analysis of respondents' interviews

Themes	Verbatim	Brief description
Active participation	"Participation makes me alert and active throughout the session. I could not dose off." "Participation actually helps me revising my knowledge in front of class fellows." "Participation polishes my abilities to analyze and summarize the content knowledge in front of a teacher". "I wanted to participate because I have spent time in preparing the topic in detail."	This theme includes description of those factors which compel students for active participation during the sessions including: • pre-determined LO's • time for self-study and preparation • peer pressure • presence of tutor • environment
Relevance	"We are getting focused as what is important and what is relevant with the clinical aspect." "I like to see the link between the basic subjects and the clinical case; it is rather very interesting for me." 'We have discussed Otitis Media in our CBL session and I have learned its relevant anatomy and physiology in the same session."	This theme describes the role of the whole process of CBL where cases from real life when discussed in relevance with theoretical knowledge, bring a change in student's learning approach: • structure of the case • pre-determined LOs • discussion during the session • active participation • role of tutor
Motivation	"Tutor's attention is towards every student as we sit in small groups; it motivates me to study and present it in a proper manner." "Sharing knowledge by teaching friends motivates me to prepare myself completely for discussion." "The assessment at the end of session compels me to sit alert and listen carefully even if I wasn't prepared for the discussion."	This theme describes the effects of following factors which play a motivational role for student's learning: • environment • structure of the case • tutor's presence • freedom of expression • assessment at the end of session
Complexity of Case	"If there are new things which we have not studied yet, then they do generate an interest to search for them. But if they are too simple, then I lose my interest and just study the LOs." "We have learned some of the very basic things that one must know as a physician and during different CBLs we are actually practicing those skills." "Case is related to the topic we were learning those days. It becomes easy to co-relate. I have learned how to connect the clinical presentation with the basic subjects. I am able to revise the normal and discuss them in an abnormal context."	This theme reveals how the case is responsible to make students deep learners: • simple, crisp case • new terms given in the case • tricky • investigations with no results • diagnosis-not shown • related to real life
Changes in learning approach	"I started studying things for myself. I don't rely on others but I'm always ready to guide others." "I prepare the topic by making flow charts, figures and then try to link them to the given scenario. Flow diagrams are easy to remember." "I have improved my study style as now I can think critically, analyze and create my own concepts or imaginations. Regular sessions have polished these skills of all the students, I believe. Participation has improved communication skills of many of us as I have seen a change in many of my class fellows."	This theme describes the factors responsible for an observable change in the learning approaches of the students brought by regular CBL sessions: • self-regulation • use of different strategies • use of different sources • distribution of LOs • active participation • time management • active listener
Role playing	"It's hard not to participate especially in a small group and when a tutor is sitting right next to us. Everyone is getting attention!" "I have learned to manage my time and content that is necessary for the discussion. Usually I like to be a moderator as then I prepare myself for the whole topic for discussion purpose and involve everyone in the session. This is my job, I think!" "I have improved my confidence to speak in front of others. I am responsible for what I am telling at that time and must have justification for that."	This theme reveals those important elements which causes a positive change in student's behavior and attitude towards their studies: • role as a leader/moderator, scribe, participant, collaborator and team worker • supportive environment • tutor's feedback • improvement in communication skills • self-regulation

DISCUSSION

This study revolved around CBL sessions and its effects on student's learning approaches. It has clearly revealed that in CBL sessions all students participate actively and for active participation they need complete preparation of the relevant topic, they have to deepen their approach towards studies. The study has shown that the pre-determined learning objectives helped students to regulate their time, direction and studies and when they were prepared well, they found it easy to contribute in the discussion. Students were given time and reading material, they set their clear-cut goals, study in detail, made notes, tried to understand the link between the case and the LOs and while doing this they adopted a deep approach to have clear understanding before the discussion. It has revealed that students have learned to contribute towards a genuine discussion with authentic knowledge by seeking meaning with independent study, relating ideas with previous knowledge, retaining it by making diagrams or flow charts and concluding it by discussion with

evidence. This finding support others[16–18] who have found that a deep learning approach is positively related with an interactive session.

The study has clearly shown that when the case and LOs were linked someway and while finding out the missing link students were adopting the habit of relating ideas to finding evidence and then drawing the conclusions; the three very important aspects found in deep learners. It also showed that clinical relevance of different disciplines has to be stated in a way which helps students to understand concretely why the topic is important for them and how they can make use of it and for this they have to spend time in self-study. It also showed that CBL is found to be an effective mean to learn and consolidate concepts. The study complements other studies that have shown that CBL promoted self-study and analytical thinking among students.[19]

The study has shown that there are internal as well as external motivational factors which were found to be responsible for improving the learning approach of the students. They have attended CBL sessions regularly because they think it was the best platform where they could clarify their concepts by the help of their peers as well as the tutor's feedback. Peer's support especially at the time of discussion or before and after the session helps them in better understanding of a topic. CBL has given them time and opportunity to get benefit from one another. They have developed an internal motivation to participate in the discussion as they want to show their peers or help or teach others whatever they know about the topic. The study has shown that Formative and summative assessment at the end of the session where grades and marks were given for participation and written test (respectively); also proved to be a great motivational factor to participate in the session with full preparation. Same was found by other researchers[18–21] who has found that the students who have high academic results or intelligence level facilitate and motivate other students' learning.

The study has shown that structure and complexity of the given case is a very important factor in making students deep learners as it caused curiosity among them. The case having some new terminologies proved to be great motivational factor to explore and search to find the meanings of those terms. For the sake of discussion students study in detail for clarification of their concepts, then by making flow diagrams relate those ideas to the given case and finally with researched evidence they were able to present it during a session in such a manner that others could easily understand and tutor support was there to correct students if lost. It was found that an expert tutor is mandatory for the success of a CBL session as he is the monitor of the student's learning process at that time of session and students revealed that they were uncomfortable, demotivated or lost their interest in the sessions when lead by non-expert tutors or tutors which have made sessions mini lectures. These findings parallel those studies[21,22] which have found that tutor's support and encouragement compel students to adopt a deep learning approach and studies[23–25] have found that tutor should be an expert to conduct the session in its true essence and demonstrated that the students score higher in exam results when facilitated by expert as compared to non-expert tutors.

The participants of the study revealed that through these CBL sessions, they have come across different strategies of gathering, organizing, memorizing and retaining of content knowledge; and with the passage of time they have adopted these skills. As they have a huge volume of syllabus it was quite helpful for them via CBL sessions to learn and adopt those strategies which save their time and energy. They have learned that working as a team is also very helpful in understanding a grand topic. When workload and time is manageable, the preferred learning approach will be deep approach and knowledge would be retained better as supported by others[24,25] who talked about the impact of high workload compelling students to employ Surface Approach of learning.

One of the elements for making students deep learners is different roles played by the student themselves during a CBL session. The present study found that students were ready to take responsibilities as a leader, or as an active member of a team, or as a collaborator to maximize the benefits of a group discussion. It revealed that as leaders they felt responsible for the success of the whole batch. They believed that being a leader is hard to play as they have to prepare themselves comprehensively for the whole topic by studying it in detail by using different sources, memorizing it by using different strategies, encouraging others to read and prepare the topic and to participate actively in the discussion. The study found that during a debate or discussion concepts of the students will become clearer and working as a team had motivated them to be responsible for their assigned tasks and to communicate well in harmony with the batch. The study indicated that students have found that relating their ideas with the evidence they have found by independent and in-depth study, research

and then to express their views or information was actually modifying their study habits.

There are many studies[24,25] that have shown opposite results in comparison with the present study. As Marlie Baeten in 2012 conducted a quasi-experimental research with pre and post-test analysis on gradual implementation of CBL alongside lectures and her results indicated that yet the students score higher on organized study schedule and effort management during CBL sessions but actually they did not adopt a deep approach. But the present study has supported various other studies where the preferred approach for professional studies was found to be deep approach. One such study[26] suggested that less usage of surface approach results in higher level of academic achievement. They have found that students need to have a purpose and intention in their studies for their professional development and lifelong learning. The present study showed and provided evidence that there are various factors in a CBL session which have actually modified students as deep learners.

CONCLUSION

The study concluded that **"**CBL is promoting a deep learning approach in medical students in their pre-clinical years even when they were not directly dealt with the patients". The six main factors have been identified and recognized. These should be revealed to the teaching faculty as their detailed review will definitely help them to focus more on those aspects in future instructional plans which they could improve and modify for students learning; for better results as well as to keep students' interest and motivation high in their medical studies. The present study has clearly revealed that CBL helps students in modifying their learning styles and encourages deep learning approach for better understanding of the basic science subjects.

There are certain limitations in the present study: as to observe the effect of CBL on adopting different learning approaches; a longitudinal study would be most desirable so that relationship of learning approaches and the percentage score of the students at the end of academic year could be investigated. The study could include other medical institutes to compare the process of CBL and its effect on students learning process and academic scores in their settings. Clinical relevance with regard to disciplines such as biochemistry, physiology, anatomy could be studied separately. Demographic factors and their relationship with the deep learning approach could have been explored at the same time. These could be studied in future.

AUTHORS' CONTRIBUTION

AG: Literature search, conceptualization of study design, data collection, analysis and data interpretation. RAK: Literature review, data analysis. RY: Literature review, final reading. NUH: Data collection, data analysis.

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