

## **Problem based learning - An approach to learning pharmacology in medical school**

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### **Abstract**

**Problem based learning (PBL) is an approach to professional education that has been adopted in higher education in various countries. But in India, PBL is still not included in the curriculum in many medical schools. Our aim is to study the changing pattern of learning approaches to pharmacology adopting PBL by undergraduate students of an Indian medical school.**

**Medical students(n= 143) at Melaka Manipal Medical College undertake a 12 week learning block of general pharmacology, Chemotherapy and blood and 10 week block of CNS, ANS , Skin, musculoskeletal pharmacology in the first semester of second year. During this period only the regular didactic lectures and self directed study were included in the curriculum. With the intention of enhancing the use of deep approach and decreasing the surface and strategic approaches to learning, PBL was incorporated in the 3<sup>rd</sup> and 4<sup>th</sup> blocks (10 and 8 wks respectively). The Short Inventory of Approaches to Learning (SIAL) was used to assess the impact of PBL after 2<sup>nd</sup> and 4<sup>th</sup> block.**

**The PBL has positively affected the learning approaches of the students as measured by the SIAL. After incorporation of PBL, there was an increase in deep learning and surface learning showed a decrease.**

**There was increase in deep approach to learning in pharmacology after the introduction of PBL in the curriculum. It made the students to know the need for learning, motivated them towards the deep learning which can make them better clinicians in future. Hence PBL should be an integral part of medical curriculum.**

**Key words:** Learning approach, PBL, medical students

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### **Introduction**

Learning approaches are classified into three categories namely surface approach, deep and achieving approach [1-3]. In surface approach, intention is to avoid failures through focusing on specific details and rehearsing and reproducing it. It is the commonly used approach and is adequate for success at primary and secondary school level [4-7]. Overload of work, assessment processes which mainly require reproduction of the content, poor teaching, poor student teacher interpersonal relationships and lack of opportunity for self management may lead to surface learning. In deep approach intention is to understand the material by using strategies like reading in detail, discussion etc. Interest in the subject matter and intention to

correlate it with the relevant experience is the stimulus for deep study [8]. Deep approach helps to remember the facts better compared to surface approach [9].

Intention in achieving approach is to excel by using highly organized learning methods. Problem based learning (PBL) is one of the deep approach methods, used by many medical schools as either a full-time curriculum or an addition to a traditional curriculum [10-13]. The reasons for adopting PBL in the medical curriculum are many, a need for professionals to fulfill the needs of the community, perceived deficiencies in 'traditional' professional education, a need to cope with the demands of the information explosion in many areas of professional knowledge, the need for professionals to be able to adapt

to challenge and communicate effectively and the need to acquire the skills for lifelong learning etc. The effects of PBL are examined using frameworks derived from theories of expertise and PBL's goals. The aim of this study is to compare the impact of PBL as a learning tool with the traditional didactic teaching approach.

## Methodology

The study was conducted in Melaka Manipal Medical College, Manipal on students studying pharmacology in the year of 2006-2007 (Batch 2005). The institutional ethics committee approved the study. Pharmacology is taught over a period of 40 wks, is divided into four blocks. The topics covered in these blocks and duration of each block are shown in the Table 1. In the first two blocks, students were exposed to didactic and self directed learning sessions. Problem based learning was incorporated in the curriculum in the 3<sup>rd</sup> and 4<sup>th</sup> block (after second block) along with didactic and self directed learning. In PBL, students learn in small groups in the context of authentic clinically oriented problems in relation to pharmacology. Initially the problem will be discussed in brainstorming session to identify unknown terminologies and issues, frame hypothesis and to list the learning objectives. In the presentation session i.e. after a gap of one week, each student will present a small topic and finally solve the problem. The expected outcome of medical education is to move students along the path from naive laypersons to novice physicians, the effects of these approaches should be understood in terms of how they affect the early acquisition of cognitive skill. The performance of the students in the first two blocks, which is in the pre PBL phase, was compared with that in the post PBL phase.

We used a 'Short Inventory of Approaches to Learning' (SIAL) to analyze the effect of PBL on learning process in our students. SIAL is a technique derived from cognitive science research. It consists of 51 items, 10 of which were drawn from the revised approaches to studying inventory [14] and 41 items from the approaches to learning inventory [15]. The 51 items of SIAL were grouped under 14 subscales, which again were grouped under 3 scales: surface, deep, and strategic approaches which measures the same in test population. SIAL had been proven to have reasonable reliability and internal consistency [16]. Its test retest reliability was obtained by giving the questionnaire to group of students (20) on two different occasions with the interval of 6 weeks. The Cronbach's  $\alpha$  error was 0.65.

SIAL was administered to all the students of the batch ( $n = 143$ ) at the end of the second and fourth block. All student studied pharmacology during Aug 2006- July 2007 were included in the study as PBL accounted for 5% of

their internal assessment. There were no exclusion criteria as no student had prior exposure to this type in preclinical subjects.

Students were asked to complete the inventory on the spot and were assured about the confidentiality of their responses. The students feedback regarding the post PBL through SIAL was obtained immediately after the compulsory PBL session. We collected the feedback of pre PBL (1<sup>st</sup> & 2<sup>nd</sup> block) session on the reopening day of 3<sup>rd</sup> block, which is compulsory.

Students were asked to respond to each item on a 4-point scale (where 4 = strongly agree, 3 = agree, 2 = disagree, and 1 = strongly disagree) indicating the degree to which the statement was true for them. The time limit for the questionnaire was 30 min. Mean scores of items of surface, deep, and strategic approaches of students during prePBL phase (end of 2<sup>nd</sup> block) and postPBL phase (end of 4<sup>th</sup> block) were compared. Mean SIAL scores of prePBL and postPBL phase were compared using an independent samples test. The data was analyzed with SPSS statistical package.

## Results

Mean SIAL scores for surface, deep, and strategic approaches are shown in Table 2. Scores for deep approach of students in postPBL phase (3<sup>rd</sup> and 4<sup>th</sup> blocks) was found to be significantly higher compared with prePBL phase (1<sup>st</sup> and 2<sup>nd</sup> blocks). The scores for the surface and strategic approaches did not differ significantly between the two phases even though there was small change. We found no statistically significant differences among the three approaches for the prePBL phase.

**Table 1:. Teaching schedule of Pharmacology**

Block 1 12 wks (prePBL)	General Pharmacology Chemotherapy Blood Immunopharmacology
Block 2 10 wks (prePBL)	ANS pharmacology CNS pharmacology Skin, muscle, bones and joints
Block 3 10 wks (postPBL)	GIT Respiratory system
Block 4 8 wks (post PBL)	Endocrines Water and electrolytes

**Table 2: Average scores of SIAL scales of prePBL and postPBL, expressed as Mean±SD**

Scales	nonPBL	PBL	P Value	
Surface approach		2.6±0.2	2.5 ±0.8	0.423
Deep approach		2.3 ±0.7	2.5±0.7	0.01*
Strategic approach	ap-	2.5 ±0.6	2.6±0.6	0.15

\*P values are significant at the 0.05 level (n=143)

### Discussion

In 3<sup>rd</sup> and 4<sup>th</sup> block (PBL period), students generated SIAL scores in deep approach imply more accurate, coherent, and comprehensive knowledge than in the prePBL phase. They transferred the reasoning strategies that they were taught and were more likely to use logical concepts in their explanations. This effect is stronger in the students during postPBL phase. The results clearly demonstrate stronger benefits of PBL in learning such as an enhancement in academic locus, triggered motivation, achieving strategy, deep approaches and deep achieving approach to learning for the whole group. The results suggest that there are important cognitive benefits of the PBL approach. PBL provides motivation for self directed learning offers an opportunity to work in groups and helps to develop problem solving skills [17,18]. PBL approach enhances clinical competence ,interpersonal relations and self directed learning [19].PBL differs from conventional teaching as it involves the use of real or simulated clinical problems as a stimulus to learning. The success of PBL block was also contributed to the topic or the ‘problem’ that is being discussed. The endocrine system such as thyroid gland problems ,bronchial asthma and other respiratory problems are more amenable to PBL[20].The other reason for the positive impact could be the introduction of clinical aspect along with basic sciences made the students feel like ‘real doctors’. Studies have shown that basic science learning is more efficient through the PBL approach [19,21]. SIAL scores of prePBL were low in deep approach which reflects rigid structure of conventional didactic lectures: poor interaction between students and teacher, lack of group discussion.

The only problem encountered in conducting PBL was that it was consuming more time, topic which could be covered in three one-hour lectures, took one full week. The same opinion is expressed by O’Hanlon *et al* [22]. Also more teachers were needed as the students were divided in small batches. Along with time constraints, poor student motiva-

tion, evaluation problems, concerns about student-directed learning and a lack of structure coupled with loss of faculty control were also the problems encountered. These problems can be solved by extensively training the staff in conducting PBL. Introduction of PBL in conventional medical curriculum encourages both the teachers and students to experiment with a new approach to learning. Eventhough the process looks difficult, it is feasible and beneficial to students as well as to teachers. The increase in score (deep) and decrease (superficial) in postPBL session could be due to the experience gained during this period which made the student to adapt deep approach.

### Conclusion

PBL should be an integral part of the curriculum as it acknowledges the possibility of prior knowledge (whether subject-specific or not) held by the learner. It motivates to acquire further knowledge on a 'need to know' basis. It enables the learner to realize their own learning needs. Knowledge gained is fed back into the problem in an interactive loop. One advantage of this approach is increased motivation, learners learn because they are interested. More importantly, the way in which knowledge is acquired in PBL; links are provided with experience which help in future recall. So sincere effort has to be made to overcome all the barriers in the implementation of PBL and it has to be made a part of our medical curriculum.

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