

Research Article

Effectiveness of Problem Based Learning in Developing Knowledge of Undergraduate Nursing Students

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Abstract

Background: Problem based learning (PBL) is an innovative and learner-centered teaching approach that improves nurses' theoretical knowledge, trains them practically, develops their critical and problem-solving skills to be used for overcoming environmental constraints during clinical practice.

Objectives: The aim of this study was to determine the effectiveness of PBL in developing knowledge of undergraduate nursing students.

Methods: This study conducted a pretest–posttest experimental design among B.Sc. Nursing students of Saida Waheed FMH College of Nursing Lahore. Lottery method of random sampling was used to recruit the participants for experiment group and control group. A PBL-based treatment for the experimental group and a series of lectures was traditionally delivered to the control group on the topic of Diabetes Mellitus. Data was collected using MCQs-based questionnaire during pre-test-post-test processes.

Results: This study identified the problem-based learning as more effective teaching method than lecture method after observing a significant difference between the scores of post-tests of lecture method (LM) and problem-based learning. The participants of the experimental group significantly gained more knowledge scores than the members of LM.

Conclusion: The intervention of PBL method has significantly improved more knowledge of the participants of experimental group than the members of LBL. It reflects that PBL is a more important and effective teaching method in developing knowledge of nursing students than lecture method.

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Introduction:

People have preferred ways of learning and developing their abilities of gaining new information, intelligence, cognitive and intellectual abilities. Teaching methods and learning styles are indispensably correlative in modifying behavior and developing knowledge of learners. In nursing education, different teaching techniques are used such as methods of discussion, lecture, clinical trial, projects, seminars, demonstration and particularly, PBL¹⁻² with the inception of problem-based learning (PBL) method in medical schools at int-

ernational level, it has acquired high recognition among other teaching approaches. World Health Organization (WHO) as well as other associations have started to sponsor and promote PBL method in nursing education, especially in underdeveloped countries³.

For the last four decades, problem-based learning has been discussed at various levels of education and accepted as a student-centered pedagogy in health professions. Firstly, problem-based learning was practiced by the “medical school of McMaster University” in 1969 as an alternative method of learning in order to set a

novice trend in health education. However, PBL is now accepted all over the globe and beyond the medical disciplines⁴. WHO reports that problem-based learning method has been implemented in about 1700 medical institutes and is increasing persistently across the world⁵.

A group in problem-based learning technique normally comprises of five to eight students in number. In problem-based learning, a huge team can be undertaken with a single "moving coordinator" in a number of cliques that are small in size⁶.

In the favor of problem-based learning, Wosinski et al⁷ state that being a useful tool, this approach has brought epistemological reforms in higher education, especially for the schools imparting health and medical education. Correspondingly, Yew and Goh have analyzed the effectiveness of PBL and discussed the naturalistic and empirical impact of PBL on students' learning. This study has concluded that PBL has generally "superior efficacy for longer-term knowledge retention and in the application of knowledge" in addition to be a productive and efficient method for educating nurses⁸.

In modern era, nurses are facing a challenging and intricate atmosphere that require themselves to be knowledgeable and skillful in order to judge and analyze the situation efficiently to deliver competent client care. Nursing teachers need to constantly comprehend, revise and re-examine the syllabus and approaches of education that are applied to teach nurses. At present the growing need of healthcare specialists is not encountered by conventional methods of learning, therefore another method (i.e. PBL) of teaching is required⁹.

Currently, it is applied internationally almost in every institute of medicine such as dental sciences, pharmacology, medical education as well as nursing. At national level in 1996, Zia Uddin University of Medical Sciences Karachi was the first institute in Pakistan that implemented PBL syllabus. Likewise, in 2002, the Aga Khan University Karachi, Pakistan was also applied this innovative learning technique in the curriculum.³ So far as the local scenario is concerned, there is scarcity of literature which has created a gap in this area of research. Therefore, the present study is aimed to determine the effectiveness of problem-based learning in developing knowledge of undergraduate nursing students

and to address this problem and to bridge this gap.

Methods:

Problem-based learning (PBL) is a student-centered innovative learning approach which helps the learners to solve the real-life problems in a group unlike the conventional teacher-centered method of teaching and learning. On the other hand, Lecture-based Learning (LBL) / Lecture Method (LM) is, one of several teaching methods, used to present information orally or teach people about a particular subject in a unidirectional way of communication.

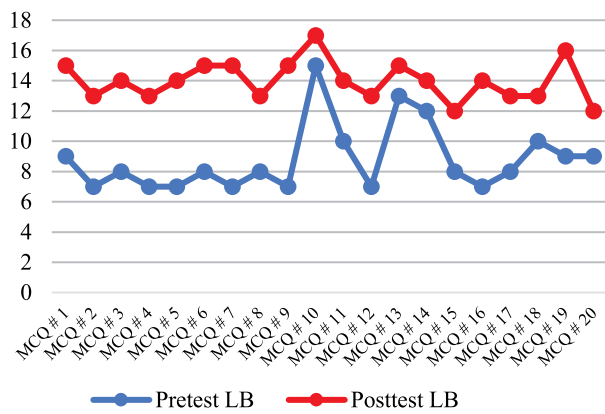
This study used "randomized control trial (RCT) design with a control group, pretest–posttest design to determine the effectiveness of PBL in developing knowledge among two groups. The population framework consisted the Students of B.Sc. Nursing class enrolled in Four Years Degree Program of UHS at Saida Waheed FMH College of Nursing Lahore after seeking permission and meeting the inclusion and exclusion criteria. From a total of N=60 of 2nd Year Class of B.Sc. Nursing, a sample of n=36 was determined using statistical formula for nursing research¹⁰ "keeping desired power of study ($Z_{1-\beta}$) equal to 80% significance level ($Z_{1-\frac{\alpha}{2}}$) equal to 5% anticipated mean knowledge score (μ_1) for CG equal to 7.93 and for EG (μ_2) equal to 8.50 alongside the Standard Deviation of knowledge score (σ_1) of CG equal to 0.70 and for EG (σ_2) equal to 0.51 in the present study"¹¹.

$$"n = \frac{\left(Z_{1-\beta} + Z_{1-\frac{\alpha}{2}} \right)^2 (\sigma_1^2 + \sigma_2^2)}{(\mu_1 - \mu_2)},"$$

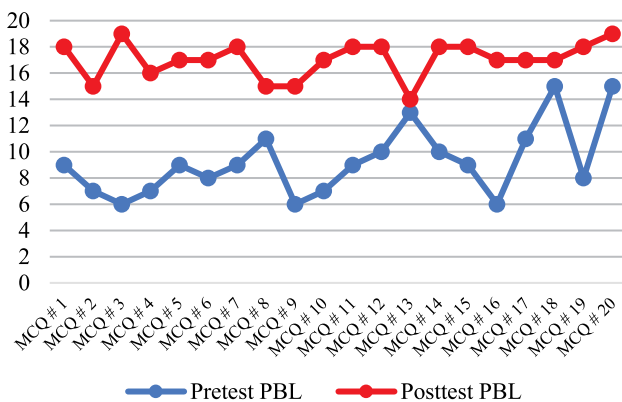
Results:

A total strength of the participants in control and experimental groups was 18:18. All the participants were females studying in B.Sc. Nursing (Four Years Degree Program). The results of pre- and post-tests are presented in the followings.

Pre- and post-test results of LM and PBL were analyzed in order to find difference between the results of both teaching approaches. To assess the knowledge of undergraduate nurses on a topic of Diabetes Mellitus, a 20 MCQs based questionnaire was distributed among the participants of control group during pre- and post-tests of LM. The highest possible score of survey was 20 for



Part-1: Difference between Pre- & Post-tests of LM



Part-2: Difference between Pre- & Post-tests of PBL

Figure 1: Comparison of Pre-Post Tests LM and PBL

pre- and post-tests. The descriptive results showed that the participants gave correct answers with mean= 8.80 \pm 2.24 of pre-test. It can be concluded that the participants of control group have answered eight correct answers and majority of students gave incorrect answers on the pre-test scale. The participants got 15 highest scores and seven lowest (Part-1 of Figure 1).

On the other hand, the results of post-test LM revealed that the students gave correct answers with mean= 14.0 \pm 1.29. The participants got 17 highest scores and 12 lowest on post-test scale. It can be concluded that the participants replied 14 correct answers on the post-test scale which is an improvement than that pre-test score (Part-1 of Figure 1).

To evaluate the knowledge of subjects on a topic of Diabetes Mellitus, a uniform questionnaire with control group was also distributed among the participants of experiment group during pre- and post-tests of PBL. The findings exhibited that the participants answered 9.25 ± 2.69 MCQs correctly in pre-test of PBL. It means

that the members of experiment group scored an average of nine correct answers during pre-test of PBL. The maximum score achieved was 15 and the lowest was six on pre-test PBL (Part-2 of Figure 1).

Whereas, the results of post-test PBL revealed that the students gave maximum correct answers as mean = 17.05 ± 1.39 . The participants got 19 highest scores and 14 lowest on post-test scale of PBL. Thus, the students achieved the average score of 17.05 in post-test that is an improvement of correct responses than pre-test (Part-2 of Figure 1).

The results showed that the maximum achieved average score was 10 in post-test of LM and mean = 14.00 ± 1.29 . On the other hand, the participants achieved an average score of (mean = 17.05 ± 1.39) in post-test of PBL. Hence, the participants of experiment group (PBL) were given more correct answers in post-test as compared to the participants of control group (LM). A

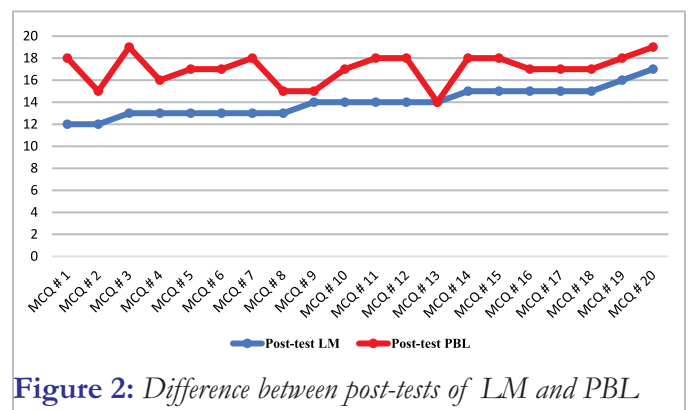


Figure 2: Difference between post-tests of LM and PBL

significant difference was found between results of post-tests of LM and PBL. Consequently, PBL method enhanced the knowledge of experiment group than control group (Figure 2).

It was hypothesized that "PBL is an effective approach than lecture based learning in developing knowledge of undergraduate nursing students". Therefore, a paired sample t-test was applied on the results of pre- and post-tests of LM and PBL to identify the difference and effectiveness of PBL. The inferential results of Table-1 for Pair-1 showed an insignificant difference between the scores of Pretest LM and Pretest PBL with MD= 0.45 and $p=.165$ (i.e. $>.05$). It could be concluded that the participants of both the control group and experimental group were found at same level before the treatments.

Table 1: Results of Paired Sample t-test

Pairs	n	Descriptive		Paired Sample t-test	
		Mean	SD	Means Difference (MD)	p-value
Pair 1	Pretest LM	18	8.80	0.45	0.165
	Pretest PBL	18	9.25		
Pair 2	Posttest LM	18	14.00	3.05	0.001
	Posttest PBL	18	17.05		

Conversely, the results of Pair-2 determined a significant difference between the scores of Post-test LM and Post-test PBL methods as MD = 3.05 p=0.001 (i.e. <0.05). It could be concluded that PBL established a difference between the scores of post-test interventions of LM and PBL. Consequently, PBL had improved the learning and knowledge of the participants of experimental group than the LM. Test results were found significant as p-value ≤ 0.05 and 95% Confidence of Interval as presented in Table-1. Hence, it is proved that “PBL is an effective approach than LBL in developing knowledge of undergraduate nursing students”.

Discussion:

This study is intended “to determine the effectiveness of PBL intervention in developing knowledge of undergraduate nursing students” through a pre- and post-test treatment. PBL is widely used as induction approach in nursing education to develop nurses' knowledge and clinical skills¹². It has been discussed that PBL has brought “a shift in the educational paradigm from the traditional teacher-centered instructional method to learner-centered approach”¹³⁻¹⁴. Many medical schools internationally are changing their curricula and moving to PBL programs¹⁵. In Pakistan, however, the application of PBL pedagogy in medical schools is still at initial stage. Therefore, it is critically important that the training of allied health professionals be geared toward the demands of these expectations and advances. Consequently, nursing professionals must be able to think critically and use clear, expedient decision making when they faced complex healthcare demands. Thus, PBL is a learner-centered pedagogical approach that encourages greater understanding, combines theoretical knowledge with practical application, enhance problem solving abilities, develops longer retention of knowledge, improves lifelong, teamwork and interpersonal skills.

In our study, the effectiveness of knowledge develop-

ment is examined through comparing the results of experimental group (PBL) and control group (LBL). A significant difference has been found between the scores of post tests PBL and LBL. Thus, the present study reports that the PBL intervention has significantly improved the knowledge of undergraduate nursing students. The PBL participants have performed given clinical scenarios appropriately as compared to their lecture method counterparts.

A number of similar studies have also found that knowledge is increased among those who have attended PBL intervention than lecture group¹⁶⁻¹⁷. Likewise, the study of Roca et al has examined significantly higher scores among the students of PBL group as compared to the participants of case-based learning and traditional teaching methods¹⁸. Yew and Goh have also reported that PBL is an effective approach for the retention of knowledge for longer terms and promotion of critical thinking in educational contexts as opposed to LM¹⁹. Similarly, a descriptive study has also found PBL as more effective than LBL in local context to improve academic performance of medical students²⁰. Consistently, another pretest-posttests based study corroborates the effectiveness of PBL and reports its meaningful effect on students' academic performance. Moreover, the students participated in PBL group have showed improved abilities in problem solving, self-directed learning and critical thinking²¹. A meta-analysis by Demirel and Dagyar also supports the results of our study. The authors conclude that teaching-learning process requires a positive students' attitude towards subject or a course to achieve success in addition to the incorporation of planned and correct learning approaches. Resultantly, PBL approach is determined as a more effective learning approach for students to develop positive attitude toward courses. Therefore, PBL has positive effective on student learning attitude²².

The present study also identified that the participants

of PBL intervention significantly achieved higher scores in post-test assessment than its pre-test assessment. Consequently, the PBL approach increased the knowledge of nurses in post-test assessment. Moreover, the average scores of PBL post-test were found higher than the average scores of LM post-test. Correspondingly, the findings of a similar study also support the results of our study. These researchers concluded that students in the PBL group gained more knowledge as compared to the students of LBL²³.

Above all, although LB method could be most recognized and common method of teaching in medical education whereas, PBL was found one of the dynamic and learner-centered instructional approaches which had acquired remarkable attention of teachers and professionals²⁴. Therefore, the recent studies concluded that the PBL approach required to be implemented for knowledge and clinical skills development among nurses²⁵ and encouraged to be used as a more efficient tool in nursing education²⁶.

As the study has proved that PBL is better and effective than LM; therefore, various resources are recommended for successful implementation of PBL. The resources include interactive, well-equipped classrooms, team works and spirits, internet facilities, digital libraries and up to date books, research journals, conducive environment, expertise, cooperation, and coordination and role change of teachers as facilitators. Moreover, the rapid changes and increased complexity of contemporary world present new challenges and put new demands on our education system. However, the LM is traditional and passive learning approach that cannot meet the future challenges of education. For increased learning progress and more learners' satisfaction; therefore, conventional teaching method is required to be revised or replaced with PBL to take advantage of this novice, innovative, prolific and student-centered instructional approaches.

There is also a trend of positive change and implementation of effective strategies and methodologies to raise the standard of education; in this regard it is quite a possibility of implementing PBL as an integral part in nursing curriculum. The findings of this study may also be helpful for teachers to adopt PBL as effective instructional method for teaching undergraduate nursing

students in addition to be utilized in planning curricula for Generic B.Sc. nursing students

This study has proved the PBL's effectiveness in increasing the knowledge of nursing students. The literature review, results and discussion have ascertained that PBL is the only effective method for teaching and learning which can be implemented in all the nursing colleges and institutions to develop and enhance their knowledge and practice keeping its merits in view. This study is also a contribution to literature about PBL in local scenario. This study has used pre-test and post-test research method that can be a baseline for further studies in Pakistan. Moreover, such types of research may be carried out among the different nursing groups in all other nursing institutes of Pakistan addressing different facets of PBL, and using other research methods to identify the benefits of PBL for students.

The findings of this study may be used by administrators, educational planners, policy makers, nursing councils, and other stakeholders in developing strategic policies for the effective implementation of PBL in the setup of nursing education in Pakistan. Moreover, the institutes imparting education to the nurses can use the outcomes to organize PBL-based short courses to develop knowledge, skills and clinical practices of nurses.

Different orientation programs like seminars, discussions, etc. are required to be organized in educational institutes depending on the availability of resources for the purpose of awareness. Such exposures can enhance the cognitive, affective, and psychomotor skills of the participants and help them to become independent lifelong learners, self-directors, critical thinkers, good decision makers, and improve the quality of education.

Conclusions:

The present study concludes that the intervention of PBL method has significantly improved more knowledge of the participants of experimental group than the members of LBL. It reflects that PBL is a more important and effective teaching method in developing knowledge of nursing students than lecture method.

Ethical Approval: Given

Conflict of Interest: The authors declare no conflict of interest.

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