Performance and Preference of Problem Based Learning (Pbl) and Lecture Based Learning Among Selected Medical Students of Nepal

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Abstract

Background: This study aims to compare student's understanding and knowledge retention when taught through PBL (Problem Based Learning) and Lecture, and compare student's perception about PBL and Lecture in medical education.

Method: This is cross-sectional study done among medical students of PBL based medical school. Ethical approval was taken from IRC-PAHS. To assess understanding and knowledge retention, 50 vignettes based Multiple Choice Questions were administered, half of which were taught through PBL sessions and remaining half were taught in didactic Lectures during basic science years of medical school. To assess student's preference on PBL and Lecture, separate pre-validate perception questionnaire was used.

Result: Out of 107 students, 99 participated in understanding and knowledge retention questionnaire and 107 filled perception questionnaires. Understanding and knowledge retention of students was found to be same for topics taught by PBL and Lecture with median score of 17 and 16 respectively. PBL was preferred more for physiology(59.81%), pathology(51.40%) and pharmacology(53.27 %) concepts, and Lecture was more preferred for anatomy(78.50%), biochemistry(45.79%), and microbiology(42.99%) topics. Many students wanted same concepts to be taught through both PBL and Lecture, especially for anatomy. Combined Lecture by group of faculties and community-based programs were preferred for Community Health Science (CHS) contents and hospital ward-based teaching was preferred for Introduction to Clinical Medicine (ICM) rather than PBL or Lectures.

Conclusion: Understanding and knowledge retention is same for topics taught by either PBL or Lecture during basic science years of undergraduate medical education. Students prefer PBL for physiology, pathology and pharmacology related concepts, conventional didactic Lecture for physiology and microbiology, and combination of Lecture and PBL sessions for Anatomy.

Introduction

Sir William Osler, referred as father of modern medicine, emphasized the role of teachers in helping students to observe and reason. He recommended abolishing traditional Lecture method of instruction.¹ PBL (Problem-based learning) is a newer educational strategy which is extensively tested and used.² PBL is an integral part of teaching in undergraduate medical education of several medical schools including Patan Academy of Health Sciences (PAHS).² The PBL process was pioneered by Barrows and Tamblyn at medical school of McMaster University in Canada in the 1960s.³ Student like PBL teaching because PBL is student-focused, allows active learning and lead to better understanding and retention of knowledge.^{4,5}

Students take more interest and responsibility for learning, look for resources like research articles, journals, internet, textbooks etc. and themselves resolve the contextual problems given in PBL.⁶ PBL enhance content knowledge and simultaneously foster development of communication, collaboration,

problem solving, critical thinking, and self-directed learning.^{7,8} PBL gives emphasis for lifelong learning by developing the potential to determine own goals, locate appropriate resources and assume responsibility for what they need to know.⁹ It helps students for long term knowledge retention and improves competency as physicians after graduation.^{10,11} PBL has gradually been adopted by several medical schools for undergraduate education.^{12,13,14}

PBL is resource-intensive requiring more staff to facilitate PBL sessions, more physical space and computer resources.¹⁵ Students also report uncertainty, information overload and inability to determine required depth and relevance of information available.¹⁵

This study aims to compare student's understanding and knowledge retention of topics taught through PBL and Lecture, and also compare student's perception about PBL and traditional Lecture, among first two batches of medical students of PAHS who passed out in 2016 and 2017.

Methods

Study Design and Participants

This study is a cross-sectional study done among medical students of PAHS, where hybrid PBL method is used during basic science years. All medical students of selected 2 batch of PAHS were included in study with informed consent. Students not giving consent, students among the researcher team of this study, and students who participated in pilot survey of questionnaire developed for this research were excluded from the study. Ethical approval was taken from Institutional Research Committee (IRC) of the Patan Academy of Health Sciences (IRC-PAHS) and research was carried out in accordance with relevant guidelines and regulations.¹⁶

Tools: validation, implementation and analysis.

Multiple-choice Questions (MCQ) was used to assess understanding and knowledge retention whereas a separate questionnaire was used to assess the preference for PBL and Lecture. The MCQ questionnaire for assessment of understanding and knowledge retention had total 50 vignettes based MCQs, half of which were from topics taught through PBL and remaining half MCQs were from topics taught through Lecture. These MCQs were developed and validated by the students with the help of research advisors. The MCQ scores were transformed into percentage and interpreted in terms of percentage: <60% = Very low, 60–70% = Low, 70–80% = Moderate, 80–90%=High and 90–100% = Very high. The perception questionnaire was compiled and discussed in the student research group and reviewed by the research advisors to establish the content validity. It was administered to the 15 students to establish the face validity and feasibility. The perception questionnaire had 30 questions to be answered on forced Likert scale, ranging from 1(strongly agree) to 4(strongly disagree). Student were allowed to explain or give opinion qualitatively in some questions of perception questionnaire. Data entry and editing was done in MS Excel spreadsheet and analyzed in SPSS 13.0 software for Windows. Descriptive Statistics (mean

and percentage) and inferential statistics was used to compare perception. A p-value less than 0.05 was taken as statistically significant result.

Results

Basic Characteristics and Information

Out of 107, 99 students filled up understanding and knowledge retention questionnaire. The mean age of the participants was 22 years. Total 59.6% of respondents were male and 40 (40.4%) were female. Majority (67/99 i.e. 67.7%) of respondents have completed their schooling from private school and 32 (32.3%) completed their schooling from public school. About half (49.5%) were living in the urban area while 24 (24.2%) and 26 (26.3%) were from semi-urban and rural area respectively. Majority (91 i.e. 91.9%) of the respondents were from 10 + 2 high school science background while only 8 (8.1%) were from 10 + 3 health sciences background.

Understanding and knowledge retention of students

The normality test showed that the marks obtained by participants on topics taught via PBL and topics taught via Lecture were not normally distributed (Shapiro-Wilk p-value = 0.015 for Lecture and 0.024 for PBL). Thus, median score was computed, which was 16 for Lecture and 17 for PBL, as shown in table 1.

Table 1: MCQ median score by two teaching methods at PAHS, Nepal		
	Lecture	PBL
Total MCQs	25	25
Median Score (IQR required here)	16	17
Mann-Whitney U Test	-0.706	
p-value	0.48	
Mann-Whitney U Test was not statistically significant (p-value: 0.48), there was no difference in the median marks obtained in PBL and Lecture methods.		

Perception of students

Perception scale was found to be internally consistent as coefficient alpha of the perception questionnaire was 0.893. Students mostly preferred physiology, pathology and pharmacology related concepts through PBL whereas they preferred anatomy, biochemistry, and microbiology related topics through Lectures. Some students wanted to be taught via both PBL and Lecture, especially for anatomy subject (Table 2).

PBL or Lecture was not so much preferred for Community Health Science (CHS) and Introduction to Clinical Medicine (ICM) where many opted not to respond. Regarding CHS student mentioned they learn public/community health better in community postings and Lecture session with group of faculties as a

part of Community Based Learning Education (CBLE). Regarding Introduction to Clinical Medicine (ICM) they prefer it more on hospital wards and bedside teaching.

Table 2
Subject preference to be taught using PBL and Lecture (N = 107)

Subject	Preference for PBL (%)	Preference for Lecture (%)	Preference for Both (%)	No Response (%)
Physiology	64 (59.81 %)	50 (46.73 %)	7 (6.54 %)	0
Pathology	55 (51.40 %)	53 (49.53 %)	1 (0.93 %)	0
Pharmacology	57 (53.27 %)	48 (44.86 %)	2 (1.87 %)	4 (3.74 %)
Anatomy	61 (57.01 %)	84 (78.50 %)	38 (35.51 %)	0
Biochemistry	43 (40.19 %)	49 (45.79 %)	5 (4.67 %)	20 (18.69 %)
Microbiology	30 (28.04 %)	46 (42.99 %)	2 (1.87 %)	33 (30.84 %)
Introduction to Clinical Medicine (ICM)	29 (27.10 %)	40 (37.38 %)	2 (1.87 %)	40 (37.38 %)
Community Health Sciences (CHS)	21 (19.63 %)	35 (32.71 %)	1 (0.93 %)	52 (48.60 %)
Note: Multiple Response Items, respondents were allowed to select PBL or Lecture or Both)				

Discussion

This study showed that students mostly liked being taught by both PBL and Lecture. PBL was more preferred for physiology, pathology and pharmacology related concepts, and Lecture was more preferred for biochemistry, and microbiology related topics, and combination of both for Anatomy. Overall, they wanted to be taught same concepts via both PBL and Lecture for anatomy. A meta-analyses done by Nandi et al. compared the newer PBL curriculum and the conventional Lecture-based mode of teaching undergraduate medical students. They concluded that, combination of both the conventional Lecture based and newer PBL curricula would provide the most effective training for undergraduate medical students.¹⁷ However, their finding were not subject specific.

This study showed understanding and knowledge retention of students remained the same for topics taught by PBL compared to topics taught by Lecture. There was no statistical difference in median score obtained for score of PBL and Lecture on understanding and knowledge retention questionnaire (17 and 16 respectively). However, most of other studies shows better understanding and knowledge retention with PBL than Lecture. A study done by Albanese et al showed that the PBL students score higher than the students in traditional courses. They also concluded that the reason of higher score in PBL to be

learning competencies, problem solving, self-assessment techniques, data gathering, behavioral science etc. of PBL students.¹⁹ Similarly a study from Pakistan showed the mean score in the group exposed to PBL was 3.2 ± 0.8 while those attending Lecture based learning was 2.7 ± 0.8 ($p = 0.0001$).²⁰ Another study on students of mathematics from Slovenia found that students exposed to PBL were better at solving more difficult problems.²¹

This study was done among students taught through PBL in 1st and 2nd year of medical school and showed equivalent result compared to Lecture. However, Another study done among PAHS students showed that PBL imparts long term knowledge retention through student's active participation.²² Wun YT et al. also have found that PBL started in the initial years of medical school is associated with more active participation, interaction and collaboration among students, and PBL students score higher too.²⁴ Another study done among nursing students found that all students with higher or lower grades showed a significant increase in score among students in PBL group, but only students with higher grades showed a notable increase in score among students in lecture group. Learning motivation was also found to be significantly higher in the PBL group ($t = 2.608$, $p = .012$).¹⁸

A few of the respondents qualitatively reported in this study that some students in PBL group worked harder than others members of same group to prepare and participate in discussions, they also found the time allocated for each topic was not sufficient at times. Silva et al. as well reported that teamwork and the time involved as factors limiting PBL learning.²³ According to Wood (2003), the major disadvantage to this process involves the tutor facilitation and utilization of excessive resources.¹⁵

Conclusion

Understanding and knowledge retention of students is same for topics taught by PBL compared to topics taught by conventional didactic Lecture. PBL is more preferred for physiology, pathology and pharmacology related concepts whereas conventional didactic Lecture was more preferred for biochemistry, and microbiology related topics and combination of Lecture and PBL sessions was preferred for Anatomy during basic science years of undergraduate medical education. Students prefer community-based programs and Lecture session delivered by group of faculties for the Community Health Science (CHS) contents while they prefer bedside teaching and hospital ward based teaching methodology for Introduction to Clinical Medicine (ICM) rather than Lectures and PBL.

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Committee (Ethical Committee) of Patan Academy of Health Sciences (PAHS), Kathmandu, Nepal. Written informed consent was obtained from all participating students.

Consent for publication

Written consent was obtained from the participants.

Availability of data and materials

Datasets supporting the conclusions of this article are included within the article. Additional data at the level of individual students is not available as per confidentiality agreements approved by the Institutional Review Committee (Ethical Committee) of Patan Academy of Health Sciences (PAHS).

Competing interests

Authors have been involved as member, tutor or volunteer of PBL and Lecture sessions at PAHS. The authors declare that they have no competing interests otherwise.

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Authors' contributions

SAY, OP, DJ, BM, and BT first planned conception and designed this research. OP, DJ, BM, and BT did Data collection. All 7 authors, SAY, SP, SG, OP, DJ, BM, and BT worked for data analysis and interpretation. SAY and SP wrote the first draft of the article. All 7 authors, SAY, SP, SG, OP, DJ, BM, and BT critically revised of the article. And final approval of the version to be published was also done by all 7 authors.

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