

Lecture-based Versus Problem-Based Learning Methods in Public Health Course for Medical Students

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ARTICLE INFO

Article Type:

Research Article

Article History:

Received: 07 Sep. 2012

Revised: 17 Sep. 2012

Accepted: 23 Sep. 2012

ePublished: 25 Dec. 2012

Keywords:

Course

Problem-based learning

Lecture-based Learning

Education

Public health

ABSTRACT

Introduction: Problem-based learning (PBL) method has progressed as an alternative to lecture-based learning (LBL) method in recent decades. Benefits of PBL clearly supported by researches however several items remain unclear especially in Iranian medical universities. The aim of this paper is to compare the learning outputs of PBL and LBL methods. **Methods:** In this cross-sectional study public health course was prepared for three groups of students. Group 1 included medical students (n=101), Group 2 dentistry students (n=54), and Group 3 was formed of pharmacy students (n=112). Scores of final exam as well as 10 similar-root questions as a short-term outcome, scores in national basic science exam, recent similar informal exam as a mid-term output in addition to course evaluation by students, and assessment of attitude about PBL were compared between groups. Data analysis was performed by SPSS-11 using means' comparison. **Results:** Scores of students in PBL group was significantly higher in final exam ($P<0.001$). The percentage of correct responses to 10 same-root questions in PBL ($M=6.68$) were significantly higher ($M=6.54$). Faculty members were evaluated better in PBL group ($P<0.001$) in all aspects of teaching. Totally, the students who evaluated teachers in PBL group had 2 points more than LBL group ($P<0.001$). Scores of students in national exam (after two years) and the recent survey (in the third year) were higher in PBL group ($P<0.001$). **Conclusion:** Results of using PBL method indicated the higher rate of scores and better recalling of learned materials in this method.

Introduction

In the present rapidly growing world, health systems should be robust enough to respond appropriately to a wide range of new challenges and threats.¹ Health workforce composes the backbone of the health system; so, any flaw in terms of the human resource numbers or skills would adversely affect the performance of the system.² So, the level of knowledge and the way of acting in the system are crucial for Iranian health networks in which medical graduates are working as a health-care providers, system managements and academicians; as implied by the name "Ministry of Health and Medical Education".²

Previous studies have shown widespread diminutions in public health training for medical students and consequently health management incompetence in Iranian health system.^{2,3} In order to achieve the Millennium development goals (MDGs) and improve the health

standards, there is a demand to reform medical schools' curriculum and educational methods in order to enable them to provide integrated health care services.⁴ Therefore, medical educators are being encouraged with new learning methods to meet expanded needs.⁵

Problem-based learning (PBL) is possibly one of the most innovative methods in medical training which has been progressed in recent decades as an alternative to learning by the traditional lecture-based learning (LBL) method.⁶ LBL isn't mostly a student-base process and the emphasis is on examination oriented learning of details⁷, while in PBL, students play an active role in learning and are assisted to change a basic understanding of information at the knowledge and comprehension levels to a higher level of understanding.⁵ Totally, PBL is a student-centered, problem-based, inquiry-based, integrated, and collaborative learning.⁸ Whereby, small groups of students, guided by tutors, focus on real-world case scenarios and

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independently study to solve "the case" with their newly acquired medical knowledge.⁹ Evidences demonstrate that graduates of PBL curricula have equivalent or superior professional competencies in comparison with graduates of more traditional curricula.

Studies in this area have been mostly carried out in other countries^{6,9-19} and there is a little information about the effects of PBL in learning outcomes in Iran.^{10-13,20} Also, replication with a larger sample is recommended in most of researches. Furthermore, in spite of passing public health course as a part of basic science courses in Iran,²¹ this course is repeated as a workshop during internship. To tackle with the problems in learning of public health concepts and methods, department of Community Medicine conducted the PBL method for teaching the public health course in order to compare the results of PBL and LBL methods.

Methods

The present cross-sectional study was carried out on 267 medical, pharmacy, and dentistry students participating in public health course from Feb 2007 to Jan 2008.

The course of public health is delivered in the first year for all three groups of students in Tabriz University of Medical Sciences with a same curriculum and professors. In this course students are expected to be prepared for working as a health team member, health service provider, and manager. Furthermore Students become familiar with health system, primary health care, Iranian health networks, and delivering health services such as immunization, occupational health, and mother-child health programs during this course.¹³

Since the public health course introduced for three groups of students with the same faculty members and educational packages, but different methods, a case-control study approach was used. There were 112 medical students, 101 pharmacy students and 54 dentistry student in the first (PBL), the second (LBL) and the third (LBL) groups respectively. Students had a similar basic knowledge of public health as they had have the same high school background and achieved similar scores in national university entrance exam.

All of 267 students have participated in the final exam. Scores of students in final exam, a quiz with 10 similar-root questions and participations' attitude toward educational methods (for evaluating the short-time outcome), national exam scores at the end of the second year, and another informal exam with 10 similar-root questions (after three years) compared in three groups (for evaluating the median-time outcome). Learning attitudes were measured by a 10-item questionnaire, each with five-point Likert scale²² developed by the investigators. Faculty members were evaluated based on a routine faculty evaluation system in all three groups.

Statistical analysis was performed by SPSS version 11.0 for windows (SPSS Inc., Chicago, USA). The scores were presented as mean, and frequency was shown as number. The independent sample t-test was used for testing the hypotheses and comparing the groups. P value less than 0.05 was statistically considered significant.

Results

Comparison of students' scores in final course exam, similar root questions, showed that scores of students in PBL group was significantly higher than those of LBL group. In other words in general health course the score of PBL group (16.02 ±2.03) was higher than LBL group (14.47 ±2.03 and 14.25 ±1.72) (Table 1). The percentage of correct responses to 10 same root questions in three groups indicated that the percentage of correct responses in PBL were significantly higher than that of LBL.

Table1. Scores of students in PBL and LBL groups in short-term outcomes.

Groups	Final exam			Similar-root Q		
	No of Q	Mean score	p	No of Q	Mean score	p
PBL	40	16.02	<0.001	10	6.68	<0.001
LBL	40	14.25		10	6.24	

PBL: problem-based learning, LBL: lecture-based learning, Q: questions.

Students' scores in national basic science exam (after two years) and recent informal exam (after three years) compared as a median time effects (Table 2). Even after two and three years, students of PBL group had significantly higher scores than students of LBL group. The comparison of national basic science exam suggested that the overall points of PBL group (58.25%) were higher than those of LBL (51.20%).

The scores of faculty members which were evaluated based on a routine faculty evaluation system showed that students attitude toward teachers were better in PBL group ($p<0.001$) in all two major aspects of teaching (teaching methods and scientific competency). The results obtained from the evaluation of faculty members are compared in Table 3.

The results of students' attitude assessment toward PBL showed high motivation and successful learning experiences (more than 95% asked for using this method in other courses).

Positive learning attitudes includes the followings: improved depth of learning in sessions 65%, consistency of learning 43%, repetition and group discussion in class 38%, increased motivation to search the litterateurs and use references 93%, opportunity for interaction with faculty members and peers 86%. Also, they suggested decreasing

the group size.

Collectively, students' responses about learning were very high and moderate in 21.5% and 14.5% in PBL and LBL groups, respectively. Students indicated the effect of the group discussion on learning very high and high in 37.5%, moderated in 12.5%.

Table 2. Scores of students in PBL and LBL groups in median-term outcomes.

Groups	National exam (after two years)			Similar-root Q (after three years)		
	No of Q.	Mean Score	P	No of Q	Mean Score	P
PBL	18	11.65	<0.001	10	7.17	<0.001
LBL	18	9.23		10	6.12	

PBL: problem-based learning, LBL: lecture-based learning, Q: questions.

Table 3. Students view about faculty members in two groups.

Aspects of teaching	LBL group	PBL group	P
Teaching methods (in 4 point Likert scale)	25.00±0.22	2.91±0.16	<0.001
Scientific proficiency (in 4 point Likert scale)	2.62±0.14	3.02±0.14	<0.001
Communication skills (in 4 point Likert scale)	2.83±0.07	3.39±0.13	0.36
Discipline (in 4 point Likert scale)	2.89±0.24	3.29±0.22	0.16
Total competency (in 10 point Likert scale)	5.86±0.21	7.96±0.23	<0.001

PBL: problem-based learning, LBL: lecture-based learning.

Discussion

In the present study, results showed a significant difference between knowledge scores of PBL and LBL groups in short and medium time. Consistent with Lorna Dodd et al¹⁴ and Kuo-Inn Tsou et al¹⁵ studies, PBL has a significant impact on how students find and use information. Results of a study in Esfahan - Iran showed that PBL is preferable to LBL. Likewise, Hwang in University of Illinois showed that PBL was more effective for improving students' knowledge and satisfactions. Qualitative studies indicated that it was feasible to conduct PBL online.¹³ However, Khan (2002) mentioned students in PBL and LBL produced similar MCQ test scores¹⁸ which is different from our finding in national exam at the end of second year. Also in other research by Miller in NEVADA, there were no significant differences between groups for any of the items measured.²⁰

The score of final exam and similar-root questions as well as similar-root questions after three years indicated successfulness of PBL method in our research that was compatible with Gurpinar et al. study in Turkey who found that the mean total evaluation score in the PBL group

was 4.5 points higher than that of LBL group.¹¹ Another experience during pharmacology course in Germany showed that students in PBL were more successful than students in LBL even in standardized national tests¹² which is similar with our finding in standardized national tests especially in public health item.

Giving positive scores to the teachers (by students) in our study, in PBL group had 2 points more than that of LBL group which was completely in agreement with German studies with 1 point difference.¹²

However, a research in Pakistan showed no significant differences between the test scores by PBL or LBL; but PBL received significantly higher student rating ($P < 0.05$) than LBL in self- study time, library time, number of books and computer consults, enthusiasm for the topic, group discussion, depth of knowledge, and interest taken in the teaching format.¹⁸ Yet, in other study in this country students showed slightly healthier attitudes towards health research in PBL compared to LBL students.⁷ However, it must be noted that comparison among studies was difficult due to differences in target sample, subject matter, and physical environment in which the PBL method was implemented.

In section of student's attitude toward PBL, our study indicated that students were highly motivated to learning in small groups which other studies are also supporting this finding.^{9,10,23} In an interview on a sample of 88 students in medical faculty by Tisonova et al.¹⁹ 65% of students found the amount of information concerning pharmacotherapy not sufficient for their future clinical practice and 83.3% were not able to use the knowledge obtained – more than 90% of students did not see enough opportunities for pharmacotherapy training during clinical subject course. Findings of the similar study about perception of graduated GPs about accordance of teaching programs with real work environment needs (IRAN health networks) also showed that a great number of health training courses were not efficient.²⁴ So, they had problems in using their knowledge in clinical work. These results are in support of our orientation teaching towards the PBL. Using a problem-based Learning (PBL) approach was recommended to the acquisition of basic public health competencies.¹ Hence we propose the development of PBL method in order to improve efficiency.

Conclusion

The present study which has been designed to determine outputs of two different educational methods revealed that students of PBL method were good at different exams in the same year and two to three years later. In other words, in order to improve the quality of health care as a central mission of medical education, we could develop PBL as the main stem of education in health system.

The main weakness of our study was to divide students

into two groups randomly for administrative reasons, acquisition of knowledge, and clinical performance.

Acknowledgement

The authors appreciate the head and personnel of Education Development Center (EDC) of Tabriz Medical University who prepared large hall and related workshop rooms during the course.

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