

Problem-based learning in comparison with lecture-based learning among medical students

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Abstract

Objective: To compare performance of medical students exposed to problem-based learning and lecture-based learning.

Methods: The descriptive study was conducted at Rehman Medical College, Peshawar, Pakistan from May 20 to September 20, 2014, and comprised 146 students of 3rd year MBBS who were randomised into two equal groups. One group was taught by the traditional lecture based learning, while problem-based learning was conducted for the other group on the same topic. At the end of sessions, the performance of the two groups was evaluated by one-best type of 50 multiple choice questions. Total marks were 100, with each question carrying 2 marks. SPSS 15 was used for statistical analysis.

Results: There were 146 students who were divided into two equal groups of 73(50%) each. The mean score in the group exposed to problem-based learning was 3.2 ± 0.8 while those attending lecture-based learning was 2.7 ± 0.8 ($p = 0.0001$).

Conclusion: Problem-based learning was more effective than lecture based learning in the academic performance of medical students.

Keywords: Education, Problem-based learning, Lecture-based learning, Multiple choice questions, Evaluation, Academic performance. (JPMA 66: 650; 2016)

Introduction

Education has long focused on teaching students to give a correct answer. Too often the teachers ask students to recite, define, describe or list facts. They are less frequently asked to analyse, infer, synthesize, evaluate, think and rethink. Students have become familiar with this process of passing knowledge, without inquiring into how this information applies to the real world.¹

Problem-based learning (PBL) was first implemented at McMaster University Medical School in the 1960s by Barrows and Tamblyn, and has since revolutionised the field of medical education. The system was later adopted by Europe, the United States and the rest of the world.²⁻⁴ Apart from medicine, PBL can now be found in many teaching settings, including architecture, nursing, engineering and social work.⁵

PBL is an educational method focused on self-directed learning,⁶ small groups discussion with facilitators and working through problems to acquire knowledge.⁷ PBL is a student-centred pedagogy which can provide learners more opportunities for application of knowledge acquired from basic science to the working situations than traditional lecture-based learning (LBL) method.⁴

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PBL is an innovative and challenging approach to medical education; innovative because it is a new way of using learning material to help students learn, and challenging because it requires the teacher to use facilitating and supporting skills rather than didactic, directive ones.^{8,9} For the student, PBL emphasises the application of knowledge and skills to the solution of problems rather than the recall of facts. It is an approach much favoured by curriculum planners in new and more progressive academic institutes.⁵

LBL was first implemented by the American Medical College Association and American Academy of Medicine in 1894 and has been used by the majority of medical and other schools.¹⁰ It traditionally consists of didactic lectures.¹¹ LBL has been at the core of medical education in most of the medical colleges.¹²

LBL focuses on factual knowledge and memorisation, providing little chance for application of knowledge acquired from basic science to the working situation.¹³ There are many other advantages of PBL over LBL, including flexible knowledge, improved communication, collaborative skills and self-directed learning skills, and a more enjoyable and motivational format.⁴

A study carried out among 1st year students at Nelson Mandela School of Medicine showed that a majority of students benefited from input of other students in PBL

tutorials as they were conducted in small groups. On the contrary, a study from Kuwait University revealed that introduction of new teaching methodologies may evoke certain factors that lead students to develop adverse perception of their educational environment. Another study showed that knowledge and power of interpretation was quite improved among students on reaching the 3rd year, but their interest in the process of PBL conduction was lost and they developed short cuts to solve problems.¹⁴

The uncertainty about the effectiveness of PBL and the heterogeneity in the published literatures provided the drive for this study. Moreover, very limited work has been done in this regard in our country. The current study was planned to compare the effectiveness of PBL and LBL by evaluation of the academic performance of the medical students in order to design the curricula with much benefited mode of learning.

Subjects and Methods

The descriptive study was conducted at Rehman Medical College (RMC), Peshawar, Pakistan, from May to September 2014. The study comprised two study groups of 3rd year students of the bachelor of medicine and surgery (MBBS) degree course.

Both the groups were already exposed to PBL multiple times in first and second years. Students were randomly divided into two groups, and informed consent was taken from all the subjects. PBL was conducted for one group, while the second group was taught by traditional LBL on the same topic. Teachers for the two groups remained the same and were trained in both PBL and LBL. At the end of PBL and LBL sessions the performance of both groups was evaluated by 50 multiple choice questions (MCQs). The MCQs and their cognitive levels were the same for both the groups. Six MCQs were of simple recall, 14 were of interpretation while the rest were problem-solving. Grading was done as: A+ (for 90-100% marks); A (80-89%); B (70-79%); C (60-69%); D (50-59%); and F (less than 50% marks).¹⁵

Test result was analysed using SPSS15. Mean and standard deviation was applied for marks obtained, while frequency and

percentage were determined for further grading. Student's t-test was applied to see the significant difference in performance among the two groups $P \leq 0.05$ was considered significant.

Results

The 146 students were divided into two equal groups of 73(50%) each.

The mean score of PBL group was 3.2 ± 0.8 , while it was 2.7 ± 0.8 for the LBL group ($p=0.0001$) (Figure).

Further comparison showed that 3(2.1%) students of PBL and 1(0.7%) of LBL scored between 90-100% marks; 22(15.1%) of PBL and 10(6.8%) of LBL between 80-89% marks, while none of them scored between 70-79%. Besides, 39 (26.7%) of PBL and 36 (24.7%) of LBL group - fell into 60-69%, while range. Nine (6.2%) students of PBL and 26 (17.8%) of the LBL group were scored in the range of 50-59% marks. No student was found below 50% marks (Table).

Table: Comparison of the academic performance of the students in PBL & LBL.

Percentage Marks	Letter Grade	PBL Group	LBL Group
90 - 100	A+(Distinction)	3 (2.1%)	1 (0.7)
80 - 89	A	22 (15.1%)	10 (6.8%)
70 - 79	B	0	0
60 - 69	C	39 (26.7%)	36 (24.7%)
50 - 59	D	9 (6.2%)	26 (17.8%)
Less than 50	F	0	0

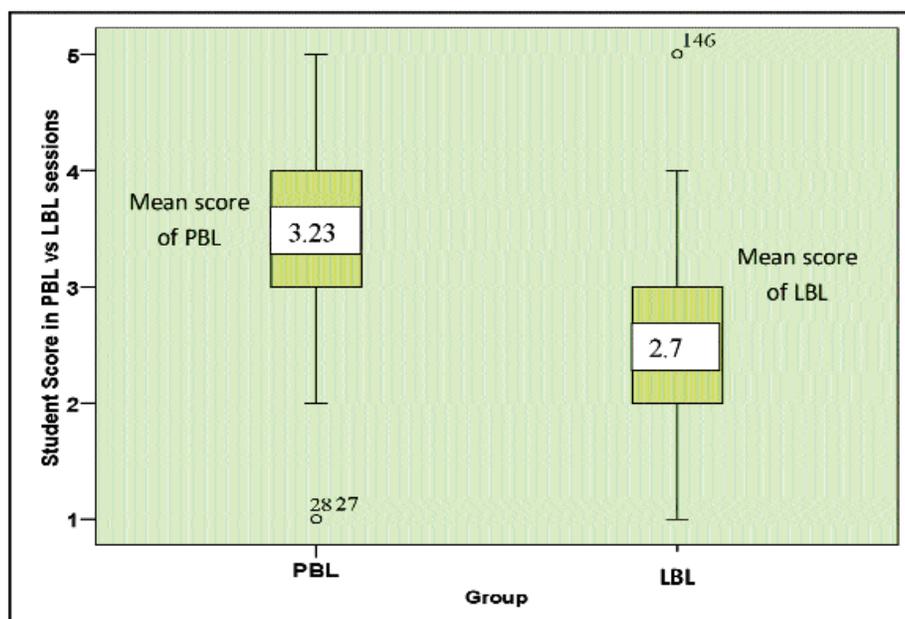


Figure: Mean score for students from the study groups.

Discussion

The study was designed to compare the effectiveness of PBL and LBL. The academic performance of the students who attended the PBL session was better than those who attended the LBL session with a significant difference of $p=0.001$. The mean score for PBL and LBL sessions was 3.2 ± 0.7 and 2.7 ± 0.8 , respectively.

Many medical schools internationally are changing their curricula and moving to PBL programmes.¹⁶ In Pakistan, however, the application of PBL pedagogy in medical schools is still in the initial stages. PBL is an instructional, learner-centred approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem.¹⁷ PBL is considered to be one of the best described interactive learning methods, and it is advocated by many as more effective in terms of lifelong learning skills and also as being more fun.¹⁸

Students on a PBL course tend to place more focus on using resources such as the library and online sources. By contrast, those who are taught in a traditional approach place more emphasis on the resources supplied by the faculty itself. Moreover, students who learn through problem-solving strategy are more likely to use this spontaneously to solve new problems in the future compared with those taught in a traditional way.⁹

Various studies have examined the outcomes of PBL in medical school curricula. There is agreement on the contribution of PBL to factors such as knowledge retention, student satisfaction, motivation and critical thinking. Literature also suggests that PBL students have as much content knowledge as their lecture-based counterparts, and they perform better at more complex forms of assessment, and retain more of what they learn.⁴

Galvao and his co-workers in 2014 found that PBL pharmacy students performed better in academic examinations than the students in the traditional learning method group. Subjective evaluations of the students did not differ between the two groups while performance on course assessments was better in PBL. Better performance of students in PBL is in accordance with the present study.⁶

Another study revealed that both PBL and lecture-type conventional teaching were effective, but PBL was still a step ahead. PBL has the potential to enhance the efficacy of teaching in situations in which there are personnel and resource constraints.⁸

Shin and Huang did the meta-analysis and found that PBL

has positive effects on the student's academic performance, outcome domains of satisfaction with training, clinical education, and skill course. The analysis also suggested that the PBL pedagogy is considered superior to the traditional lecture-based teaching in this setting. The results are similar to the current study.^{19,20}

A study in the Netherlands was carried out in 2009 to gauge the effectiveness of PBL in comparison with LBL in a postgraduate medical training programme. The results showed that in both groups knowledge had increased equally after the programme and then decreased equally after the follow-up. The performance indicator scores also increased in both groups, but significantly more in the PBL group.²¹

A study was performed at the psychiatry and behavioural sciences department of the University College of London. Consecutive cohorts of second year clinical students taught using a traditional psychiatry curriculum and a PBL curriculum were compared. The PBL curriculum resulted in significantly better examination performance than did the traditional teaching curriculum, both for MCQs and viva.²²

The sample size and single-centre nature of the study were limitations of the study. Therefore, caution should be exercised while generalising the results.

Conclusion

PBL improved the academic performance of medical students when compared to LBL. Our recommendation to teachers of undergraduate and postgraduate medical courses is to consider introducing PBL methods in their programmes.

Disclaimer: This abstract has not presented or published in any conference/journal.

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