

Problem based learning in Medical education- A review

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ABSTRACT

Problem Based Learning is an innovative instructional method in which a problem forms the basis of learning. It was brought to the foreground in the 1960s by McMaster University, Canada. Since then, PBL has been implemented as teaching method in some of the most reputed institutes around the globe. It emphasizes on self directed learning, and allows students to tackle topics as puzzles, or clinical situations. In India, the MCI has shown support for PBL, and many institutions have sought to include it in their curriculum. PBL is gaining popularity due to its significant advantages such as student centric learning, enhanced motivation to learn, with an interdisciplinary integration of knowledge.

Introduction

Problem based learning (PBL) has been defined as an educational method which uses carefully constructed clinical problems as a context for students to learn problem solving skills and acquire knowledge about the basic and clinical sciences.¹ McMaster University, pioneers in the problem based learning (PBL) approach, describes PBL as “a pedagogical approach, which uses cases, and problems as the starting point for acquiring the desired learning objectives”.² PBL is also stated to be an educational format that is centered on the discussion and learning that emanates from a clinically based problem.³

It involves the use of clinical problems to motivate students to identify and apply research concepts and information to realistic situations, work collaboratively, and communicate effectively.⁴ PBL is student-centered, encouraging students to become more thoughtful problem-solvers. It promotes life-long habits of active learning: the most effective technique for learning, applying, integrating, and retaining information. It is now a well-established method of facilitating basic science education intended for clinical application.^{5,6}

Overall, it can be said to promote self-directed learning.

Traditional medical curricula which stresses on conservative lecturing and memory based learning, is passé. From its uncertain beginnings around 40 years as a novel teaching strategy in a few established medical schools worldwide, PBL has become relatively mainstream, though not in India.

History

The idea of problem based learning came from Case

Western Reserve University in the mid-1950s.⁷⁻⁹ It was disseminated due to the work of Harold Barrows, a professor at McMaster University, Canada, over the late 1960s.¹⁰⁻¹² In 1974, The Maastricht University became the first in Europe to integrate PBL into course work. At the turn of the 20th century, nearly 150 medical schools worldwide (around 10% of the total number present) had integrated problem-based learning into their curricula.¹³

Process

PBL places emphasis not only on the content of what is to be learned, but also the learning process.¹⁴

There are some essential components of PBL which are as follows:¹⁵⁻¹⁹

- (i) There is a **problem** which acts as a “trigger” for the session
- (ii) **Participants** (students) have discussions in **small groups** for a period of time.
- (iii) A **tutor** guides the learning process, which occurs through PBL sessions
- (iv) **Lectures** are reduced and only form a part the curriculum.
- (v) **Self-initiated** learning is encouraged
- (vi) **Self-study** is an crucial part of the process

The Maastricht University formulated the “seven jump” sequence which is a chief method to execute PBL sessions. The steps in this sequence are as follows:

1. Clarify and agree working definitions and unclear terms and concepts.
2. Define the problems; agree which phenomena need explanation.

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3. Analyze the problem (brainstorm)
4. Arrange possible explanations and working hypotheses
5. Generate and prioritize learning objectives
6. Research the learning objectives
7. Report back, synthesise explanations, and apply newly acquired information to the problem.¹⁵⁻¹⁹

An important aspect of the PBL is teaching basic sciences in the context of a clinical problem, whether real or hypothetical. This serves two goals: to make knowledge more relevant and retrievable, and to foster the development of specific reasoning.²⁰

In PBL, learners come across a problem and make an effort to solve it with information they already possess allowing them to understand what they already know. They also identify what they need to learn to better appreciate the problem and how to resolve it.

Once they have worked with the problem as far as possible and identified what they need to learn, the learners engage in self-directed study to research the information needed finding and using a variety of information resources (books, journals, reports, online information, and a variety of people with appropriate areas of expertise). In this way learning is personalized to the needs and learning styles of the individual.

The learners then return to the problem and apply what they learned to their work with the problem in order to more fully understand and resolve the problem.

After they have finished their problem work the learners assess themselves and each other to develop skills in self-assessment and the constructive assessment of peers. Self-assessment is a skill essential to effective independent learning.

The responsibility of the teacher in PBL is to provide the educational materials and guidance that facilitate learning. The principle role of the teacher in PBL is that of a facilitator or educational coach (often referred to in jargon of PBL as a "tutor") guiding the learners in the PBL process. As learners become more proficient in the PBL learning process the tutor becomes less active.

<http://www.queensu.ca/ctl/resources/topicspecific/problembased.html>

Objectives :

1. Develop an ability to identify relevant health problems that warrant further discussion or self-study within the context of a clinical scenario present as a "patient problem"
2. Develop an appreciation for the interrelated nature of the physical, biological and behavioral mechanisms that must be considered with each

health problem during the process of generating a management plan.

3. Develop the knowledge base necessary to define and manage the health problems of patients, including the physical, emotional and social aspects, within the context of effective health care provision within the society
4. Reinforce the development of an effective clinical reasoning process including the skills of problem synthesis, hypothesis generation, critical appraisal of available information, data analysis and decision making.
5. Cultivate the skills necessary to become self directed as a learner, acknowledging personal educational needs and those of group members, and making effective use of available learning resources.
6. Function effectively as an active participant within a small group engaged in learning and the provision of health care.
7. Recognize, develop and maintain the personal characteristics and attitudes necessary for a career in the health professions including the following:
 - Awareness of personal assets, limitations and emotional reactions
 - Responsibility and dependability
 - Ability to relate to, and show concern for other individuals and
 - The evaluation of personal progress, that of other group members and the group process itself.

Indian Scenario

Medical Education in India still follows the traditional pattern with efforts by some progressive institutes to pursue newer options.²³ Medical schools in the country have not yet permanently adopted PBL into their syllabi.²²

The Medical Council of India, driven by the observation of a gap between the qualitative and quantitative advancement in medical education and achievements in the field of health care, adopted the "Regulations on Graduate Medical Education, 1997". It endorses a teaching methodology in which emphasis is placed on encouraging integrated teaching. Traditional teaching is carried out with a PBL approach. There is a reduction in compartmentalization of disciplines so as to achieve both horizontal and vertical integration in various stages. MCI encourages integrated teaching using the PBL approach. However, it has not released

any mandatory guidelines regarding the same.²⁴

However, over the majority of the country, PBL is still at a premature stage.⁵

It is important to keep in mind that the hospital postings faced by students in the clinical stages of MBBS is in fact type of problem-based learning. While observing and interacting with patients, they gain unique insights into the actual problems faced in medical practice, and are introduced to management/care of such situations.

It is encouraging to know that PBL has ventured into several well-known medical schools as a choice. These schools often use it as an aide to traditional lectures, and are experimenting with newer teaching styles.⁴ Not many medical colleges in India have converted to have PBL as the singular teaching method. There are many factors contributing to this such as lack of knowledge regarding PBL and undesirable opinions about the responsibility of a teacher in these sessions.²⁵

At present, curricular reforms in undergraduate medical education are being achieved through the introduction of medical education units in various medical colleges over the country. The main aim of these units is to familiarize the faculty with PBL, its advantages, and its efficacy in varied situations in order to develop new teaching styles that encompass the best of both traditional and PBL methods.⁵

Numerous studies on PBL have been conducted in the country. Some of these studies involve conducting PBL sessions and evaluating various aspects of it with pre and post session questionnaires.

One study showed that, with reference to learning efficiency, student-teacher relationships, and understanding principles, neither PBL nor traditional methods held an advantage statistically. However, in this study more students felt that the traditional method was better for understanding principles.⁴

A comparison of the pre- and post-PBL questionnaire showed a clear preference for PBL over the conventional curriculum for the interactive resource sessions and group discussions. Both students and teachers found PBL rewarding.⁶

However, in PBL both the students and teachers form the crux of the learning process and it is necessary for the teachers to be trained and introduced to PBL. Studies have also been conducted to evaluate the response of teachers as tutors in moderating PBL sessions. The workshops have been very helpful to understand the meaning of PBL, steps of PBL, importance of group dynamics and student responsibilities in PBL.⁶

PBL has also been extended to post-graduate education in the country.²⁶

Advantages Of PBL

1. Student Centric Learning

PBL encourages a form of student centric learning in which the students dynamically take part in their own education. In addition to course related knowledge, students practice skills that will urge them to become self-directed learners permanently.²⁷

Student-centred learning is an active process, where the student does “learn to learn” through his own “digging” or study which provides the student to use his “learning relevant to his educational needs, his future career, and his style and manner of learning, and can pace his learning appropriately, according to his ability to learn or understand in any particular area”.²⁸

It gives students the confidence to learn on their own.⁶

2. Personal Factors

PBL has been found to be a more enjoyable form of learning with a greater degree of learning satisfaction as compared to the traditional teaching methods. It has also been found to pique interest in the subject by encouraging students to go beyond books, into the intricacies of the subject matter.²⁹⁻³² However, evidence that PBL enhances motivation towards learning is disputed.^{28,33} Recent studies have shown that PBL definitely provides a stimulus and incentive to learn.⁴

3. Student – teacher interaction

It has been shown that newer teaching learning methods; such as PBL benefit both students and teachers.³⁴

PBL places a more importance on the presence of an informal environment, which is less intimidating for free conversation and flow of thoughts and ideas. The qualities take precedence over subject proficiency and the ability to explain concepts, in the tutor.³⁵

In a PBL setting, the boundaries between the facilitator and student are noticeably reduced, providing opportunities for the student to be empowered in raising pertinent questions challenging existing issues in relation to a PBL problem.³⁶

It has been shown that students guided by subject matter experts achieve better and spend more time on self-directed learning. Mastery over the skill of tutoring is more important.³⁷

4. Team work and Interpersonal skills

PBL being an interactive teaching method, has the additional benefit of imparting skills such as leadership, teamwork and delegation, that are all sought after qualities in the medical profession.³⁸ It has been found to

improve student-student relationships and introduces the concept of teamwork.⁴

5. Integration

PBL facilitates an integrated core curriculum. Basic medical sciences are learned parallel to and always in the background of a clinical situation.²⁷

6. "Deep" learning

PBL fosters deep learning in contrast to the surface learning seen in lecture-based learning. In deep learning students interact with learning materials, relate concepts to everyday activities in order to improve their understanding.^{31,39,40}

7. Problem solving skills

PBL specifically engages students in solving large complex, interdisciplinary problems while emphasizing the need for a deep, conceptual understanding.

The hallmark of any PBL approach is to generate questions in an effort to systematically analyze and solve the problem, and, not unexpectedly, the PBL method of teaching has been shown to be an effective instructional tool to foster critical thinking and problem solving skills among medical students.²⁷

8. Constructivist approach

In this approach, students develop a strong knowledge base on which all other newer concepts are based. As a result, prior knowledge is continuously revised and retained effectively. Compared with conventional instruction, PBL, as suggested by the findings, is more nurturing and enjoyable; PBL graduates perform as well, and sometimes better, on clinical examinations and faculty evaluations; and they are more likely to enter family medicine.²⁹

Disadvantages of PBL

1. Cost

Significant costs are incurred for the setup and continuation of PBL sessions.³³

2. Time

PBL is taxing on staff time and requires more staff to take part in the tutoring sessions. There is a stress on students and faculty until orientation towards the process takes place.⁴¹ PBL often requires a full time involvement. Teacher

3. Resources

The participants require access to libraries, computers and other technologies to facilitate self-learning and preparation for the PBL sessions.¹

4. Convention

Conventional methods of teaching are the mainstay in most institutions. Conversion to PBL requires training

of tutors and numerous modifications, which are often difficult and frustrating. Furthermore, students being introduced to the process may be unsure of what information is significant, and how to go about self-directed study.

5. Class size

PBL is primarily implemented in small group sizes. It is often complicated by the presence of the more prevalent large class sizes seen today.²⁹

6. Curricula

PBL has been found to be an inefficient method of learning. Only 82% of what is covered in traditional curricula can be covered through PBL sessions.²⁹ PBL is found to be less effective for understanding general principles and concepts.⁴ It highlights clinical knowledge, while basic sciences take a backseat. Students are found to perform poorer as compared to those from traditional schools of learning.³²

Conclusion

PBL has been endorsed by bodies such as the World Health Organisation and is increasingly proposed as a solution to both the ills of medical education and new challenges such as clinical governance .

Finally, PBL is a methodology that is rooted in history. Learning through problems has been in existence along with project based learning for years. PBL is the manifestation of collective work done by students to find solutions.

PBL and traditional learning could co-exist and enhance the learning experience. PBL facilitates deeper learning in a non-intimidating environment. Tradition learning is geared more towards acquiring a broader knowledge base. If the knowledge is critically applied to various situations, learning could be integrated harmoniously. This integration not only leads to better learning but also makes for an enjoyable experience.

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