

## Original Article

# Perception of Medical Students Regarding Problem Based Learning

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## ABSTRACT

**Objectives:** To assess medical students' perception about problem based learning (PBL)

**Study Design:** Descriptive cross-sectional survey

**Setting:** College of Medicine, Princess Nourah bint Abdulrahman University (PNU), Riyadh, KSA

**Subjects:** Second year medical students who attended fifteen or more PBL sessions

**Intervention:** Students were voluntarily invited to fill a self-administered questionnaire comprising 15 close-ended questions with a 5-point Likert scale responses

**Main Outcome Measures:** Student's perceptions and opinions

**Results:** Overall, students had a positive perception towards all the items; self-learning, critical thinking, integration of basic concepts into clinical science, identifying gaps in knowledge and improved problem solving skills. The mean value of all items was  $19.77 \pm 2.61$  out of 25. Students who were satisfied with PBL were 59%. Almost 83% of students

perceived that PBL stimulates critical thinking and 90.4% agreed that PBL integrates basic science with clinical knowledge. Although 73.1% of students found that PBL motivates self-learning, majority disagreed about increasing the frequency of PBL. Also, most of students were against increasing marks allocated for the assessment of PBL. Almost three quarters of students realized the value of PBL in improving communication skills and interpersonal relations. Students who thought that PBL is a preferable teaching tool for clinical concepts amounted to 69.2%.

**Conclusion:** Overall, students perceived PBL positively. While positive perception was maximum for integration of basic science into clinical knowledge and critical thinking, it was least for identification of knowledge gap and problem solving. Students also valued PBL in enhancing communication skills and promoting positive interpersonal relations. However, majority of students disagreed to have more frequent PBL sessions or to increase PBL exam marks.

**Key Words:** active learning, problem based learning, opinion, perception

## INTRODUCTION

Problem-based learning (PBL) is an innovative strategy that changes the teaching context<sup>[1,2]</sup> from teacher-centered learning to student-centered, experiential and activity based learning. It gives students a chance to monitor their own learning and thus gain a degree of self-direction and independence in their studies. PBL signifies andragogy and constructivism which is an approach to knowledge that focuses on active role of learners<sup>[3]</sup>. Students activate their prior knowledge and build on existing conceptual knowledge framework, develop critical thinking, clinical reasoning and good communication skills<sup>[4]</sup>. Thus PBL is considered compatible with the modern theories of adult learning<sup>[5]</sup>.

Effectiveness of PBL has forced medical institutions to adopt this system as an operating strategy in their curricula. Initially introduced as a case-based tool by McMaster University in mid-1970's, it was subsequently implemented by Maastricht University, Harvard Medical School<sup>[6]</sup> and followed by many Asian medical schools including Kingdom Saudi Arabia (KSA).

PBL may be used either as the mainstay of an entire curriculum or for delivery of individual courses, depending upon the needs and level of students. In practice, PBL is usually a part of an integrated curriculum using a system based approach to achieve learning outcomes in knowledge, skills and attitudes<sup>[7]</sup>. It is a teaching method that can be included in the

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teacher's tool-kit along with other instructional strategies, rather than used as a sole educational strategy.

PBL has many advantages; it facilitates the acquisition of generic competencies and attitudes including team work, chairing a group, listening carefully to others, respect for colleagues' views, critical evaluation of literature and use of many resources of knowledge (journals, libraries, world wide web *etc*). It encourages a deep approach to learning, promotes identification of relevant issues and prepares students for life-long learning in health care professions<sup>[8]</sup>. However after so many years of successful implementation of PBL as a gold standard in many medical schools all over the world, many challenges and drawbacks have been identified from literature and effectiveness of this method is being questioned<sup>[9]</sup>.

The apparent disadvantages of PBL include: failure of students to develop an organized framework for their knowledge, inhibition of good teachers sharing their enthusiasm for their subject with students, teachers may not have skills to facilitate PBL sessions, lesser faculty acceptance of PBL, lower level of satisfaction among students in early years of program and lack of consistency in PBL classes<sup>[10, 11]</sup>.

Students' feedback and input have registered many complaints, documented in different studies such as different levels of contents being discussed among different groups, diverse manners of facilitators conducting PBL sessions, achievements of same grades by hard working and average students, domination by good students in discussion sessions, lack of fairness in evaluations *etc*.<sup>[11]</sup>

College of Medicine at Princess Nourah bint Abdulrahman University, Riyadh (PNU), has implemented integrated hybrid PBL system from the first year of its inception. The aim of this study was to find out students perceptions and opinions regarding this tool of learning with which they were not familiar before and to assess students' satisfaction with their educational experience and accomplishments. Based on their responses, we could formulate important remedial measures in order to make it a useful educational tool.

## SUBJECTS AND METHODS

### Study design and study sample:

Cross-sectional study with convenient sampling from 2<sup>nd</sup> year medical students

### The research question?

Does the implementation of PBL using clinical problems and scenarios increase knowledge and understanding of undergraduate medical students? A qualitative exploration of students' perception.

### Study Setting

PNU started its Medical School in the year 2012 in collaboration with Medical College, King Saud University (KSU). A five-year curriculum is offered to the undergraduate medical students with first two years of basic sciences focusing on nine blocks, based on systems and divided into four semesters. The courses share full vertical and horizontal integration of basic science subjects: Anatomy, Physiology, and Biochemistry with Pathology, Microbiology, Pharmacology and few relevant topics of Community Medicine according to the themes of weeks.

Teaching and learning strategies include interactive lectures, tutorials, practical and demonstration, smart lab, history taking and PBL sessions. The design of PBL is based on real cases that demonstrates core learning objectives with integration of basic and clinical sciences knowledge. Brief clinical examination sessions were also introduced to students. Methods of assessment include a midterm exam and end of the block exam comprising multiple choice questions, OSPE and PBL formative and summative evaluation.

Faculty members were trained for conducting and constructing PBLs by a series of workshops. Students were also trained for developing group dynamics, team work, sharing information and presentations as well as communication skills. PBL sessions are conducted at two weeks intervals with students divided into six small groups of nine students each.

At the end of each block, students' feedback on instructional effectiveness, active self-learning, relevance and amount of knowledge learnt from cases and blocks is assessed.

### Ethical consideration

Prior to the commencement of study, the proposal was submitted to Ethical Review Committee, Faculty of Medicine, PNU for approval. Verbal permission was taken from students.

### The Questionnaire

A self-administered questionnaire consisting of fifteen questions related to important issues for evaluation of students' perception and opinions regarding effectiveness of PBL was employed. The questionnaire has been tested before for its applicability<sup>[12]</sup>. For this study it was translated by two experts and tested for face validity.

Responses to perception and opinion items were ordinal following a five-point Likert scale format, where one indicated 'strongly disagree' and five indicated 'strongly agree'. The higher the score the more likely the students considered PBL to be effective. The total perception score is 25 and the total opinion score is 30. The variables for perception included: stimulus for self-directed learning and critical thinking, integration

**Table 1:** Students' perception about problem based learning (PBL)

Item	Percent Response, N = 52					Mean Value
	SA	A	ND	DA	SDA	
1. Stimulates self-learning	23.1	50	23.1	3.8	0	3.92 ± 0.79
2. Stimulates critical thinking	34.6	48.1	17.3	0	0	4.17 ± 0.71
3. Integrates basic science with clinical knowledge	32.7	57.7	7.7	1.9	0	4.21 ± 0.67
4. Identifies knowledge gaps	17.3	42.3	34.6	1.9	3.8	3.67 ± 0.92
5. Enhances problem solving skills	19.2	46.2	28.8	5.8	0	3.79 ± 0.83
Satisfaction about PBL (items 1 - 4)	21.2	38.5	17.3	19.2	3.8	3.54 ± 1.15
Total mean value of perception	19.77 ± 2.61					

SA = strongly agree, A = agree, ND = not decided, DA = disagree, SDA = strongly disagree, PBL = problem based learning

of basic and clinical sciences knowledge, identification of gaps in knowledge and improvement in problem solving skills. The variables for opinion included; development of communication skills, team working skills, group consistency, and preference of PBL for clinical concepts, opinion about increasing marks and frequency of PBL.

### Data Collection

Questionnaires were distributed among 54 students of second year who had attended more than fifteen PBL sessions. Students were assured that their participation is voluntary and their names were kept confidential.

### Statistical analysis

Data were analyzed using SPSS version 20. Results of descriptive analysis were tabulated in the form of percentage, mean and standard deviation for each individual item. The overall perception and opinion scores were computed for all students. Satisfaction was measured on five-point Likert scale. In addition, students were dichotomized into satisfied and unsatisfied and perception and opinion scores were computed for each category. Student's t-test was applied to compare between the two categories and p-value of less than 0.05 was considered as statistically significant.

### RESULTS

The study included 52 junior medical students, all enrolled in the 2<sup>nd</sup> year of Medical School, PNU, KSA. PBL is administered on biweekly basis and the total number of PBL sessions till the time of data collection was 15. Table 1, demonstrates student's perception about PBL. Overall, students had positive perception of all items, the mean value of all items was 19.77 ± 2.61. The minimum value was 3.67 ± 0.92 whereas only 59.6% of respondents perceived the benefit of PBL in identifying knowledge gaps, and 34.6% were not sure. The maximum mean values were; 4.17 ± 0.71 and 4.21 ± 0.67 for items number 2 & 3 respectively. 82.7% of students perceived that PBL stimulates critical thinking and 90.4% agreed that PBL integrates basic science with clinical knowledge. The mean value of self-learning was 3.92 ± 0.79, although 73.1% of students found that PBL motivates self-learning, yet 23.1% were not sure. As for the problem solving skills, 65.4% had positive perception, while 28.8% were not sure and 5.8% disagreed.

Table 2, summarizes student's opinion about PBL. The percentage of students who thought that PBL improves communication skills and interpersonal relations were 73% and 76.9% respectively. Those who disagreed that PBL improves communication skills and interpersonal relations were 11.5% and 9.6 % respectively.

**Table 2:** Students' opinions about PBL

Opinions	Percent Response, N = 52					Mean Value
	SA	A	ND	DA	SDA	
1. Improves communication skills	28.8	44.2	15.4	9.6	1.9	3.88 ± 1
2. Improves team working skills	19.2	57.7	13.5	5.8	3.8	3.83 ± 0.94
3. Group consistency	22	34	30	10	4*	3.6 ± 1.07
4. PBL is preferred for clinical concepts	36.5	32.7	11.5	15.4	3.8	3.83 ± 1.2
5. Individual assessment is preferred	81.3	---	---	---	18.8**	-----
6. Increasing the marks for PBL	4	22	10	26	38*	2.28 ± 1.29
7. Increasing the frequency of PBL	1.9	13.5	7.7	32.7	44.2	1.96 ± 1.12
Total mean value of opinion	19.4 ± 3.24					

SA = strongly agree A = agree ND = not decided DA = disagree SDA = strongly disagree, PBL = problem based learning

\*Total number of respondents were 50, \*\*Total number of respondents were 48

**Table 3:** Mean score of perception and opinion according to the level of satisfaction

Satisfaction	Mean score	
	*Perception (Total score = 25)	**Opinion (Total score = 30)
Satisfied	21 ± 1.9	20.2 ± 2.6
Unsatisfied	17.9 ± 2.4	18.1 ± 3.7
T-test	5.2	2.3
P-value	0	0.02

\* Dissatisfied = 21, Satisfied = 31 \*\*Dissatisfied = 19, Satisfied = 29

Students who responded that PBL as a preferable teaching tool for clinical concepts amounted to 69.2%. 19.2% disagreed and 11.5 % were not sure. Regarding group consistency in PBL; only 54% of students agreed that the groups were consistent, whereas 30% and 14% were not sure and disagreed respectively. Individual assessment was preferred by the majority of students (81.3%). It is notable that more than 50% of students disagreed to increase the marks or frequency of PBL (64.6% and 76.9% respectively). The overall mean value of opinion items was not high ( $19.77 \pm 2.61$ ), with the minimum values for increasing marks and increasing frequency of PBL being  $2.28 \pm 1.29$  &  $1.96 \pm 1.12$  respectively. The mean values for all other items were very close ranging from  $3.60 \pm 1.07$  to  $3.88 \pm 1.00$ . Overall, 59.6% of students were satisfied with PBL and the mean value of satisfaction was  $3.54 \pm 1.15$ , while more than one fifth of students were not satisfied (24%) and 17.3% were indecisive. The differences in perception and opinion scores between satisfied and unsatisfied students were statistically significant ( $p$ -value < 0.05).

## DISCUSSION

Several studies have considered PBL among the best educational strategies that empowers students in the health fields to develop higher cognitive, communication and research skills<sup>[3,5,8,13]</sup>. In KSA many medical schools continue to shift from the traditional lecture based learning (LBL) to PBL<sup>[14-16]</sup>. The preclinical phase at Faculty of Medicine, PNU is based on hybrid problem based learning aiming to equip our students with the teaching modalities that best enhance their medical practice skills during the clinical phase, stimulate self-directed learning and foster life-long learning. As a part of the ongoing educational monitoring, the present study was designed to assess students' perception and opinion about PBL.

Our study demonstrates that the overall students' perception was positive, majority of students admit that PBL helped them to apply basic science to explain clinical phenomena. Accordingly, 69% of students viewed this educational strategy as preferable for

clinical concepts. It is worth noting that our PBL curricula are designed such that to integrate basic science to clinical scenarios of the PBL cases which are organized in parallel to different body systems<sup>[15,17,18]</sup>. Most of the students also pointed out that PBL is helpful to sharpen their critical thinking and a good percentage of participants reported that PBL has stimulated self-learning. Tutor triggering questions and feedback on student assignments during the PBL sessions motivate student to build-up their knowledge through multidisciplinary educational resources. Thus, motivation is crucial to maintain self-directed learning. In addition, the positive competitive educational environment during the PBL sessions fosters student to search for knowledge from various resources, learn from each other, develop higher cognitive skills and develop the habit of questioning and gain self-confidence. Meanwhile in LBL, while education is teacher centered, information is fragmented and students are acting just as passive consumers<sup>[19-21]</sup>.

The feedback of medical students, students from KSU and other regional and international health colleges highlighted the value of PBL system to foster self-directed learning and to integrate knowledge from several disciplines<sup>[6,15,12,22]</sup>. Moreover, students enrolled in PBL system achieved higher scores per topic as compared to students enrolled in traditional system for both single best multiple choice question exam and objective structured practical examination (OSPE) in a respiratory physiology course<sup>[19]</sup>. Similarly, the PBL positive effect was evident in a randomized multicenter study in pharmacology and in the National Board of Medical Examiners (part 2) clinical science examination<sup>[23,24]</sup>. Nevertheless, the conflicting results of studies claiming that PBL had no statistically significant differences on students' knowledge in comparison to traditional teaching strategies<sup>[25,26]</sup> might be attributed to differences in research methodology among different studies, the impact of culture on educational outcome and prior students' experience of the PBL system.

The influence of PBL on problem solving skills and identification of knowledge gaps scored the least of all items (just 65.4%, and 59.6% of students experienced a positive perception towards these items respectively). The observed low score for problem solving might be a reflection of the frequency at which PBL is implemented in our program which is only biweekly. In addition, the study encompassed only junior students who just finalized the first year of the preclinical phase. Contrary to this, in a study done at Faculty of Medicine, Qassim university which included students from year one through year five, 81.4% of participants pointed out that PBL system improved their problem solving skills<sup>[27]</sup>.

Regarding communication skills and interpersonal relations, our study demonstrates that majority of students exhibited positive opinion. Certainly the structure of PBL sessions where only nine students comprise each group provides more chance for individual participation and active contribution. Also, while in such small groups, student feel more at ease to ask questions, postulate hypothesis and suggest necessary required information to justify their views. In spite of the positive perception and opinion of students about PBL in most of the addressed items, yet majority of them disagreed to increase either the frequency or the allocated marks of PBL. The underlying factors include, limited experience of our students of this system. They joined the medical school just one year ago and their background information in basic science is limited and their prior experience with PBL is nil. Resistance to change, work load, and the homogeneity of student group are all contributing factors for students to disagree on increasing the frequency and the marks of PBL. Similarly, the responses of students enrolled in integrated problem-based curriculum at King Saud Bin Abdul Aziz University (KSAU) were highly supportive. Yet, students comments included negative response as "huge amount to be learned and lots of self-directed learning"<sup>[14]</sup>. Adding to these factors, negative perception of PBL system includes uncertainty on accuracy of knowledge acquired due to language barrier and waste of time in the class<sup>[28]</sup>.

Overall students' satisfaction about PBL is just acceptable. The limited experience with the PBL system might explain the degree of student satisfaction. Students' learning and teaching perspective is influenced by their previous experience and current instructional teaching modalities<sup>[27]</sup>.

## CONCLUSION

In conclusion, students' perception about PBL was variable. Positive perception was maximum for integration of basic science into clinical knowledge and critical thinking and least for identification of knowledge gap and problem solving skills. Most of participants valued the PBL system in enhancing communication skills and promoting positive interpersonal relations. However, majority of students disagreed to increase frequency or the exam marks of PBL. The negative perceptions and opinions provide useful information to further improve PBL sessions at Faculty of Medicine, PNU.

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