

Problem Based Learning in Medical Education

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INTRODUCTION

Problem based learning is used in many medical schools in the United Kingdom and worldwide. This article describes this method of learning and teaching in small groups and explains why it has had an important impact on medical education.¹

Problem based learning (PBL) was originally introduced in the Medical School at Mc-Master University in Canada in the late 1960s and is now a common curriculum component in medical and health science schools around the world.¹⁻³ PBL has become an increasingly popular alternative in medical education and literature is replete with its many benefits; like its ability to foster early acquisition of cognitive skills and encourage deep learning in students.⁴⁻⁷ It is also found to be beneficial in increasing the level of motivation by helping to develop self directed learning skills that last for whole careers and increasing intrinsic interest in the subject of study.⁸⁻¹²

ABSTRACT

Problem based learning, originally introduced in the Medical School at Mc-Master University in Canada in the late 1960s, and is now being used as a learning method in many medical schools in the United Kingdom and worldwide. Problem based learning have been adapted in many medical colleges of Nepal be used either as the mainstay of an entire curriculum or for the delivery of individual courses. Institution of Medicine, Tribhuvan University in 1980, BP Koirala Institute of Health Sciences at Dharan in 1999, KUSMS with the great support of faculties from Harvard University in 2001, Patan Academy of Health Sciences (PAHS), and lately all the affiliated medical colleges of Kathmandu University have adapted Problem based learning

KEY WORDS

Medical Education, PBL

Distinguishing characteristics of PBL are: the inclusion of a problem or 'trigger', which a small group of learners aims to 'solve'; its learner-centredness; and its reliance on dialogic and collaborative learning.^{13,14} The rationale for the PBL approach in medicine and the health sciences is that its emphasis on real world problem solving develops student's capacity for clinical reasoning, and that it facilitates acquisition of both basic and clinical sciences in a way that enables retention and transfer to clinical tasks.¹⁵

A brief history of PBL adapted by medical institutions in Nepal

Institution of Medicine, Tribhuvan University, was the first institution in Nepal which had adapted PBL in 1980 with integrated Medical Basic Sciences. Though initially two cases of PBL were discussed for each of the two years of MBBS this figure was reduced to one case per year over the course of one week. The next institution in Nepal to come

forward for implementation of PBL was BP Koirala Institute of Health Sciences (BPKIHS) at Dharan in 1998. Currently more than twelve PBL themes, each of one week duration, are organized during the course of two years of phase one of the MBBS course.¹⁶

PBL was introduced from the first batch MBBS student in KUSMS with the great support of faculties from Harvard University in 2001. Since the inception of the medical program, KUSMS has been having problem based learning academic program in the pre-clinical sciences (i.e., the first two years) of MBBS course. In the pre-clinical sciences, approximately one third of the total academic hours for about forty cases are covered by problem based learning.

Patan Academy of Health Sciences (PAHS) started the implementation of PBL with almost a decade of preparation. It has now three batches of sixty each in its course of five years duration. A total of 33 cases are covered in the first year and 33 in the second year. All the few basic sciences and the clinical science teachers are involved.¹⁶

What is problem based learning (PBL)?

"A learning method based on the principle of using problems as a starting point for the acquisition and integration of new knowledge."¹⁷ Problem Based Learning (PBL) is a method of learning in which students first encounter a problem, followed by a student-centered inquiry process.¹⁸⁻²¹ During the past few decades, many medical schools have changed over to a problem based learning curriculum.²² PBL is characterized by individualizing learning needs of students, improving motivation for learning, and stimulating the integration of knowledge with formative evaluations.²³ PBL requires a shift to a learner-centered, inquiry based environment for the students.¹

Both content and the process of learning are emphasized in PBL. Many variants of PBL have evolved during the past 40 years and yet its essential elements have remained relatively constant. Axiomatic to PBL is that the problem comes first without advance readings, lectures, or preparation, serving as a stimulus for the need to know. Typically, five to eight students work collaboratively in a group, together with one or more faculty facilitators or tutors, to identify and define problems, develop hypotheses to explain the problems, and explore preexisting knowledge relevant to the issues. Students determine and explore what they already know and what they need to learn in order to advance their understanding of the problems. Key elements of PBL are the formulation of questions that can be explored and answered through systematic, self-directed inquiry and the testing and revision of hypotheses through the application of newly acquired knowledge. Active discussion and analysis of problems, hypotheses, mechanisms, and learning issues among students are essential to this process, enabling students to acquire and apply content knowledge and to learn and practice both individual and group communication skills critical to learning and teaching.

In problem based learning (PBL) students use "triggers" from the problem case or scenario to define their learning objectives. Subsequently they do independent, self directed study before returning to the group to discuss and refine their acquired knowledge. Thus, PBL is not about problem solving per se, but rather it uses appropriate problems to increase knowledge and understanding. Group learning facilitates not only the acquisition of knowledge but also several other desirable attributes, such as communication skills, teamwork, problem solving, independent responsibility for learning, sharing information, and respect for others. PBL can therefore be thought of as a small group teaching method that combines the acquisition of knowledge with the development of generic skills and attitudes. Presentation of clinical material as the stimulus for learning enables students to understand the relevance of underlying scientific knowledge and principles in clinical practice. However, when PBL is introduced into a curriculum, several other issues for curriculum design and implementation need to be tackled. PBL is generally introduced in the context of a defined core curriculum and integration of basic and clinical sciences. It has implications for staffing and learning resources and demands a different approach to timetabling, workload, and assessment. PBL is often used to deliver core material in nonclinical parts of the curriculum.

PBL in curriculum design

PBL may be used either as the mainstay of an entire curriculum or for the delivery of individual courses. In practice, PBL is usually part of an integrated curriculum using a systems based approach, with nonclinical material delivered in the context of clinical practice. A module or short course can be designed to include mixed teaching methods (including PBL) to achieve the learning outcomes in knowledge, skills, and attitudes. A small number of lectures may be desirable to introduce topics or provide an overview of difficult subject material in conjunction with the PBL scenarios. Sufficient time should be allowed each week for students to do the self directed learning required for PBL.²⁴

The way we do PBL in KUSMS

Components of PBL

There are five components of perfect PBL

- PBL cases
- PBL group
- PBL session
- PBL study session
- Wrap- up session

PBL cases

Problems (sometimes referred to as cases) are created/ selected by the faculty to represent important priority

health problems of the region as well as prototypical situations and knowledge domains.^{25,26} The format of the problem simulates professional practice or a real life situation and can involve a real or standardized patient or a paper case. Faculty or Tutor should prepare a clinical based case which provides highest yield of basic concept. The case should be discussed among faculty members and finalized of case and distribution to each tutor and co-tutor. Tutor guide is provided with each case. In average there are three cases for 4 – 5 weeks system (block) and four to five cases for 6 – 8 weeks system (block).

Other forms of media such as video, the Internet, and digitalized computer applications allows for even more variability in format. Problems cannot be solved easily at first glance or with only the initial information presented. The case is constructed so that as students explore what they know it becomes evident to them that they do not have enough information to decide among the hypotheses they have developed, and their need for additional information becomes imperative.

Characteristics of PBL Cases

- Relevant, realistic & logical
- Not too complex
- Cases are characterized by “progressive disclosure”
- Story unfolds, step-by-step
- Narrative provokes discussion leading to next step

How to create effective PBL scenarios²⁷

- Learning objectives likely to be defined by the students after studying the scenario should be consistent with the faculty learning objectives.
- Problems should be appropriate to the stage of the curriculum and the level of the students’ understanding.
- Scenarios should have sufficient intrinsic interest for the students or relevance to future practice.
- Basic science should be presented in the context of a clinical scenario to encourage integration of knowledge.
- Scenarios should contain cues to stimulate discussion and encourage students to seek explanations for the issues presented.
- The problem should be sufficiently open, so that discussion is not curtailed too early in the process.
- Scenarios should promote participation by the students in seeking information from various learning resources.

PBL group division:

Medical schools are increasingly changing over to a problem-based system of learning. Students work in a small group to analyze a well-structured, clinically relevant patient case. Problem Based Learning (PBL) provides a logical approach in training students for practicing

medicine in a complex environment by exposing them to simulated problems which may reflect real life situations.²⁸ An ideal PBL group is around 6-8 students and any more than 12 students become unmanageable. In KUSMS; Each PBL group has 10 students among them one student will be chair-person and one student will be a scribe. Each group will have one Tutor and one Co-tutor. Each group comprises of at least one tutor, who is generally a MBBS doctor.

PBL Session

To allocate total time of two hours for each PBL session and three times in a week on alternate day.

- 1st day
 - o Past learning issue
 - o New case discussion
- Last 10 minutes
 - o Feed back
- Read the case
- What do you know about this scenario?
- What do you need to know?
- Discuss and list learning issues
- Discuss and list potential sources of information
- Organize who (theoretically) will do what
- Evaluate how you performed as a group

How do we learn from PBL?

Principles & Process

Principle

PBL is

NOT a “Teaching Method”

BUT a “Learning Process.”

So,

Teachers DO NOT teach,

Students LEARN by themselves

Process

“Problems” as Primary Source of Learning

Tutorial Group Setting

Student-Directed Study

Characteristics of the PBL process

- Based on clinical and relevant cases
- “Progressive disclosure” of case
- “Cold approach” to the first tutorial
- Learning issues determined by learners
- “Open-ended” sessions to allow learning in the interval

- Tutor as “process manager” not necessarily an “expert”, except in the process.

Seven Jumps in PBL¹

Step-1: Identify and clarify unfamiliar terms

Step-2: Define the problems

Step-3: Analyze the problems & explain the underline causes

Step-4: Summarize and discuss the analysis

Step-5: Formulate Learning objectives

Step-6: Self Study based on objectives formulates in step 5

Step-7: Report back to group and discuss

PBL study session

After each PBL session, two hour PBL preparation (study) time is allotted. The students are supposed to use this time and also other time for the preparation related to problem based learning. During study session, students should use available resources with students, available books in library, Journals, Internet resources and Researches.

Wrap up

- At the end of each block:

o Wrap-up session for one hour.

- In wrap-up:

o Students select and present different topics related to the PBL case which are made in their learning objective during PBL session.

- All faculties member should present in Wrap-up session.

Role of tutor:

PBL requires a major shift in the way teachers deal with students, The ‘knowledgeable’ teacher is no longer dominating learning and students and teachers become equal partners in the learning process. The teacher stops lecturing and starts asking questions (Hogerzeil, 2001).²⁹ In a PBL course, teachers should encourage critical thinking, foster self directed learning and curiosity, monitor group progress, promote teamwork and create conducive learning environment (Wilkerson, 1998).³⁰

- To study the curriculum thoroughly for the block
- To prepare the PBL cases
- To facilitate the active participation of students of each groups.
- To keep records of students attendance.
- To keep records of feedback of students regarding the PBL session
- To keep records of role of Tutor/Co-tutor and as well as students
- To conduct the wrap-up session

- Not a teacher

Characteristics of a good PBL student

- Prompt and present for all sessions
- A knowledge of the process of PBL
- Commitment to self/student-directed learning
- Active participation in discussion and critical thinking while contributing to a friendly, non-intimidating environment
- Willingness to make constructive evaluation of self, group and tutor

Characteristics of a good PBL tutor

- A knowledge of the process of PBL
- Commitment to student-directed learning
- Ability to generate a non-threatening environment while still acting to promote discussion and critical thinking
- Willingness to make constructive evaluation of student and group performance

Advantages of PBL

- Learning and teaching enjoyable for students and teachers.
- Learning environment more stimulating and humane.
- Promotes interaction and interdepartmental collaboration
- Promotes deeper learning
- Tutors make or break PBL
- Increased student-staff relationship

Disadvantages of PBL

- Higher costs in resources; staff time- costly with start up and maintenance.
- Stressful for staff and students familiarization.
- Less knowledge of pre-clinical sciences.
- Implementation difficulty when class size is large or lack of enthusiasm of idea.
- PBL curriculum covers about 80% of same curriculum as done with traditional curriculum in the same period.
- Need for tutorial set ups.

Problems with PBL in hybrid curricula

- Finding enough tutors - 1 for each 6 students.
- Faculty busy with “traditional” curriculum.
- The range of topics which can be discussed is a limiting factor - quality control is difficult.
- Heavy on library and computer resources.
- Objective evaluation of PBL is difficult.
- Inherent conflict with lectures - waste of time.

EVALUATION

- Evaluation of Learner by Oneself
- Evaluation of Learner by Tutor
- Evaluation of Learner by PBL-Log Book
- Evaluation of Tutor by Oneself
- Evaluation of Tutor by Learner
- Evaluation by PBL-Based Questions in Block Exam

- Evaluation by PBL-Based Questions in Block Exam

CONCLUSION

Students' determination of their own "level of ignorance" (Learning Issues/Objectives) is fundamental to PBL.

The facilitator is to prompt, guide and question, when necessary and to ensure that predetermined learning issues (tutor guide) are identified, researched and discussed.

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