



ISSN: 2091-2749 (Print)  
2091-2757 (Online)

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## Students' Perception and Preference of Problem Based Learning During Introductory Course of a Nepalese Medical School

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### ABSTRACT

**Introductions:** Problem based learning is considered superior to the conventional didactic teaching for contextual learning, long term retention of knowledge, development of generic skill and attitudes. This study looked in to the students' perception and preference of problem bases learning in a six-month introductory course in the beginning of undergraduate medical school program.

**Methods:** A 20-item questionnaire with four-point rating scale (1-strongly disagree, 2-Disagree, 3-Agree and 4-Strongly agree) was administered to collect first year medical students' perception on problem based learning during first six month introductory course (June 2010 to November 2010) of first batch of medical students. The questionnaire included 13-items for perception and seven for preferences. It also had an open-ended comment section.

**Results:** Students showed positive reaction problem based learning irrespective of gender or educational background in providing contextual learning and retention of knowledge. Students agreed that it fostered generic skills (communication, group work, critical thinking, reasoning, reflectiveness and self-directed learning). Students wished for more such sessions in more subjects with short content assessment at the end of the sessions.

**Conclusions:** Problem based learning is fun, provides contextual learning and imparts long term retention of knowledge through students' active participation in a small group. It also promotes generic skills and self-directed life-long learning.

**Keywords:** medical school, perception, problem based learning, students

### Plain Language Summary

The study was conducted to see the effectiveness of problem based learning (PBL) in a six-month long 'Introductory Course' of undergraduate medical sciences program. The study found that PBL made topics interesting and created a fun-filled learning environment. It found PBL to be effective in fulfilling learning objectives and making the contents relevant. It also showed PBL to be effective in promoting a set of generic skills and attitudes. Thus, the curricular contents presented in context through PBL can impart meaningful knowledge and a set of generic skills that are important to develop of a habit of self-directed, life-long learning.

## INTRODUCTIONS

School of Medicine, Patan Academy of Health Sciences (PAHS-SOM) has created graduate attributes encompassing cognitive and non-cognitive domains.<sup>1</sup> To foster these attributes among its medical graduates, PAHS-SOM has adopted Problem Based Learning (PBL) and Community Based Learning and Education (CBLE).

PBL is major teaching-learning method for first two and half years of undergraduate medical school program, which includes six-month of introductory or foundation course followed by two years of basic sciences. PBL is a learner-centered method with distinct advantage over the conventional teacher-centered didactic method in promoting a long-term retention of information, providing contextual learning and development of generic skills and attitudes.<sup>2,3</sup>

Since didactic lectures are main teaching-learning method in senior high school in Nepal, PBL is introduced in Introductory Course to foster the cognitive and non-cognitive skills among incoming students of PAHS-SOM. This study was conducted to measure students' "reaction" on PBL they underwent during introductory course.

## METHODS

In six months introductory course, a PBL case was conducted each week with three tutorial sessions of two hours duration conducted on alternate day (starting on Sunday) and facilitated by a trained tutor. Self-study period of at least one and half times of the total PBL hours was embedded in between the tutorial session. The PBL case was concluded at the end of each week (on Friday) with an hour long large group wrap-up session including all seven PBL groups (8 to 9 students in one group) in the presence of concerned discipline experts and tutors.

Students underwent PBL tutorial orientation program where a simulated tutorial session was demonstrated prior to the course. A total of 13 PBL cases, three from community health sciences (CHS), two each from Physics, Chemistry, Biology, Medical Informatics and Introduction to Clinical Medicine (ICM, early clinical exposure) were implemented.

A questionnaire was designed to measure the students' reaction, corresponding to Kirkpatrick's learning evaluation model.<sup>4</sup> The questionnaire was validated

through series of discussions in PBL committee and experts in PBL within and outside of PAHS-SOM. It consisted of 15 items of which 13 measured students' perception on PBL process and two items measured their preference about the PBL. The fifteenth item consisted of six sub-items measuring students' preference for specific disciplines. This anonymous questionnaire utilized a four-point forced Likert scale (1-strongly disagree, 2-Disagree, 3-Agree and 4-Strongly agree). The questionnaire also consisted of an open-ended section to comment on the PBL process and contents.

Data entry was done in Excel spread sheet. Cronbach's alpha, median and inter-quartile range (IQR) were calculated in SPSS 15 for Windows. P-value less than or equal to 0.05 was taken as statistically significant result for comparing median. Consensus Index was used to interpret the Likert scale responses.<sup>5,6</sup> Students' comments were analyzed using pile sorting method in MS Excel 2007. Ethical approval (Ref: 2011.105.sg) was obtained from the Institutional Review Committee (IRC) of PAHS.

## RESULTS

Out of 60 students, fifty seven returned the filled questionnaire. There were 40 (70.17%) male and 17 (29.83%) female students. Fifty two students were from science background with two years (class 11 and 12) of natural sciences (physics, chemistry, biology) after high school (class 10). Five students were from health sciences background with paramedical education training for two and half to three years after high school. The median age of the respondents was 20 years with Interquartile Range (IQR) of one year.

The tool was highly reliable with internal construct reliability more than 90% (Cronbach's alpha = 0.903). Perception sub-scale was highly reliable (Cronbach's alpha = 0.907) and preference sub-scale was acceptable for (Cronbach's alpha = 0.708).

The median perception scores for female students (in comparison to male) and health sciences graduates (in comparison to high school) was high. The difference in perception score was statistically non-significant on Mann Whitney test (p-value = 0.427 and 0.529). The preference scores among gender and education stream were not different, Mann Whitney test (p-value = 0.473 for gender and p-value = 0.615 for educational stream).

**Table 1. Perception and preference scores for PBL by gender and educational stream of medical students in first six months of introductory course**

|                         | Gender      |               | Education stream   |                      | Total    |
|-------------------------|-------------|---------------|--------------------|----------------------|----------|
|                         | Male (n=40) | Female (n=17) | High School (n=52) | Health Science (n=5) | n=57     |
| Median Perception score | 41 (6.00)   | 43 (4.5)      | 41 (6.00)          | 43.5 (6.5)           | 41(6.00) |
| Median Preference score | 21 (4.00)   | 21 (4.00)     | 21 (5.00)          | 21 (6.00)            | 21 (4.5) |

Note: Figures in parentheses show inter-quartile range (IQR), PBL (problem bases learning)

**Table 2. Consensus among first year medical students about perception and preference of PBL during six months introductory course**

| Item Numbers | Items   | Rating   |           |           |           | Consensus Index |
|--------------|---|----------|-----------|-----------|-----------|-----------------|
|              |   | SD       | DA        | A         | SA        | Qn(i)           |
| 1            | PBL is more effective in fulfilling the learning objectives of the topicV | 0 (0.0)  | 16 (28.1) | 34 (59.6) | 7 (12.3)  | 62.1            |
| 2            | PBL imparts better content knowledge of the topic                         | 0 (0.0)  | 11 (19.3) | 34 (59.6) | 12 (21.1) | 68.6            |
| 3            | PBL encourages me to learn in context                                     | 0 (0.0)  | 5 (8.8)   | 34 (59.6) | 18 (31.6) | 76.2            |
| 4            | PBL promotes the retention of knowledge                                   | 1 (1.8)  | 3 (5.3)   | 39 (68.4) | 13 (22.8) | 81.1            |
| 5            | PBL promotes my participation in the learning process                     | 1 (1.8)  | 2 (3.5)   | 37 (64.9) | 17 (29.8) | 79.3            |
| 6            | PBL promotes my critical thinking skill of the topic                      | 1 (1.8)  | 3 (5.3)   | 33 (57.9) | 20 (35.1) | 75.8            |
| 7            | PBL promotes my reasoning skill of the topic                              | 1 (1.8)  | 4 (7.0)   | 36 (63.2) | 16 (28.1) | 77.4            |
| 8            | PBL promotes my self-directed learning on the topic                       | 1 (1.8)  | 0 (0.0)   | 25 (43.9) | 31 (54.4) | 78.4            |
| 9            | PBL promotes my group skills  | 1 (1.8)  | 4 (7.0)   | 26 (45.6) | 26 (45.6) | 71.1            |
| 10           | PBL promotes my communication skill                                       | 1 (1.8)  | 0 (0.0)   | 28 (49.1) | 28 (49.1) | 78.5V           |
| 11           | PBL helps me to identify my strength and weaknesses                       | 1 (1.8)  | 3 (5.3)   | 35 (61.4) | 18 (31.6) | 77.2            |
| 12           | PBL makes the topic more interesting and fun learning                     | 1 (1.8)  | 8 (14.0)  | 33 (57.9) | 15 (26.3) | 70.8            |
| 13           | PBL promotes to explore different resource materials                      | 1 (1.8)  | 2 (3.5)   | 29 (50.9) | 25 (43.9) | 75.1            |
| 14           | I prefer to have a short content assessment at the end of each PBL case   | 1 (1.8)  | 7 (12.3)  | 21 (36.8) | 28 (49.1) | 64.7            |
| 15.1         | I prefer more PBL sessions on Physics                                     | 8 (14.0) | 14 (24.6) | 22 (38.6) | 11 (19.3) | 36.3            |
| 15.2         | I prefer more PBL sessions on Chemistry                                   | 2 (3.5)  | 11 (19.3) | 37 (64.9) | 5 (8.8)   | 63.7            |
| 15.3         | I prefer more PBL sessions on Biology                                     | 2 (3.5)  | 1 (1.8)   | 35 (61.4) | 18 (31.6) | 77.9            |
| 15.4         | I prefer more PBL sessions on Medical Informatics                         | 7 (12.3) | 13 (22.8) | 22 (38.6) | 12 (21.1) | 39.1            |
| 15.5         | I prefer more PBL sessions on Introduction to Clinical Medicine           | 1 (1.8)  | 3 (5.3)   | 32 (56.1) | 19 (33.3) | 75.8            |
| 15.6         | I prefer more PBL sessions on Community Health Sciences                   | 1 (1.8)  | 8 (14.0)  | 23 (40.4) | 23 (40.4) | 65.0            |

Note: Figures in the parentheses are percentage, SD – Strongly Disagree, A – Agree, D – Disagree, SA – Strongly Agree

Students agreed that PBL promoted retention of knowledge by participation in the learning process, communication skills, self-directed learning, reasoning skills, identifying strengths and weaknesses, learning in context, critical thinking skills and exploration of different resource materials based on Consensus Index, groups skills, made topic more interesting and fun learning,

imparted better content knowledge and was more effective in fulfilling learning objectives .

More students preferred a short content assessment at the end of PBL case and wanted more cases in Biology, ICM, Chemistry and CHS. Less students preferred to have more cases in Medical Informatics and Physics.

Open comment analysis on overall PBL content and process revealed PBL as "far better learning method than lecture" or "better than other teaching-learning methods". It also revealed some concerns related to PBL process (Table 3).

**Table 3. Concerns expressed by first year medical students regarding PBL during six months introductory course**

| S.N. | Concerns   | Number of Students |
|------|--|--------------------|
| 1    | Having no knowledge assessment at the end of each PBL session        | 12                 |
| 2    | Having no homogeneity and accuracy of acquired knowledge among peers | 8                  |
| 3    | Case objectives being not covered                                    | 6                  |
| 4    | Going out of track during discussion                                 | 6                  |
| 5    | Time-consuming learning process                                      | 3                  |
| 6    | Confusion regarding depth of knowledge required                      | 3                  |
| 7    | Lack of resources for self-directed learning                         | 2                  |
| 8    | Language as English is mandatory for PBL sessions                    | 1                  |
| 9    | Self-learning being not-effective                                    | 1                  |
| 10   | Evaluation of students' performance in PBL by tutor being biased     | 1                  |

## DISCUSSIONS

In this study, the students from both educational streams i.e. general sciences and health sciences highly rated the process and outcomes of PBL as effective process despite being an entirely new learning method. The PBL made the learning interesting and fun to fulfil the learning objectives with relevance and understand better for retention of the knowledge. Majority of students found PBL very effective for development of generic skills and attitudes. Students also expressed their greater interest in having most of their contents to be delivered through PBL.

Similar findings were reported among students pursuing 3-years certificate level allied health science (laboratory technology, physiotherapy and general medicine) courses after their high school in Kathmandu University School of Medical Sciences (KUSMS), Nepal.<sup>7</sup> Another study from KUSMS, Nepal conducted among the second and third year undergraduate medical students reported students' overall experience and attitude towards PBL during basic sciences as positive and further showed their willingness to have PBL during clinical years.<sup>8</sup> A study from B.P. Koirala Institute of Health Sciences (BPKIHS), Nepal having partial PBL curriculum during basic sciences also reported greater interest and enthusiasm towards PBL by the students.<sup>9</sup>

PBL is a student centered teaching-learning methodology where students first encounter a problem followed by a systematic, learner-centered inquiry and reflection process. Problem imposed to the student will itself serve as stimulus to self-directed learning independently or in a group enabling the students to understand the relevant scientific knowledge and principle in context while acquiring a set of non-cognitive skills at the same time.<sup>10,11</sup> Many studies have compared the outcomes of PBL and conventional teaching method showing students' strong preference to PBL. Moreover, students have shown more positive attitudes toward PBL curriculum and found learning more enjoyable with strong awareness of social issues in medicine.<sup>2,12</sup>

As assessment drives learning, most of the students preferred to have a short content assessment at the end of the PBL session to evaluate their learning and find the gap. Students had also expressed in open comment section their apprehension regarding the knowledge gap and if the appropriate depth of the knowledge had been acquired. However, there are evidences to support that PBL does not lead to any significant knowledge deficiency.<sup>13,14</sup> As PBL is found to be very effective in promoting long term retention of knowledge, the assessment at the end of the PBL session which only promotes the short term recall of knowledge contradicts with the evidence of having PBL as main teaching method to foster performance improvement and the long term retention of knowledge.<sup>13</sup>

The students performed well in the summative examination of this six months of introductory courses involving external examiners: 58 out of 60 students passed the examination. The examination consisted of Structured Integrated Short Answer Questions (SISAQ) (or Problem Based Questions) and vignette based Multiple Choice Questions assessing higher order cognitive level along with assessment of skill through Objective Structured Practical/Clinical Examinations (OSPE/OSCE). This is something PBL approach tended to favor when it comes to the assessment of elaboration and application of knowledge and skills.<sup>13</sup> The summative exam result also indicates that they had done expected learning through PBL, which is on contrary to their concern about knowledge gap in PBL.

In this study, majority of the students preferred PBL cases for contents delivery in most of the subjects of Introductory Course namely Biology, Chemistry, Introduction to Clinical Medicine and Community Health Sciences. The reasons were relevance of these subjects for the subsequent basic and clinical sciences course. It also suggests students' strong affinity to this type of teaching method. Similar findings have also been reported from KUSMS and BPKIHS.<sup>8,9</sup> However, students seemed to

have less agreement in having more cases on Physics and Medical Informatics (MI). The reasons cited were the content difficulty (for physics, "should be taught through lectures"), no relevance to the subsequent medical course (Physics and MI), having no prior knowledge (MI) and delivery mismatch ("MI is better taught through practical sessions").

This study only shows the reaction of students towards the PBL process and their performance in the summative exam of Introductory Course. However, their performance in subsequent basic sciences phase of the curriculum in terms of cognitive as well as non-cognitive skills through PBL remains to be evaluated.

It is also important to note that Nepal Medical Council, the accreditation body, in its guideline has advocated the incorporation of PBL method as innovation in undergraduate medical education program. Majority (10 out of 17) of the medical schools in Nepal now use PBL in one form or the other.<sup>15</sup> The present study and other studies have shown the effectiveness of PBL method and students' positive attitudes towards the process and outcomes of PBL, thereby negating the concern and scepticism, if any, regarding the appropriateness of this method in our context too.

## CONCLUSIONS

The students' perception and preference of PBL in a six-month introductory course in the beginning of undergraduate medical school program was contextual in fun filled environment promoting retention of knowledge and helpful in development of generic skills such as communication skill, critical thinking and reasoning, group skills, reflectiveness along with self-directed learning and life-long learning habits.

To minimize the concerns expressed by students the curriculum committees should monitor the implementation of PBL process by designing PBL cases with well explained tutor guide to fulfil the case objectives and to keep the discussion on track, conduct PBL case orientation session and tutorial skills training for tutors, provide feedback to students and tutors on their performance.

The evaluation on behavioural change and life-long performance of students is required to establish the long-term effect of PBL in the local context.

## ACKNOWLEDGEMENTS

PBL Committee, School of Medicine, Patan Academy of Health Sciences (PAHS-SOM) for their role in validation of questionnaire for this study.

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