

Problem based learning has an efficient teaching and learning method for small group teaching-its evaluation and medical student's perception

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Abstract

Objective: To evaluate the efficacy of problem based learning as a teaching learning method and its evaluation by medical students

Keywords: active learning ,case scenario,evaluation,medical education,problem based learning,small group learning

Method: A small group of 13 medical students of second year were selected. A pretest was given on the topic selected for problem based learning .They were given the problem-case scenario. During active learning process,group discussion,brain storming ,library and internet searches with the help of the facilitator was done.The students analyzed the problem,formulated learning objectives,and post test on the same topic was given andthe students perception towards problem based learning was noted by a 10 point questionnaire with percentage positive responses.

Results: The pretest score was 2.88+/-0.74,the post test score was 7.80+/-2.12 which was statistically significant,(p value<0.0001). the students perception questionnaire on the outcome of problem based learning was 69.22% positive response which also suggested significant value.

Conclusion: These findings suggest that problem based learning is an efficient teaching learning method with a good outcome perception of medical students

I. Introduction

Problem-based learning (PBL) is a student centered approach to active learning where students in groups are presented with a well structured problem or case which they study collaboratively over a week or longer in contrast to systematically building knowledge in individual subjects. The goals of PBL are to help the students develop flexible knowledge, effective problem solving skills, selfdirected learning, effective collaboration skills and intrinsic motivation.¹ Over the years the role of tutor was subject to gradual change from a passive facilitator to an active discussion leader ².The theoretical basis of PBL is grounded in a constructivist perspective in learning as the role of the instructor is to guide and challenge the learning process rather than strictly providing knowledge ^{3,4}.Feedback and reflection on the learning process and group dynamics are essential components of PBL which is considered as an aid to guide the student from theory to practice through solving problems ⁵.Nevertheless, one of the main critics to this approach is that, early in the learning process, learners may find it difficult to process a large amount of information in a short amountof time due to their working memory limitations. In 1998, Swellerproposed the “cognitive loadtheory”⁶ to explain how novices react to problem solving during the early stages of learning and described the guidance-fading effect. To counter this effect he suggested a worked example to be used first, and then a gradual introduction of problems to be solved ⁷.

As demonstrated by Taylor and Mifflin ⁸, PBL has an enormous variability at different medical schools and even within the same medical school. Such

Variability constitutes a real difficulty when comparing “PBLs” together or to other types of learning. Though more than eighty percent of medical schools in the

United States have some form of problembased learning in their programs ⁹, the debate is still ongoing on the weaknesses and strengths of the PBL curriculum compared with traditional methods

Polizois et al.¹⁰ reported no clear difference between PBL and conventional teaching such as lectures, and Hartling et al. ¹¹demonstrated no significant differences in knowledge acquisition and concluded that research is needed to determine appropriate outcome measures in order to capture and quantify the effects of PBL. As stated by Neville, while various outcomes of PBL can be measured, including knowledge acquisition and clinical competence, very few published studies considered all the variables that can affect PBL¹²

In addition, the implementation of PBL could be challenging. In fact, the literature is scarce on the process and the evidence of a good implementation; multiple factors might be incriminated such as the extent of

incorporation of PBL into the school curriculum, the motivation of the learners, the dynamics of the group and the experience of the teachers¹³ H.G.Schmidt¹⁴, suggests steps involved in PBL which are in table 1

TABLE 1. Steps involved in problem-based learning

Step 1:	Clarify terms and concepts not readily comprehensible.
Step 2:	Define the problem.
Step 3:	Analyse the problem.
Step 4:	Draw a systematic inventory of the explanations inferred from step 3.
Step 5:	Formulate learning objectives.
Step 6:	Collect additional information outside the group.
Step 7:	Synthesize and test the newly acquired information.

As used in medical education, the PBL curriculum is intended to meet three goals: the student must acquire a body of basic biomedical knowledge equivalent to that learned in a traditional curriculum, the student must learn to apply this basic knowledge in patient care, and the student must acquire the attitudes, habits, and techniques of a lifelong learner.¹⁵ Thus in order to evaluate the efficacy of problem based learning, we selected a small group of 13 students, after getting no objection from the head of the department of pharmacology and proceeded to our study.

Methods

Participants

The second year medical students with their internal marks in pharmacology in the descending order were chosen so that the best and the worst learner gets an equal chance in the study. since the study was on small group, only 13 students were selected.

Study design

Before the study, all underwent a pretest on the topic to be used in problem based learning. after the problem based learning process, they underwent a posttest and %positive response ten questionnaire on the outcome of the study.

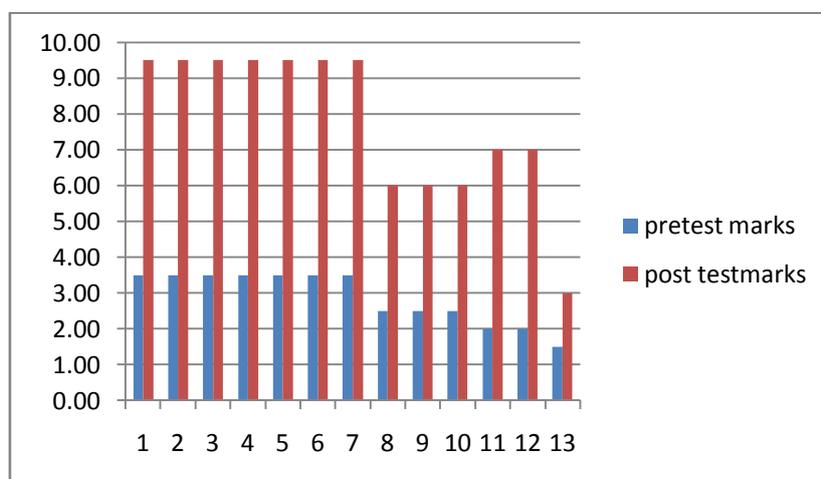
Study duration

Three weeks

Data collections:

Pre test and post test score was evaluated. the students perception on PBL was also evaluated with percentage positive response by each student.

Results



Unpaired *t* test results

P value and statistical significance:

The two-tailed P value is less than 0.0001

By conventional criteria, this difference is considered to be extremely statistically significant.

Confidence interval:

The mean of Group One minus Group Two equals -5.324

95% confidence interval of this difference: From -6.357 to -4.290

Intermediate values used in calculations:

t = 10.6584

df = 23

standard error of difference = 0.499

s.no	Questionnaire(yes/no response)	percentage positive
1	good	69.23
2	achieve learning objective	61.53
3	improves understanding	69.23
4	enjoyable/interesting	76.92
5	recommend PBL	69.23
6	expect to score better in exam	69.23
7	knowledge and skill acquired will help in clinical practice	53.8
8	relevance of topic to other branches also explained	69.23
9	improved communication skills	84.61
10	improved psychosocial skills	69.23
	average	69.22

Mean	69.2240
SD	8.1176
SEM	2.5670
N	10
90% CI	64.5184 to 73.9296
95% CI	63.4170 to 75.0310
99% CI	60.8817 to 77.5663
Minimum	53.8
Median	69.23
Maximum	84.61

II. Results

Evaluation of the same small group before and after the problem based learning process showed an average increase in the marks scored ,the average score for pretest was 2.88 with a standard deviation of 0.74,the post test score increased to 7.8 with a standard deviation of 2.12,which is shown in the graph 1.The outcome questionare of students perception was percentage positive 69.22 on an average of 10 questionare by all 13 students which is depicted in the table 1

III. Discussion

Our study suggests that the problem based learning is an effective way of small group learning .the students perception towards the PBL was also good. Oja¹⁶ reported a positive relationship between problem-based learning and improved critical thinking in nursing students, Shin and Kim¹⁷ found that PBL has positive effects on the outcome domains of satisfaction with training, clinicaleducation, and skill course. Our study also showed a good outcome domain of satisfaction,(recommend PBL=69.23% positive response, knowledge and skill acquired will help in clinical practice(positive response= 53.8%)

On the other hand, other systematic reviews failed to show robust evidence that PBL improves problem-solving ability. The review conducted by Williams and Beattie¹⁸ including undergraduate nursing students revealed a paucity of evidence supporting or confirming the application of PBL in the clinical setting. . Koh et al.'s¹⁹ found positive effects on physician competence (mainly on social and cognitive competencies) with PBL.our study also showed improved understanding ,improved psychosocial skills and above all well appreciated communication skill which is a recognized skill to be groomed by a medical student.

Donner and Bickley²⁰ reported of the PBL curriculum include cost, high faculty workload, variable tutor quality,and the need for supplemental training in grossmorphology. The cost disadvantage relates primarilyto faculty time expenditure. One study²¹ reported that it takes between 500 and 600 hours of faculty time to provide 130 hours of lecture in a traditionalmedical school. This does not vary appreciablywhether student enrollment is 10 or 300.

In our study ,the disadvantages of PBL were time consuming,active facilitatorneeded,practical for only common diseases.The limitation of this study was we have not compared the PBL process with the traditional learning. The study was restricted to that particular group of 13 students.the time spent on PBL process was around 3 weeks,which would be definitely less in a traditional lecture.

IV. Conclusion

The research identifies three values enmeshed within PBL: (1) Stimulating the Affective; (2) Strengthening the Cognitive; and (3) Enhancing the Social. Here we have done a small scale small group study on PBL, which tries to show a definitive path of PBL, its research and its success in medical education Problem based learning

Case scenario:an animal attender 45 yr aged c/o breathlessness and cough recurrent since 20 yrs.once his symptoms worsened taking aspirin.of now, he gets 1-2 attacks a weekwith night symptoms >2 times a month.o/e revealed generalized wheeze(expiratory) tachpnea.>25/min.tachcardia110/min.PEFR,<50%,PEF Variability 35%

Pretest questionnaire:
1.what is the most likely diagnosis?
2.etiological agent of the disease here is
3.auscultation of chest should reveal..... For the diagnosis
4.the diagnosed disease is grouped under
5.which drug exacerbates this disease
6.first drug of choice for this disease is ----- and route is -----
7.control medications used here are
8.releiver medication used here are
9.adverse effect of inhalation therapy are
10.complimentatry therapy tried in this disease includes/.....
Post test questionnaire
1.What is the preferred route of administration of drugs for chronic asthmatics?
2.which drug causes exacerbation of asthma?
3.which inhalational agents of animals exacerbates asthma?
4.what is attached to inhaler to increases the effectiveness of asthma?
5.Which instrumenmt is used in hosp[itals during acute sdevere asthma?
6.name one reliever medication used in asthma?
7.Name one control medication used in asthma?
8.name one adverse effect of salbutamol?
9.name one adverse effect of steroid?
10.name one complimentary therapy used in asthma?

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