The Why and How of Problem-Based Learning?

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Probably the most important skill that children learn is how to learn. ... Too often we give children answers to remember rather than problems to solve. This is a mistake.

[Roger Lewin](#), American Anthropologist and Writer (1974–)

43.1 Origins of Problem-Based Learning—An Era of Transformation

In 1966, the faculty of medicine at McMaster University started conceptualizing medical education, which subsequently led to the evolution of what is known as ‘*The McMaster Philosophy*’ [1]. Strong emphasis was placed on the discrete capacities of the student physician rather than having a store of knowledge. Dr. Burrows, at McMaster, explored the reasoning capabilities of both medical students and expert practitioners and found that students learned more effectively through problem situations. In 1969, the learning experiences were transformed from traditional, i.e., fact memorization, to problem-based learning at McMaster University [2].

43.2 Why Problem-Based Learning?

Problem-based learning has been popularly used in the medical curriculum with the principal aim to engage the learner in the process of learning by using a problem [3]. It is not simply the opportunity to solve problems, but rather an opportunity where solving problems is the focus or starting point for students’ learning (Fig. 43.1) [4].

The original version of the book was revised: The authors and co-authors have been cited within the chapters. The correction to this book is available at https://doi.org/10.1007/978-981-16-5248-6_49.

Fig. 43.1 Facets of problem-based learning

Advantages of PBL

- The problem is structured around common clinical cases. This adds strong contextual relevance to PBL as the students get the opportunity to apply critical thinking and problem-solving skills to real-life problems. It also eliminates irrelevant information which increases the cognitive load on students [5].

Example: **Part 1**—Mrs. Khan brought her 15-month- old baby to the clinic with a history of recurrent loose stools since the last few months. Every time the child ate, he passed watery, sometimes mucus containing stools. There was no associated history of vomiting or diarrhoea.pause for discussion.....**Part 2**—Mrs Khan is a 30-year old lady. She has 4 children. Her husband works on daily wages. She stitches ladies' dresses at home. They live in a kutch house.....pause for discussion..... **Part 3**—The baby was born by Dai assisted delivery at home at full term. He was breast fed till 8-months and then gradually started on diluted goat milk, rusk and rice. He has not received any vaccination.'

- A well-structured problem facilitates learning critical thinking and problem-solving skills. Working with peers also provides the opportunity to learn the core competencies of teamwork and communication. PBL also serves the purpose to assess the aforementioned competencies.
- PBL rests around the core principles of adult learning. The students take the responsibility for their own learning and progress. This helps in internally motivating them towards the process of learning, having a key impact on metacognition.
- It is a vital education strategy that offers horizontal and vertical integration between various concepts of basic sciences and along with clinical sciences.

43.3 Teaching and Learning: Pedagogy Versus Adult Learning

Roles	Pedagogy	Adult learning
Teacher	<ul style="list-style-type: none">– Seen as an <i>Expert</i>.– Direct the learning (what to learn, how to learn, and when to learn).	<ul style="list-style-type: none">– <i>Facilitates</i> the learning process.– Manages the group dynamics and supports and challenges the student’s learning.
Learner	<ul style="list-style-type: none">– Passive recipient.– Dependent on external motivations(e.g., appreciation).– No prior experience/lacks the support to utilize the past experiences.– The focus is on memorization.	<ul style="list-style-type: none">– Creates the learning experience based on the students’ needs.– Self-directed, responsible for his/her own learning.– Internally motivated.– Rich prior experiences which have a key role in learning.– The focus is on developing concepts.
	<i>Example: Traditional lectures</i>	<i>Example: Problem-based learning</i>

43.3.1 How to Develop PBL?

As problem-based learning revolves around a problem, crafting a good problem is vital to the learning process [6].

Context	Problems simulating real life tend to motivate the learner. The learner invests himself in not only solving the problem but also in the application of concepts to real life.
Learning outcomes	This is the purpose behind the problem, i.e., what do you want your learner to attain out of the whole learning experience. A problem may have one or more learning outcomes, depending upon the duration of PBL.
Prior knowledge	A good case helps the learner to establish new knowledge while stimulating the previous experiences relevant to the same context.
Peer interaction	The learners interact with one another in the quest for a solution. A good case provides an opportunity for discussion, which gives birth to unique ideas.
Gaps and Cues	A good case has pre-identified gaps coupled with thought-provoking cues which prevent the learner to distract from key learning outcomes.

43.4 Characteristics of a Good Case for PBL

A PBL case composed of the following components (Fig. 43.2):

1. Problem—*The Case*

The case is developed by a group of people (content specialist and educational expert). The group discusses the intended learning outcomes (ILOs) and drafts events relevant to each outcome. Real-life facts and evidences available in

Fig. 43.2 The process of problem-based learning

the literature help in creating the ILO and the events. The case has established triggers in the form of patient age, gender, residence, occupation, ethnic background, sociocultural background etc. The triggers have cues (problems) which direct the learning process. The learning outcomes are not shared with students. The case is structured with a logical flow in such a way that students identified their learning needs themselves.

2. Facilitator Guide

Each case is accompanied by a facilitator guide, also developed by the case developer. The guide provides the facilitator the information regarding the ILOs, details relevant to each ILOs, and the pertinent resources (e.g., reading material) for tutors.

3. Assessment Rubrics:

Assessment is imperative to improve the quality of learning process [7]. PBL has embedded assessment that focuses on how well the students have attained the learning outcomes, how much the facilitator supported the group dynamic and process of inquiry and how well the problem was structured to generate the inquiry and discussion.

43.4.1 PBL—*The Process*

43.4.2 Facilitating PBL

1. Maintaining the group dynamics is one of the key expectations from PBL facilitators, i.e., to see if every individual fairly contributes in proposing solutions. At the same time, facilitators also make sure that appropriate time is invested on each learning objectives [3, 7].
2. The facilitators also serve to stimulate the process of problem-based learning by challenging student's thinking towards aspects that need consideration.
3. PBL facilitators act as guides to students during the process of developing scientific reasoning and critical thinking. The facilitators should not propose solutions themselves or serve as direct source information unless they see that the resources have already been exhausted by students.
4. Certain personal qualities of facilitators, such as communicating with the students, creating a non-threatening environment where unique ideas float and an empathetic attitude seem to be important in promoting student learning.
5. There is a natural tendency of content experts as facilitators to complicate the flow of learning and problem solving; therefore the literature supports facilitators who are trained for PBL facilitation with no content expertise.

43.5 What are the Limitations of PBL?

- Problem-Based Learning is found to have a promising impact (long and short term) as compared to the traditional curriculum on selective competencies, e.g., critical thinking, problem solving, and teamwork. Current evidence does not show a significant effect of PBL curricula on clinical/patient-related outcomes [8–10].
- Despite an obvious overlap between PBL competencies and graduate attributes, PBL is little used in residency programmes [11]. One reason could be that these programmes have their roots embedded in the clinical context and traditional schools of thought do not support the learning of patient-based skills using only problems.
- The sociocultural perspective in Asia regarding teacher-centeredness, i.e., seeing the teacher as the centre of expertise makes it far more challenging to implement the student-centred PBL-based approach [12].
- Authentic assessment is required to evaluate the effectiveness of problem-based learning.
- An effective PBL requires a significant amount of time to develop and implement problem-based learning [13].
- Effective problem solving requires more time by the student, which is sometimes not possible due to concomitant curricular activities.
- PBL facilitation requires holistic training of faculty members on the principles of small group teaching and learning.

43.6 Conclusions

- The evidence supports problem-based learning over the traditional curricula in developing competencies related to problem solving, critical thinking, teamwork, and communication.
- A group of content and education experts develop problems around intended learning outcomes.
- A good PBL case stimulates prior knowledge, has more than one solution and is relevant to real life for future applications.
- PBL facilitators have to be experts in maintaining group dynamics and act as a stimulus towards inquiry.

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