Comparison of the Medical Students' Attitudes Toward Problem-Based and Lecture-Based Learning in a Course of Basic Immunology

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ABSTRACT

Background *According to the available evidence, problem-based learning (PBL) is one of the most successful methods in achieving higher educational objectives. In this method, the discussion about the subjects that should be taught to the students is based on a real clinical case. Various advantages and disadvantages of this method have been addressed in different studies, but the students' attitude toward this method is vital for its success.*
Objective *To evaluate the students' attitude toward problem- based learning and to compare it with lecture-based learning.*
Method *In this experimental study, two topics of basic immunology were chosen after holding coordination meetings. The students were divided randomly into two groups. Group A received PBL for the first and LBL for the second topic, and group B had LBL for the first and PBL for the second topic. After the last session, a questionnaire was given to the students.*
Results *The students considered PBL as superior in view of the student's active role in education. According to the students' opinion, group working was more evident in PBL. Although they preferred LBL to be used in a complete immunology course, they suggested that PBL is good to be used in some of the sessions. They suggested that although the learner's role is more evident in PBL, the instructor's role is still significant. They believed that self-assessment is better and easier in PBL.*
Discussion *According to the results it is clear that, at least in some aspects, the students' attitude toward PBL is positive. This shows that by considering these aspects in educational reform programs, and by further study on the items not definitely determined in this research, we could modify PBL so that it could be used in a broader level.*

Key Words: *PROBLEM-BASED LEARNING, LECTURE-BASED LEARNING, ATTITUDE*
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Introduction

One major objective of medical education is to train physicians to have a comprehensive view to the patients' problems, and to integrate the theoretical subjects with professional medical needs and realities. Lecture-based learning (LBL) and using unilateral lecturing is the method that has been used for many years in most of the universities around the world to achieve this goal. In this method, the instructor teaches all topics personally.

However, in the recent years, problem based learning (PBL) has been recommended as one of the alternatives for developing and strengthening the learning process, and several studies have been performed to evaluate its applications, advantages and disadvantages (1). In this method, the subject that should be taught to the students is discussed based on a real clinical case. The participation of the attending students is a major components of this method. Clearly, the learners' conception of this method will greatly influence its implementation, efficacy and efficiency. Although several studies have revealed the advantages of PBL over LBL (2-7), the students' emotional approach toward this method will, in practice, be the ultimate determinant of its possibility and success.

The criteria for the success of an educational strategy, such as PBL, include the student's active role in education, the instructor's role in education, the student's ability to perform self-assessment, group working, and the method of knowledge transfer (8-10).

Therefore, the objective of the present research is to examine the attitudes of the 3rd term medical students in Shaheed Beheshti Medical University toward the PBL method and its specifications in comparison with LBL method.

Materials and Method

In this experimental study, two educational methods, problem-based learning and lecture-based learning have been compared according to the students' attitudes (the modified PBL and LBL methods which have been used in the study will be explained in this section).

In this regard, the researchers conducted a number of joint meetings with the cooperating instructor – an immunologist from Shaheed Beheshti medical school, a dermatologist who is an authority in medical education and a clinical immunologist- and two topics of basic immunology were selected for this study: hypersensitivity reaction types III and IV, and transplantation.

The study group was the medical students of the 3rd term in Shaheed Beheshti Medical University, School of Medicine, in the second semester of the 2000-01 educational year.

One week before starting the project, a one-day educational workshop was organized to familiarize the students with the PBL method. First, the project's objectives and the PBL method were explained for the students. Then, for more familiarization, one topic of microbiology (typhoid fever) was taught using this method.

To perform the study, the students were divided into two groups (A & B), using random allocation. Each topic was addressed in two separate 1-hour sessions so that the first topic was taught to group A using the PBL method and the same topic was taught to group B using LBL. The remainder of this topic was given in the second session with a 2-days interval.

For the second topic, the same program was performed except that the educational methods were exchanged between the two groups, so that group A received LBL and group B received PBL method. Thus, each group received both PBL and LBL methods. The instructor to both groups was one person so that there would be no personal bias.

At the end of the second session of the second topic, a questionnaire for attitude evaluation was distributed between the students.

To prepare the questionnaire, the necessary items for attitude evaluation were gathered from educational references and previous studies (2, 8-11). The items were selected after consulting with two competent experts in the field of attitude evaluation, and the questions were designed based on the Likert scale. Considering the consultations, we used a two-section format for the questionnaire in which one section belonged to PBL and the other to LBL, in order to minimize the statistical bias.

Since it was the first time that the PBL method had been performed in Shaheed Beheshti Medical University, we included five questions about the operational aspects of this method at the end of the questionnaire to provide guidance for further studies and decision-makings.

After collecting the data, analysis was performed using SPSS Version 10 and consulting with a biostatistics expert.

THE QUESTIONNAIRE FOR MEDICAL STUDENTS' ATTITUDES TOWARD PBL AND LBL METHODS

Items	*Lecture-based*	*Problem-based*
In this method, the student had a more important role	0 1 2 3 4	0 1 2 3 4
In this method, the student could recall the studied subjects more efficiently	0 1 2 3 4	0 1 2 3 4
In this method, the student had a better understanding of his/her advantages and disadvantages	0 1 2 3 4	0 1 2 3 4
This method could attract the students' attention better	0 1 2 3 4	0 1 2 3 4
In this method, the vertical linkage between basic and clinical sciences was more evide	0 1 2 3 4	0 1 2 3 4
In this method, the scientific group-working skills were improved		
This method is suitable for all educational subjects	0 1 2 3 4	0 1 2 3 4
In this method, knowledge could be transferred more easily because of the instructor's expertise	0 1 2 3 4	0 1 2 3 4
In this method, the instructor had a less prominent role	0 1 2 3 4	0 1 2 3 4
In this method, the instructor was an appropriate educational and behavioral model for the students	0 1 2 3 4	0 1 2 3 4
In this method, the instructor had enough capability to guide and teach the students	0 1 2 3 4	0 1 2 3 4
	0 1 2 3 4	0 1 2 3 4

0= complete disagreement, 1= disagreement, 2= no opinion, 3= agreement, 4= complete agreement
Note: The questions about the operational aspects are not included.

Problem-Based Learning

This method focuses on the participation of the students and on a clinical problem as the main axis of education. Each topic was addressed in two sessions and in 7 steps.

Step 1. *Problem presentation.* According to the educational objectives of each topic, the clinical problems of one or more patients were explained to the students. A committee consisting of the cooperating immunology professor and two clinicians designed the clinical cases. These cases were designed so that they could be understood easily by basic science students and could fulfil the educational objectives. The members of the committee had passed a course on problem designing.

Step 2. *Terminology.* In this step, the instructor gave the necessary explanation about the terminology and the concept of the specific words.

Step 3. *Defining the Problem.* The students asked their questions about the subject.

Step 4. *Brain Storming.* The attending students were divided into 8-10 member groups and discussed about the subject with each other under the supervision of the tutors (the executives of the study) and found probable answers for their own questions. The instructor supervised the discussion of all groups.

Step 5. *Assembling.* A representative from each group explained the conclusion of the their discussions to all of the class. Then the instructor classified the subjects and questions expressed by the representatives and the students were instructed to find the answers of those questions for the next session. The required references were presented at the end of the first session.

Step 6. *Presentation.* At the beginning of the second session, the representative of each group presented the results of the group's study to the class.

Step 7. *Final Conclusion.* The instructor corrected and completed the given answers if necessary. At the end of the session, the resulting educational objectives were explained to the students.

Lecture-Based Learning

It was the traditional method of explaining subjects using unilateral lecturing by the instructor.

Results

This study was performed on the second year students of Shaheed Beheshti Medical University, School of Medicine.

The number of the students attending classes was 56, from which 34 filled the questionnaire. Of these respondents, 13 were male and the rest were female. It should be mentioned that not all of the respondents filled the questionnaire completely. Therefore the following figures are based on the number of students answering each topic.

Answering a question about the active role of the student in education, 21 students (67.7%) preferred PBL, 5 students (16.1%) preferred LBL and 5 (16.1%) gave the same score to both methods (p-Value<0.01) (Figure 1).

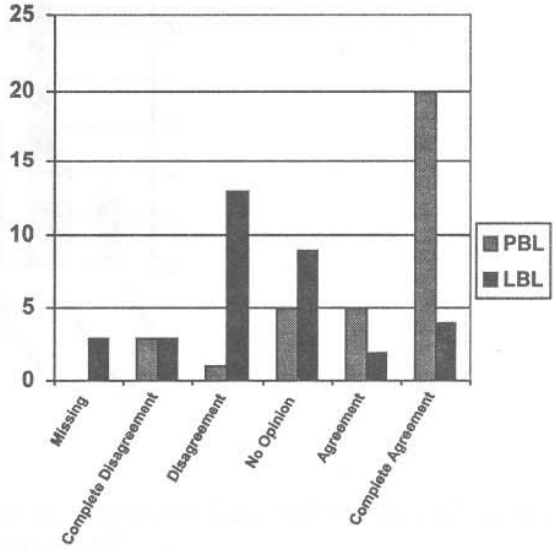

Fig 1. COMPARISON OF THE STUDENTS' ATTITUDES TOWARD THEIR ACTIVE ROLE IN EDUCATION IN PBL AND LBL

However, 17 students (54.8%) pointed out that the instructor's role in education is less prominent in PBL, 3 students (10.1%) had the same opinion about LBL, and 11 (35.5%) saw no difference (p-Value<0.005) (Figure 2).

Of the total number, 18 (58.0%) suggested that the ability to recall the studied subjects with PBL is more than LBL, and 8 (25.8%) had the opposite opinion. There was no difference between two methods in the viewpoint of 5 (16.2%) students. The result was not statistically significant (p-Value=0.103).

Answering a question about the ability to perform self-assessment, 19 students (63.3%) gave higher score to PBL, 7 students (23.3%) to LBL and 4 (13.3%) gave an equal score (p-Value<0.05) (Figure 3).

Of all the respondents, 13 (43.3%) mentioned that PBL is more successful in attracting the attention of the students in the class. The same percent preferred LBL and 4 students (13.3%) mentioned

no difference. The result was not significant (p Value=0.513).

Of all the students, 17 (56.6%) announced that the vertical linkage between basic and clinical sciences is stronger in PBL, 8 (26.7%) had the opposite opinion, and 5 (16.7%) mentioned no difference (p Value=0.094).

Group working was more evident in PBL in the viewpoint of 20 students (66.7%). However, 5 students (16.7%) selected LBL and 5 (16.7%) preferred none of them (p Value<0.001) (Figure 4).

Of all the students, 10 (33.4%) preferred PBL to be used for all educational subjects in a complete course of immunology, 14 (46.6%) preferred LBL, and 6 (20.0%) mentioned no difference (p Value<0.05) (Figure 5).

Of all students, 6 (19.3%) suggested that the teacher's role as a behavioral model is more evident in PBL and 10 (32.2%) saw this role more

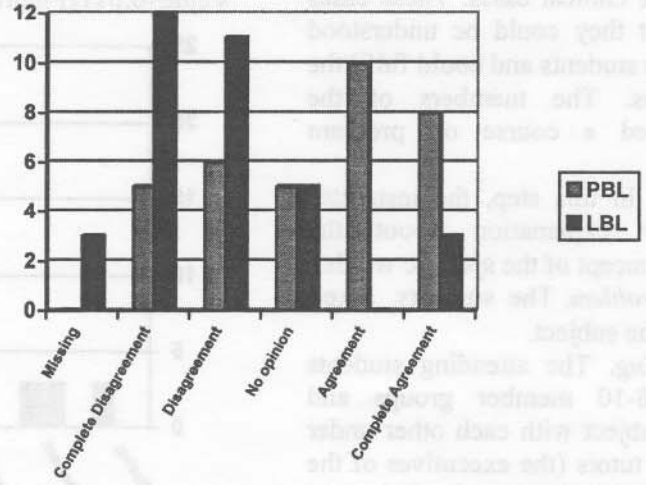

Fig 2. COMPARISON OF THE STUDENTS' ATTITUDE TOWARD THE INSTRUCTOR'S LESS PROMINENT ROLE IN EDUCATION IN PBL AND LBL

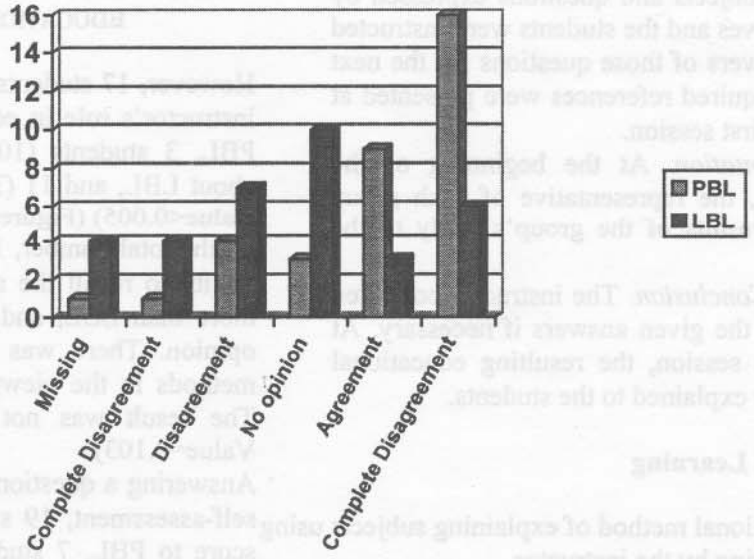

Fig 3. COMPARISON OF THE STUDENTS' ATTITUDE TOWARD THEIR ABILITY IN SELF-ASSESSMENT IN PBL AND LBL

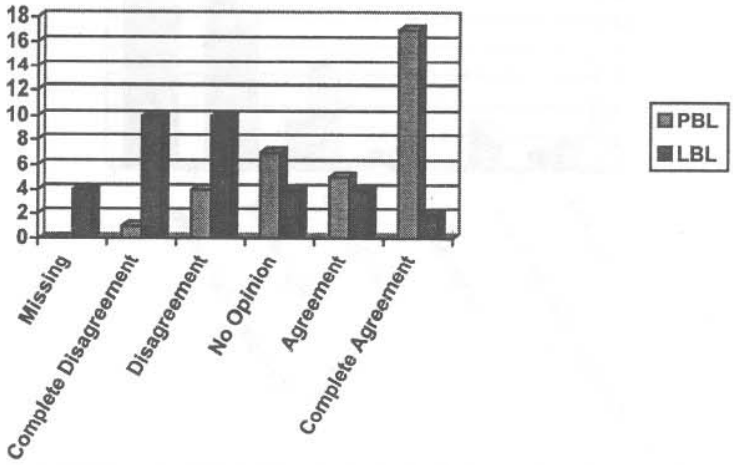

Fig 4. COMPARISON OF THE STUDENTS' ATTITUDE TOWARD THEIR ABILITY IN GROUP WORKING IN PBL AND LBL

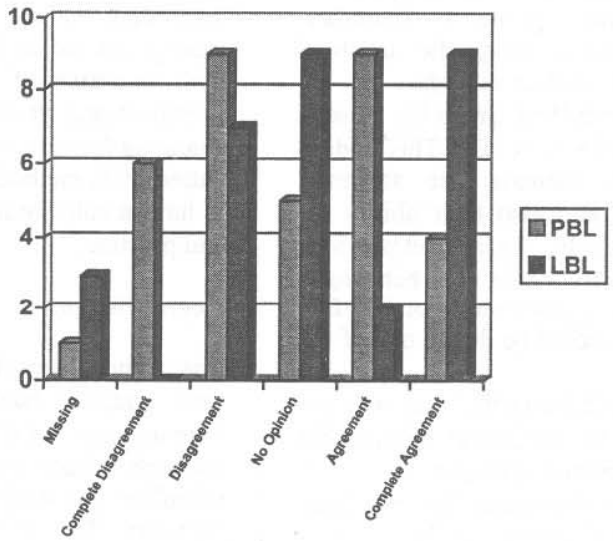

Fig 5. COMPARISON OF THE STUDENTS' ATTITUDE TOWARD THE SUITABILITY OF PBL AND LBL FOR A COMPLETE COURSE

clearly in LBL. The remainder (14 students, 48.4%) mentioned no difference between two methods (p Value=0.291).

Answering a question about the instructor's capability and expertise, 14 students (45.2%) noted that these characteristics were higher in applying LBL, and 5 (16.1%) mentioned higher capability in applying PBL. Other 12 students (38.7%) gave an equal score (p Value<0.05) (Figure 6).

Discussion

Review of the students' attitude questionnaire showed that in their opinion, the learner's role is more evident in PBL than LBL, and the instructor's role is less important in PBL. This finding shows that in PBL, the burden of education is mostly on the shoulders of the students, not the instructor.

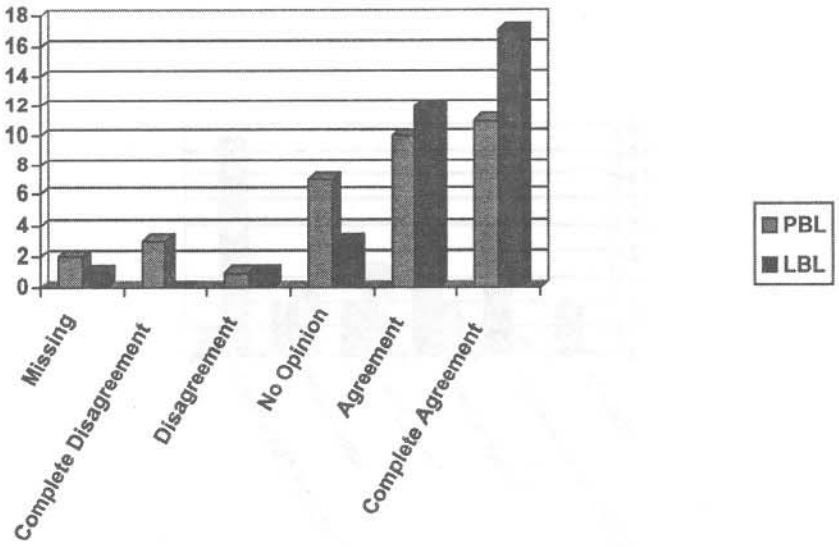

Fig 6. COMPARISON OF THE STUDENTS' ATTITUDE TOWARD THE INSTRUCTOR'S EXPERTISE IN APPLYING PBL AND LBL

Although most of the students thought that their ability to recall the subjects would be higher in PBL, this result was not significant. Therefore, further research is needed to weigh the statistical significance of this issue in other settings.

The students believed that their capability in self-assessment is more prominent in PBL. This finding shows that PBL can increase the students' motivation for learning and also their ability for self-education. Consequently, this method provides the potential of evaluation and promotion of the educational outcomes by the students themselves.

According to the results, group-working skills were promoted in PBL. This finding is consistent with the results of other studies (11, 12). Since all scientific and practical aspects of today's life is changing from an individual-based to a team-based pattern, this method can enhance the students' will to have a collaborative approach in their education and practice.

The fact that the instructor's role as a behavioral model in education was considered poor in PBL, although not significant, could be due to one of the followings:

1- The method used for holding the class was not successful in creating an emotional relationship between the instructor and the students;

2- This item of the questionnaire has not been able to assess the students' view properly.

3- PBL does not have this capacity at all.

Answering a question about the preference of one of these methods to be used in a complete course of immunology, most students voted for LBL and considered PBL as not useful for all sessions. They also believed that the instructor showed more expertise in applying LBL. Considering the long period of applying LBL in this university and the instructors' experience in this method, this could be understandable.

The results of this research show that with performing further studies, the condition for applying PBL in adaptation with our educational framework could be achieved.

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References

1-Azizi F.: Problem-based learning. Marandi A., Azizi F., Larijani B., Jamshidi H.R.: Health in Islamic Republic of Iran. WHO & UNICEF, 1998: 841-842 [Farsi]

2-Antepohl W., Herzig S.: Problem-based learning versus lecture-based learning in a course of

basic pharmacology. Medical Education 1999; 33:106-113

3-Doucet M.D., Purdy R.A., Kaufman D.M., Langille D.B.: Comparison of problem-based learning and lecture format in continuing medical education on headache diagnosis and management. Medical Education 1998; 32:590-596

4-Dhapagain M.L., Bhattachrya N., Jain B.K., Kaini K.R., Koirala S., Jayawickramarajah P.T: Introducing problem-based learning into an organ system program. Medical Teacher. 1998; 20(6): 587-589

5-Azizi F.: Changing medical education programs according to the requirments of the community. Journal of Shaheed Beheshti Medical University. 1999; 9(4): 229-244 [Farsi]

6-Jones G.L., Margetson D., Bligh F.G.: Problem-based learning: A coat of many colors. Medical Education. 1998; 32: 492-494

7-Davis M.H., Harden R.M.: Problem-based learning: A practical guide. Medical Education. 1999; 21(2): 130-134

8-Shotliff K.: Basic sciences in problem-based learning and conventional curricula: Students attitudes. Medical Education. 1997; 31(5): 394.

9-Nandi PL, Chan JN, Chan CP, Chan P, Vhan LP. Undergraduate medical education: comparison of problem-based learning and conventional teaching. Hong Kong Med J, 2000 Sep; 6(3): 301-6

10-Treloar C, McCall N, Rolfe I, Pearson SA, Garvey G, Heathcote A. Factors affecting progress of Australian and international students in a problem-based learning medical course. Med Educ, 2000; 34(9): 708-15

11-Lieberman SA, Stroup-Benham CA, Peel JL, Camp MG. Medical student perception of the academic environment: A prospective comparison of traditional and problem-based curricula. Academic Medicine. 1997; 72(10): S13-15

12-Mennin SP, Kalishman S, Friedman M, Pathak D, Snyder J. A survey of graduates in practice from the University of New Mexico's conventional and community-oriented, problem-based tracks. Academic Medicine. 1996; 71(10): 1079-1089