

What is Problem – Based Learning?

By Professor Matthew Gwee,
Professor Lee Eng Hin and
A/Professor Koh Dow Rhoon

This article is the first of a 2-part series. The second will focus on the PBL experience of NUS on implementing PBL in the undergraduate medical curriculum.

THE MCMASTER INITIATIVE: BEGINNING OF PROBLEM- BASED LEARNING

About three decades ago, a new medical school with a difference was established in the McMaster University Faculty of Health Sciences. Medical educators at McMaster were apparently disillusioned with the then existing “traditional” medical curriculum which they perceived as having many inherent shortcomings. In particular, they were critical of the highly lecture-based discipline-oriented traditional curriculum with consequent information overload to be endured by students who then resort to rote-learning, but lack the ability to integrate and apply knowledge of the basic sciences to clinical problems. It was also perceived that students were insufficiently prepared in problem-solving skills considered essential for life-long learning.

McMaster University medical school then implemented problem-based learning as its innovative educational philosophy and pathway that underpinned the design of its entire course curriculum. The McMaster initiative introduced a radical trend in medical education which was progressively adopted, as well as adapted, by many medical schools around the world.

PBL: KEY FEATURES

“Problem-based learning is the learning that results from the process of working toward the understanding or resolution of a problem”
(Barrows, HS and Tamblyn, RN 1980)

“Problem-based learning (PBL) is grounded in the belief that learning is most effective when students are actively involved and learn in the context in which the knowledge is to be used”
(Boud, D and Feletti, GI, 1997)

PBL is primarily *problem-first* learning

in which a commonly encountered medical problem serves as the *main focus* of and *stimulus* for learning. Students undertake to study a general medical problem without the prior acquisition of new knowledge (i.e. before receiving any discipline-specific lectures) relating to the problem. In PBL, there is therefore a strong emphasis on the importance of the learning process itself to the intended educational outcome. PBL is not, therefore, problem-solving per se, i.e. PBL is not for the purpose of solving a problem to derive at an expected answer or solution. PBL is more of an educational strategy to learn and practise the *problem-solving process* to enhance understanding of the problem. Other key features of PBL, underpinned by sound educational principles, include learning through the active involvement of students themselves (*peer teaching-learning*) and in the context in which the knowledge is to be applied (*contextual learning*). Thus, PBL is designed to promote learning: through the integration and application of knowledge in the basic sciences and clinical disciplines toward understanding or solving a problem; through the social interaction of students in small learning groups; through independent self-study periods and the critical use of resource in the search for information that is relevant to the problem. Importantly, too, is the learning that results from the facilitation and nurturing of the learning process by the teacher (the PBL tutor). Thus, PBL differs in concept, educational philosophy and practice from the highly teacher-centred, lecture-based and discipline-oriented traditional medical curriculum.

THE PBL TUTORIAL PROCESS

The main educational strategy employed in designing a PBL curriculum is the *small group tutorial* in which students themselves are actively involved in the learning process. Group size is usually limited to 6-10 students to optimise group dynamics, but much larger group

sizes have also been adapted for use in PBL. The teacher takes on the role of a tutor who facilitates and guides the learning process, including the creation of a conducive environment for students to readily want to share their ideas with one another. Usually two tutorial sessions of 1-2 hours each are allocated to each PBL problem. Each tutorial session has its specific intended process, goals and outcomes.

Session 1

- *Problem presentation* (e.g. paper case, video clip, etc)
- *Analyse problem, Brainstorm, Generate Hypothesis*: to identify the broad nature and explore possible causes of and solutions to the problem
- *Problem Synthesis*: to critically review the hypotheses generated, and prioritise relevant and key issues that would require new knowledge to enhance understanding of the problem
- *Formulate List of Learning Issues (preferably, in the form of Questions)*: to identify what needs to be learned
- *Assign Learning Tasks*: to follow-up on learning issues during self-study period, either as an individual or group responsibility
- *Identify Learning Resources*: to ensure critical, effective and appropriate use of resource
- *Feedback (among peers and with tutor)*: to identify factors that enhanced or impeded individual and/or group functioning and achievements

Self-study Period (3-5 days)

- *Independent, Self-directed Learning*: to achieve assigned tasks
- *Search for and Gathering Information*: to utilise resource (including discipline experts) effectively and appropriately

Session 2

- Students reconvene in their respective groups
- Review and share newly acquired information

◀ Page 5 – What is Problem – Based Learning?

- Re-analyse the problem using the new information
- Critique, refine and reformulate the initial hypotheses
- Integrate and apply the new knowledge toward understanding or resolving the problem
- Review and critique of resources used
- Feedback (as in session 1)

Session 3

- All students reconvene in the lecture theatre at the end of Session 2
- Student groups present “findings” (including learning issues)
- Case writer conducts interactive session while reviewing the problem, including opening the session for general discussion and summing up

Note: Session 3 is not commonly employed in PBL practice, but in our medical school we incorporate a Session 3 to provide opportunities for students to meet with and listen to the case writer (the expert), and to obtain a better perspective of the learning outcomes expected for a particular problem.

PBL: EXPECTED RETURNS ON INVESTMENTS

“Faculty members work with alert, motivated, turned-on minds in a collegial manner that has no equal” (HS Barrows, 1996)

Implementing PBL within a medical curriculum requires considerable logistics support that make heavy demands on curriculum time, tutor skills and commitment, case writer expertise for designing quality medical problems, student understanding of their role and responsibility, quality library and IT facilities and adequate number of suitable seminar rooms. Continued staff training and development to enhance tutor skills and close monitoring of teacher and student morale are also essential to ensure, not only the successful implementation of PBL, but also to ensure that it can be sustained with increasing enthusiasm and co-operation of all concerned. What then are the expected returns on the heavy educational investment required to implement PBL?

Laying the Foundations for Lifelong Learning

An important aim of PBL is to encourage and empower students to take greater initiative and responsibility to direct and to manage their own learning, since PBL fosters the development of self-directed learning skills. Thus, the PBL experience will lay the foundations for lifelong learning so essential to medical practice.

Promoting Cooperative-Collaborative Learning

In PBL, students actively engage in peer teaching and learning and learn to respect each other’s viewpoints, as well as the need for and importance of learning together as members of a team. Students will therefore develop the skills required of cooperative group learners, instead of becoming competitive individualistic learners.

Enhancing Critical Thinking and Problem-solving Skills

A primary focus of PBL is enhancing contextual learning through a total engagement of students in the problem-solving process involving the application, analysis, integration and evaluation of knowledge and information toward the understanding or resolution of a problem. Thus, PBL will foster the development of critical thinking and problem-solving skills, as well as communication skills.

Learning that Goes Beyond the Biomedical Sciences

The design of case problems in PBL often incorporates issues that relate to and impact on various aspects of human behaviour, and community and population health. Student perspectives are therefore enhanced beyond just the biomedical sciences and this then helps students, especially in the early years of the medical course, to have a better appreciation of the relevance of the basic sciences to clinical practice.

The PBL Tutor: Facilitator and Motivator of Learning

“An academic who only presents facts is not a teacher; a teacher is one who nurtures the learning process and thereby modifies behaviour and patterns of thinking for a lifetime” (RL Woosley, 1997)

The important role of the PBL tutor (teacher) is that of a facilitator “to expedite the intellectual and interpersonal process for the group” (Gresham and Philp, 1996). PBL therefore provides excellent opportunities for tutors to build with their students strong partnerships and bonding in learning. In this context, the tutoring skills of a PBL tutor will impact strongly on student enthusiasm, attitudes and motivation in learning.

Sharing Common Educational Goals and Building Learning Communities
Implementation of PBL is not discipline-specific, but is a shared responsibility of all teachers in the medical school. PBL provides an excellent forum for cross-talk among teachers from different clinical and non-clinical disciplines in the course of reviewing case problems for use in the classroom. The multidisciplinary inputs provided by teachers broaden their perspectives beyond their own disciplines. PBL therefore offers an excellent pathway for building learning communities in the medical school.

CONCLUSION

PBL is not just a method of teaching but, more significantly, it is also an innovative way of learning that goes beyond simply passive rote-learning: students are actively involved in the educational process underpinned by sound pedagogical principles. A primary aim of PBL is to further develop the potential of students and to motivate student learning through total engagement in the problem-solving process. PBL will provide a more holistic and value-added education, albeit requiring considerable logistics support for its successful implementation. PBL, therefore, offers a unique experience with quality education in the educational preparation of medical students for their future practice. ■

Editor’s Note:

Matthew Gwee is Professor of Pharmacology, Chairman of the Faculty of Medicine’s PBL Committee and Associate Director of the Centre for Teaching and Learning at the NUS.

Lee Eng Hin is Dean of Medicine, Professor and Head of Orthopaedic Surgery, NUS.

Koh Dow Rhoo is Vice-Dean (Curriculum) of Medicine and Associate Professor of Physiology, NUS.