

# A Quantitative Assessment on The Application of Problem Based Learning to The Teaching of Pharmaceutical Analysis for Pharm D Students

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## ABSTRACT

Problem-based learning is an unknownst educational pedagogy that challenges students with problems to provide a stimulus for learning, focused on self-directed, cognitive active learning. The present objective of the study was to establish an aggressive problem-based learning format for pharmaceutical analysis and assess the impact of problem-based learning on the learning behavior, including knowledge, skill and attitude of the students, who are studying in third year of Doctor of Pharmacy. Problem based learning is an important approach to education that involves challenging students with problems from practice which provide a stimulus for learning. In this type of educational format, students were work in groups and their performance were assessed by the facilitators who were the faculty members with varying teaching experience and qualification. Standard questionnaires were used for the assessments of students by the facilitators. Bar charts were used to represent the data for easy understanding and comparison.

Pre and post tests were administered with Multiple Choice Questions (MCQ) to assess the improvement in the overall knowledge in problem-based learning in a specific content area. The study showed positive impact on the learning behavior i.e. knowledge, skill and attitude of students. Baseline and end problem-based learning assessment by facilitators showed improvement in student's knowledge, skill and attitude. Pre and posttest on the problem-based learning topics showed significant improvement in the students learning behavior. Most of the students showed an increase in motivation to learn and interest in the subject, and the quality of the work was very high. But challenges to the implementation of problem-based learning include time issues, group-related issues, variability among facilitators, student evaluation and faculty acceptance and training. Certainly, in future problem-based learning will deserve a place in teaching than traditional teaching.

## Introduction

Problem Based Learning (PBL) was first introduced at McMaster University in Canada by Barrows [1]. At present, it is frequently used in medical schools in worldwide [2]. It is also used in physiotherapy, nursing and occupational therapy. Now-a-days, some PBL sessions are included in pharmacy curriculum in UK to promote the thinking ability of pharmacy students [3,4]. Ghulam Dastgeer, conducted a study on improving english writing skill by PBL. He found that PBL was more effective teaching than conventional lecture method

for improving English writing skill of secondary level students [5]. According to Boud and Feletti, learning starts when the problem arises, in this problems act as the context and driving force for learning. Similarly, learning in practice starts when a pharmacist is faced with a new challenge [6]. The "McMaster philosophy" for PBL was popularised in medical education by the work of Neufeld and Barrows [7]. Macdonald and Savin-Baden described that specific methods for assessment designed for PBL such as "tripartite assessment", the "triple jump" and the "patchwork text" [8].

Candy, Philip C. has written a book named *Self-direction for lifelong learning: a comprehensive guide to theory and practice* it demonstrates that Problem-based learning gives emphasis to lifelong learning by developing in students the potential to determine their own goals, locate appropriate resources for learning and assume responsibility for what they need to know [9]. Traditional education or conventional education focuses on individual student needs and self-control. It is a traditional teacher-centered method, focused on note learning and memorization must be abandoned in favor of student-centered and task-based approaches to learning. The PBL is student-centered and social. Participation assists not only the individual student's learning, but also, ideally, the learning of others in the group. The tutor acts as facilitator and so PBL allows students to take responsibility for their own learning by making a topic their own, integrating existing and newly-acquired knowledge and resolving a problem. PBL, therefore, fosters independent learning, critical thinking, a deeper understanding of material rather than a mere superficial coverage [10-12].

## Methodology

To establish an aggressive PBL format and to assess the impact of problem-solving skills and PBL behavior the following approaches were adopted in students pursuing third year Doctor of Pharmacy course. A group of 20 students were divided into 5 groups and a pre and post PBL sessions were conducted on the topics Gel Electrophoresis and UV-VISIBLE Spectrophotometry by the facilitator. A panel of 15 MCQs was prepared on the respective topics and the pre-existing knowledge, skills, and attitude of the students were assessed in 3 sessions. Each session lasted for 2 hours and a 2-3 days gap was given for self-study, library and preparation sessions. In order to assess the prior knowledge, pre-tests were conducted before the first session and post tests were conducted at the end of third session. In session 1, brain storming activity and Students Centered Learning Objective (SCLO) was performed. In brain storming activity, a group creativity technique was involved where the students in groups generate ideas and solutions by removing inhibitions. All the ideas were noted down and were not criticized and after brain storming session, the ideas were evaluated. In student centered learning, the facilitator was the primary source of knowledge whereas the students take a very receptive role. It focuses on the skills and practices that enable independent problem-solving abilities. In second session, the learning was based on sharing the notes and team-based discussions on the topics provided. Few books and references were suggested for the students. In session 3, presentations from each group were performed which was being monitored by the facilitator. Only selected student from each group was performed a presentation to share the information amongst all the students.

In post PBL testing standard questionnaires were prepared by the facilitator and the students were assessed again based on knowledge, attitude, and skill. The evaluation of pre and post PBL testing was done on the basis of a 5-point scale and a statistical analysis was done based on the values, marks given as 5- Excellent,

4-Very good, 3- Good, 2- Satisfactory, 1- Not satisfactory. Bar charts were prepared for both for pre and post data analysis for easy understanding and comparison.

## Results and Discussion

Pharmacy students need to be equipped with problem solving and critical thinking skills in order to be competent in providing pharmaceutical care to the patients. Hence, the impact of the PBL exercises needed to be evaluated to find out its present and future value as a part of the pharmaceutical analysis curriculum for Pharm D students. Student evaluation was done by means of a pre and post-topic survey that also included an individual self-assessment exercise. Academic staff members opinions were canvassed. The PBL project was favorably received by all concern. The reflections of the people concerned with this PBL are summarized below.

### The Facilitator

The timing of the task and its process had to be carefully planned around other subject requirements. The tutor met routinely with each group to ensure that everyone understood the nature of the topic and to monitor the group activities, and on request, for guidance. The tutor had many roles, once the task was in progress. The activity included: encouraging the application of prior knowledge; providing constructive criticism; facilitating the group process; assessing the adequacy of information sources; initiating evaluation; helping the learning synthesis

### The Student

The impact and the success of PBL must be evaluated to determine its value in the Pharm D curriculum. In the 1st session, students were able to discuss and decide the student-centered learning objectives which enabled them to generate their own ideas. This is the fundamental need in PBL which was satisfactorily accomplished. Here students were given more time and encouraged to self-assess. This reflected on their involvement in the group and contribution to the task. Students were also asked to evaluate the process of PBL. Most of the students were enjoyed working as part of a team with satisfaction on completion of the task. Some students were not involved much in the learning task. This indicated the need for a more guidance and care from the facilitators. Moreover, the students were able to find significant information reasonably easily. Students prefer individual marks rather than the allocation of a group mark. To satisfy the students, each student submitted an individual report, for which they were given an individual mark. Although results were not statistically analyzed, the students were, on average, in close agreement with the tutor as to the merits of each group presentation. Overall scores were very similar although differences became more noticeable when individual criteria were examined. Baseline and end PBL evaluation showed marked improvement in all the aspects of learning such as knowledge, skill and attitude as indicated in charts Figure 1. Initially the performance of the students was average but after PBL sessions had marked improvement in the performance of the students.



**Figure 1:** Comparison of knowledge, skill and attitude for III Pharm D students.  
Note: \*Series 1, 2 and 3 represents session 1, 2 and 3, respectively.

In future PBL task could be extended to apply for clinical case studies in India. Moderations may be needed to manage with variations in number of students. This may be possible if more staff members with adequate knowledge and actively to participate with PBL process.

### Conclusion

To recapitulate the result of studies, especially in pharmaceutical analysis education, PBL style could be considered because it is an interesting way of teaching and assessing students. But it is a big task to develop and apply the PBL process according to the motivational differences of students. In order to run PBL model, it is very important to be well organized. It is also essential to plan and select the topic, prepare model questions and answers as well as evaluation sheets well in advance. The main advantage that students really develop the behavioral learning about how to implement plans, lead teams, resolve conflict, and communicate with multiple constituencies in case studies during the curriculum and as a Pharm D professional in various pharmacy and clinical fields.

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