

Problem-Based Learning Variant: Transition phase for a Large Institution

I. Khan (Department of Biochemistry, Dow Medical College, Karachi.)

A. Fareed (Department of Marketing Statistics, Aga Khan University Hospital, Karachi.)

Abstract

Objective: To compare students' test scores and perceptions of problem-based learning (PBL) and lecture-based learning (LBL) by applying a PBL-variant.

Method: For the transition from LBL to PBL, PBL was varied for one discipline only and for a large group of students. Two hundred forty nine second year medical students were taught a topic of Biochemistry by the LBL method and then 141 of these were taught another topic by the PBL-variant. At the conclusion of each topic an MCQ test was given. One week later a 9 item questionnaire was given to the 50 students now attending classes to assess their perceptions of the 2 teaching formats. The test scores of the two methods were compared. Students' ratings were differentiated by the Wilcoxon Signed-Rank test.

Results: There was no significant difference in the test scores by PBL or LBL, but PBL received significantly higher student ratings ($p < 0.05$) than LBL in self-study time, library time, number of books and computer consulted, enthusiasm for the topic, group discussion, depth of knowledge and interest taken in the teaching format. But there was no significant difference in students' ratings of the teacher's importance in either PBL or LBL.

Conclusion: PBL variant and LBL produced similar MCQ test scores but the former is more conducive to enthusiastic self-study. Thus in the transition phase, PBL may be applied to one discipline and a large group of students without undermining its merits (JPMA 51 :271 :2001).

Introduction

Dow Medical College is the second oldest Medical College of Pakistan, admitting nearly 480 students annually. The method of teaching is Lecture-based learning (LBL). Recently, the attendance at lectures has fallen sharply. It is assumed that this is because students prefer to study on their own - the immediate goal being to pass the examination. But the Information explosion and the fast pace of change make it necessary to give medical students the scaffolding to become active, self-directed, life-long learners to keep abreast with change¹. Adult learning behaviour is also geared to self-directed learning in response to a need.² So, to make learning more meaningful, clinically oriented and enjoyable³, the administration decided to try Problem-based-learning (PBL).

However, curriculum-wide changes specially in a class size of more than 100 students,^{3,4} are costly in terms of finances, faculty time, strength of staff and number of rooms required⁵. International review literature has shown that basic science scores are lower with the PBL method.^{3,6}

To circumvent these problems without sacrificing the advantages of PBL, a PBL-variant was tested in the transition phase using a single discipline-biochemistry, and applying it to the entire class. Large group PBL⁷ and Single-course PBL⁵ have been tried before^{8,9} and have proven to offer potential insight into PBL function. It has been found that facilitator directed learning issues are more beneficial for the students¹⁰.

This pilot study was conducted to compare students' scores and perceptions of the teaching method by LBL and the PBL-variant.

Method

Sample: All second year medical students at Dow Medical College for the year 2000, who were attending lectures.

Intervention - In May 2000, 249 students attending lectures were taught a topic of Biochemistry - "Bioenergetics" by the conventional LBL method, in 10 classes of one hour each. An MCQ test was then given to judge their core knowledge.

By August 2000, the number of students attending the lectures had fallen to 141. They were then taught another Biochemistry topic - "Nucleoprotein metabolism", by the same teacher, using the PBL-variant method, in 10 classes of one hour each. In the first class, scenario of a "Gout" patient was presented. Active discussion was encouraged. Upon disclosing that his "uric acid" level was higher than normal, the facilitator gently prodded the students towards their knowledge classes of one hour each. In the first class, scenario of a "Gout" patient was presented. Active discussion was encouraged. Upon disclosing that his "uric acid" level was higher than normal, the facilitator gently prodded the students towards their knowledge deficiencies of Nucleoprotein metabolism.

The students identified 8 learning issues. They were asked to divide themselves into eight groups of 15-20 students each, and to select one topic per group. The groups studied on their own from different sources of information. Then, one group made a presentation in each class and the rest of the class were asked to read the topic beforehand and ask them questions. At the end of the presentation, the peers and facilitator both graded the group's work. In the last class, the whole class pooled in their knowledge to find what was wrong with the patient and how to alleviate it.

Then an MCQ test was given to judge their core knowledge.

One week later only 50 students were attending class. A 9-item questionnaire on an ordinal scale was distributed to check the students' perception of the two teaching methods (Table 1).

Table 1. Comparison of Students' Ratings of PBL and LBL.

S.N.	Question	Teaching Style	n	Scale*			p value
				I	II	III	
1.	Daily Self-Study Hours	PBL	50	11	24	15	0.001
		LBL	50	26	22	2	
2.	Number of Books Consulted	PBL	50	3	35	12	0.002
		LBL	50	10	38	2	
3.	Total Internet-Study Hours #	PBL	19	8	8	3	0.003
		LBL	19	17	2	0	
4.	Daily Hours Spent in Library	PBL	50	23	14	13	0.007
		LBL	50	31	14	5	
5.	How interesting Was it	PBL	50	2	35	13	0.001
		LBL	50	6	41	3	
6.	How Stimulating for Further Study was it	PBL	50	12	27	11	0.001
		LBL	50	32	17	1	
7.	How Much Group Discussion was There	PBL	50	13	21	16	0.001
		LBL	50	27	22	1	
8.	Depth of Knowledge Gained	PBL	50	6	34	10	0.027
		LBL	50	11	35	4	
9.	Usefulness of Teacher	PBL	50	15	20	15	0.684 **
		LBL	50	9	27	14	

* For first four questions scale is I = zero, II = 1-2, III => 2, for all other questions scale is

I = minimum II = moderate III = maximum

Only 19/50 students had access to internet

** p value insignificant

To ensure honest answers, the students were asked not to identify themselves on the questionnaire.

Statistical Analysis

1. Test scores of LBL and PBL were compared. Paired t test was used to detect the difference in the students' scores¹¹.

2. Since the data for the questionnaire was on an ordinal scale as an alternate for t test on paired differences, Wilcoxon Signed-Rank test was done for the difference in students ratings for PBL and LBL.

Results

As shown in Table 1 and Figure,

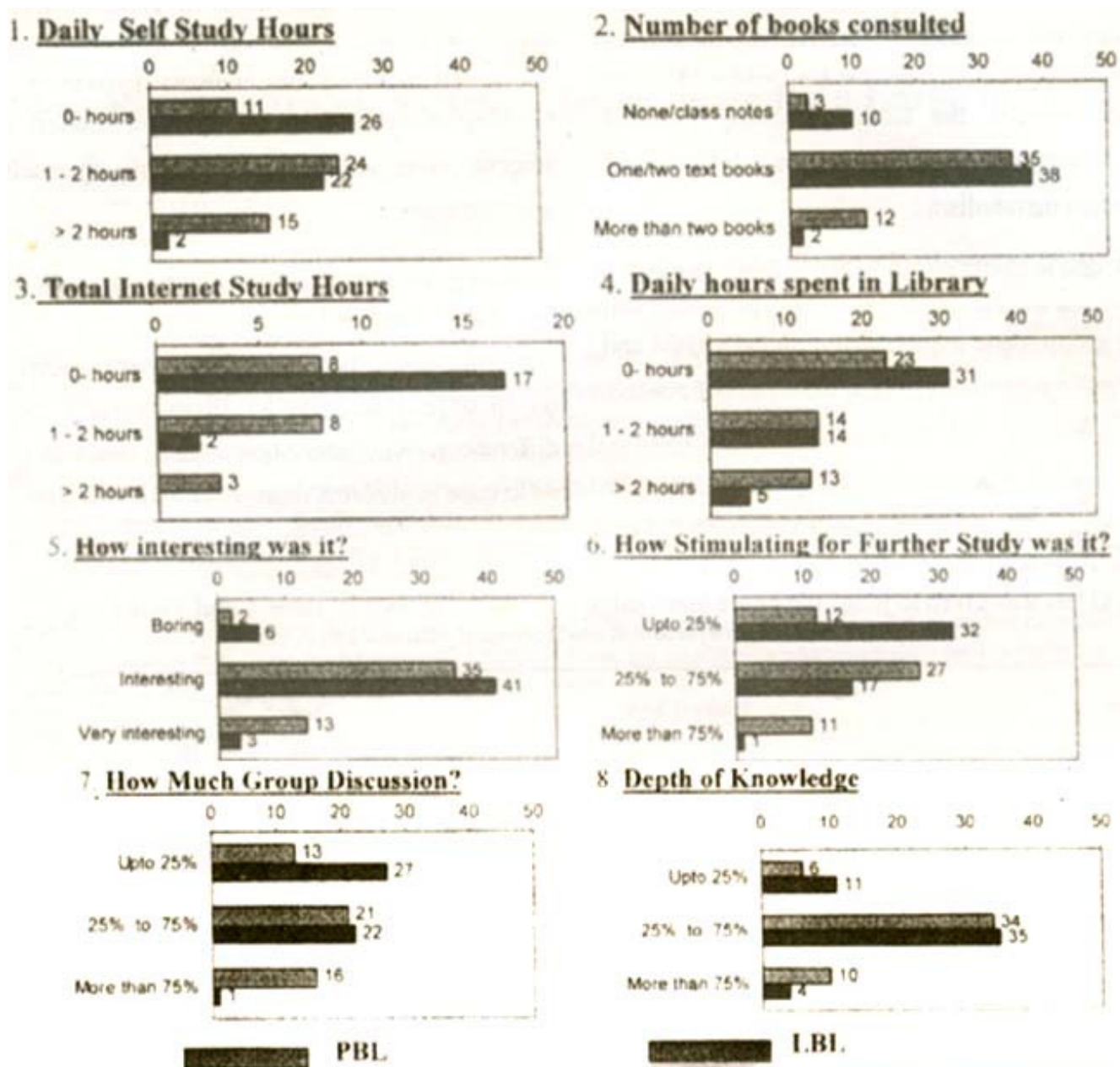


Figure 1. Comparison of Students Perceptions of PBL and LBL. where Significant Differences were Found

students evaluated PBL significantly higher than LBL (p value < 0.05) on 8 of or LBL. the 9 parameters tested - i.e time spent in self-study, number of books consulted, time spent on internet search, time spent in library, interest in method of learning, stimulation for further study, amount of group discussion and depth of knowledge gained.

However, there was no significant difference (p value > 0.05) on the usefulness of the teacher by either PBL or LBL.

Table 2. Comparison of Students' Scores by PBL and LBL.

Marks Obtained	PBL (n = 249)		LBL (n = 141)	
	Actual Number*	% #	Actual Number	%
≥ 90	5	3.5	8	3.2
80 - 89	27	19.5	47	18.7
70 - 79	50	35.6	68	27.5
60 - 69	34	24.1	74	29.8
50 - 59	15	10.4	42	17
40 - 49	8	5.8	9	3.5
30 - 39	2	1.5	1	0.3
≤ 29	0	0	0	0
Mean marks	71		70	
S.D.	13		16	

* Actual number of students who got marks in this range.

Percentage of students who got marks in this range.

Table II shows the marks obtained out of 100 and the number of students who obtained these marks, by both PBL and LBL. The mean grades were almost the same in both systems (71 in PBL against 70 in LBL) and t test for matched samples indicated that there is no significant difference in the scores obtained by students by either PBL or LBL.

Discussion

This study was conducted over a 6-month period from April to September 2000. The aim of this study was to find if this PBL variant (applied to one discipline only and for a large group) produced results comparable to those obtained by pure PBL. Our results showed that students scored equally well, if not better, with the PBL variant as with LBL. This is consistent with research done on comparison of students' scores with pure PBL and LBL^{3,5,8,11}. However, some studies have found that PBL scores are better than LBL^{12,13}. Since we were testing this PBL variant in the transition period of changing from LBL to PBL, we were satisfied that the students' scores did not suffer. But we did find that by this method it took a longer time to complete this same topic than LBL took in the past few years (to classes versus 5 classes for latter).

Students perception of this PBL-variant process were also consistent with the enthusiasm shown for pure PBL by students in other research works done elsewhere^{3,8,14-16}.

Because PBL motivates the students and prepares them for active, self-directed, life-long education as well as the “patient-centered-scenarios” that they will be encountering throughout their lives and because the scores obtained by this method are the same as those with the conventional LBL method, we feel that this PBL variant may be adopted in the transition phase since it has been adapted to counter the effects of a large group size and financial constraints which are the two chief objections worldwide to the changeover from LBL to PBL⁵. It has already been proposed that PBL should be adapted to suit the requirements³. although some proponents suggest that this should be done only in the transition phase, as it offers less benefits than pure PBL⁶.

This study had some limitations. Since the sample consisted of all students attending classes, so the sample size for LBL, PBL and the questionnaire were different. Another limitation was the retrospective nature of the students’ ratings - this might have given rise to bias. An interesting follow-up would be to do the same study applying pure PBL and observing if the results are any different from the PBL variant’s results. Then we can judge if a large institution with financial constraints can adopt this PBL variant rather than pure PBL.

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