



Implementation of PBL Curriculum Involving Multiple Disciplines in Undergraduate Medical Education Programme

Srikumar Chakravarthi

Department of Pathology, Faculty of Medicine, International Medical University

57000 Kuala Lumpur, Malaysia

Email: srikumar_chakravarthi@imu.edu.my

Nagaraja Haleagrahara

Department of Human Biology, Faculty of Medicine, International Medical University, Malaysia

Abstract

This article describes how a multidisciplinary problem-based learning (PBL) curriculum was established at the International Medical University in Malaysia for preclinical education in a 5-semester phase 1 programme. Based on positive feedback from a modified PBL program implemented in one discipline, a multidisciplinary PBL curriculum was established. PBL training for facilitators and students, development of resource materials, curriculum design, and case writing were done in a manner that is consistent with the characteristics and learning style preferences of undergraduate medical students. About 80% of the lectures were kept in the new PBL program. The multidisciplinary PBL curriculum has been successful in helping undergraduate medical students mentally construct an understanding of the interrelationship between medical knowledge and basic science concepts. The experience at International Medical University, Malaysia, indicates that there are clear benefits for students in the PBL format. A benefit to faculty is that PBL tutorial facilitators were partly liberated from their traditional roles and developed additional skills for facilitating. However, conflict arises when PBL-trained students encounter the traditional exam-centered education system.

Keywords: PBL, Multidisciplinary, Undergraduate medical education, Preclinical education

Introduction:

Problem-based learning (PBL) is a student-centered instructional strategy in which students collaboratively solve problems and reflect on their experiences. Characteristics of PBL are: Learning is driven by challenging, open-ended problems; Students work in small collaborative groups; Teachers take on the role as "facilitators" of learning.

Accordingly, students are encouraged to take responsibility for their group and organize and direct the learning process with support from a tutor or instructor. Advocates of PBL claim it can be used to enhance content knowledge and foster the development of communication, problem-solving, and self-directed learning skill.

In response, many medical schools around the world set about constructing new curricula that were more responsive to student learning and more sensitive to evaluation mechanisms. These new curricula have employed a more contemporary student-centered approach, utilizing flexible methods of teaching and learning that enable development of dental clinical skills enhanced by self-assessment and criterion-referencing. Teamwork and competency-based systems also characterize these curricula.

Problem-based learning (PBL) is a curriculum method that has frequently been advocated as a way to provide a better learning environment for health professions students (Hmelo-Silver & Barrows, 2006; Schmidt, 1993; Susarla *et al*, 2004; Rideout *et al*, 2002). PBL originated in medical education at McMaster University in Canada in the 1960s (Gillian & Elizabeth, 2003). Since that time, many versions of PBL have arisen worldwide in a variety of fields and at different levels of education. Now, the role and advantages of PBL as an innovative approach in health professions education have been well documented; (Morales-Mann & Kaitell, 2001; Fincham & sculer, 2001) these include the structuring of knowledge for use in clinical contexts, the development of an effective reasoning process, the development of effective self-directed learning skills, and stimulating students' motivation for learning. There has been an emerging trend of incorporating PBL into all aspects of the dental curriculum in many nations.

During the fifteen years since the founding of the IMU, the academic programmes within the institution have undergone a series of changes, focusing on producing leaders in both clinical medicine and biomedical research. All medical students are trained in Phase 1 at Bukit Jalil campus for two and a half years, before they move to the clinical school in Seremban. Over the past few years, the undergraduate curriculum for the medical degree has evolved from an undergraduate curriculum based upon didactic teaching and clinical and laboratory sessions to the undergraduate and

graduate curriculum for a degree that now emphasizes the ability to solve problems in the clinical environment. A modified PBL in just one single discipline, pathology, has been ongoing in the undergraduate curriculum since 2003. Positive feedback about the modified PBL was voiced by some of the students and teachers, which included the ability of students to more effectively communicate ideas in a group setting, the enhancement of a practical approach in solving treatment-related problems, the development of critical thinking and problem-solving skills, and improved enthusiasm for learning. As a result of this positive feedback, a multidisciplinary PBL curriculum was established.

Materials and Methods:

This section describes several factors that influenced the design of the new PBL curriculum at IMU, with an emphasis on the characteristics of medical students under the hybrid traditional cum PBL education system.

The students in traditional system have independent personalities and are traditionally hesitant to communicate with others voluntarily (Song *et al*, 2005). Students ask few questions in class and offer objections even less. They worship their teachers or parents and treat their textbooks with the same reverence. They usually accept their fate passively.

The traditional education system is also very different from that of other countries. Almost all the students in the university have graduated from high schools that use very traditional teacher-centered instructional methods. As a consequence, entering students are used to gaining information from didactic lectures. Numerical scores from the highly competitive entrance examination, especially in scientific subjects, represent practically the sole yardstick for admission into professional health institutes, although many medical educators now think that it is inappropriate to select medical students who will become physicians in the future based only on their examination scores while neglecting their people skills and career interests.

Children born into a family in Malaysia have been coddled since childhood because of the control that the family exerts on its offspring. As a result, many educators in Malaysia believe that our medical students have poor abilities to live independently, to think independently, and to study independently. They lack the propensity and skill of self-directed study and may be less mature in dealing with people or may even have become spoiled in the historically passive academic culture. The traditional examination-driven teaching system of the past has encouraged them to focus on the retention of factual knowledge without concern for the process of reasoning out situations.

Preparation of Facilitators and Students for PBL:

Changing the concept of teaching and learning to support the facilitator's role in PBL has been a big challenge at our university. Although all faculty who were assigned as facilitators were experienced in leading conferences, most of them did not have any experience as PBL facilitators. Thus, their preparation focused on developing the proper behaviors of a facilitator within student-centered group discussions, such as encouraging students to comment on scenarios, sharpening their awareness of interests and skills, and using insight and problem-solving to reach goals and avoid blocks. Central to the facilitator's role was the ability of the faculty member to break away from teacher-dominated discussions to those that are truly student-centered. If commitment to PBL is to be maintained, every facilitator must appreciate its advantages, such as the encouragement of greater student participation and responsibility and the development of group ownership and leadership skills.

Every year, three or four young faculty members whose teaching experiences ranged from teaching large classes to small groups in clinical settings are assigned as facilitators in PBL. One of the current faculty received training as a PBL facilitator at universities with established PBL programs. The new faculty members being introduced to PBL take part in a tutor training workshop, which is led by the two faculty members who were trained to learn comprehensive PBL.

In preparation for the workshop, a PBL manual incorporating ideas from established PBL programs was used. The trainer used questioning while taking participants through the PBL steps. Participants then worked in small groups to formulate the two parts of a problem situation (main problem statement and additional data). Each of the developed problem situations was examined by the large group for appropriateness and completeness, with the guidance of the trained PBL facilitator. After an additional two-hour session with the new PBL facilitators, all aspects of PBL such as facilitator role behaviors and problem situations were practiced in a small group. The goal was that all new facilitators should master three concepts: first, learn about PBL; second, develop an understanding of the facilitator's role; and third, acquire facilitator skills.

Further PBL training is ongoing. All the facilitators are asked to attend a periodic training project during the year. They are assigned a temporary full-time teacher to cover their responsibilities during the training. Other faculty members are encouraged to audit some training workshops or PBL courses, so that they can develop an understanding of PBL concepts and also write some PBL cases for teaching.

Students received a three-hour program that introduced them to PBL basic concepts before they started the PBL curriculum. A one-hour discussion followed the lecture. A demonstration was given by the trained facilitator and several others who have had experience in the modified PBL curriculum. As students have to be proficient at accessing

informational resources to gather relevant, credible information to solve PBL problems, they were also given a special orientation to the library. At this time, it was hoped that the curriculum change would allow students to explore their academic interests more freely and would encourage the pursuit of basic and patient-oriented research during the preclinical and clinical years.

Resource Preparation:

Laptops were bought for the facilitators of PBL, who used the laptops to prepare the cases and search for information using the Internet. Whiteboards were prepared for PBL groups. Students could write out what they were thinking or diagram their strategies for how to deduce the learning issues and print it out after the discussion.

Library resources are critical to PBL. The educational resources and facilitator's effectiveness are limited without sufficient books in library. Therefore, a large number of new textbooks and references were bought recently. Wide-band communication was built up for students, so they are able to utilize the resources of the Internet more freely. The library hours were also extended, so that students are now able to research information needed to analyze cases.

Design of PBL project:

In the preclinical period, multidisciplinary PBL curriculum was created just for the medical program students. Teaching modalities used in large classes, which were lectures, were mainly didactic, while PBL was student-centered. The total lecture hours for the medical programs were reduced and about 20 percent of the lecture schedule was converted to the PBL curriculum.

PBL was planned for cohort groups of nine or ten, to address content areas, group process, and conflict resolution. In addition, students explore elements of professional practice such as ethical decision making, legal implications, collaborative practice, and the role of professional organizations. Three teachers were responsible for course design and implementation. The PBL evaluation tools developed by Woods were adopted (Morales-Mann & Kaitell, 2001). This includes the knowledge base, reasoning process, communication skill, assessment skill, and professionalism. These tools evaluated students' competency in problem-based learning, students' performance as a group member, and students' task and role performance as related to group morale. The last ten minutes of each class are set aside for reflection and evaluation of group performance.

Case preparation:

PBL strategy is centered on a case, a facilitator, and a group. An effective case, developed from previous experiences of facilitators and input from clinical experts, based on actual previous cases is essential for implementation and acceptance of PBL (Lohman & Finkelstein, 2002). It provides a focus for learning, whether it is used in a single course or used as the principal educational method in an entire course or curriculum. It is a framework for a discussion that allows students to recall what they already know, to quickly identify the limit of their knowledge, and to formulate a question to clarify a concept. A well-constructed case should function as a surrogate teacher. Therefore, case preparation is a very important step.

Some of the facilitators have had experience in writing PBL cases, so we have prepared new cases, and also translated and changed one or two cases taken from established PBL programs and tried to imitate the concepts of these cases to write new ones. The purpose is to write cases as a focus for multidisciplinary learning, which is designed to foster mastery and understanding of particular skills, behaviours, and values that are identified as goals and objectives of the curriculum. The cases should match the logistic realities of the courses or curricula in all the disciplines. The case should not go beyond the content considerations of education outlined for undergraduate teaching.

The facilitators wrote ten cases for the PBL curriculum in each semester for the 2nd to 5th semesters students; thus, forty cases are currently ready for use. All the cases are deliberated and discussed by the faculty who attended the PBL tutor training workshop or other training in PBL. Of course, these cases will likely be changed after the PBL sessions, depending on feedback from the students and the facilitators.

Discussion:

PBL at IMU is in an exploratory phase. Although modified PBLs in few disciplines have been in existence for years, we are still gaining experience with PBL in a multidisciplinary setting. The knowledge gained in the fourth and fifth semesters is especially quite important for all the students. No remediation is allowed by the students or their parents or the school. This places a heavy burden on all of our facilitators and students. To take into consideration the probable side effects of educational innovation, 80% of the existing lectures were retained to limit the influence of the new curriculum.

Although the new curriculum was well received according to feedback from the students, there were conflicts between the traditional education system and PBL. For example, the traditional exam-centered education system restricted the application of PBL. The students complained they did not have enough time to prepare for the PBL curriculum during the period of the final exams. Students also wanted an evaluation that would provide clear and specific evidence of their

competence. Because the students invested time and effort in PBL, a majority believed that their PBL grade should count towards their grade point average. But we could not give a multidisciplinary grade to the university because it required grades for each of the various single disciplines. However, PBL could not be set up as a lab section, as it is part of the curriculum which requires compulsory attendance in small groups in the PBL discussion rooms.

Another concern is that some faculty members perceive PBL to be too time-consuming and too difficult to implement. Not all the teachers who are in charge of lectures took the time to become familiar with the concept of PBL. They gave their lectures employing the didactic format, including the concepts that were designed to be learned in the PBL curriculum. Students did state, however, that PBL was becoming a good method of review.

In regard to case innovation, the focus of the new cases was much more multidisciplinary in nature. Compared with the single disciplinary setting, the multidisciplinary PBL curriculum is much more successful in building a firm foundation for students that will help them understand complex medical knowledge and basic science. The PBL process helps students develop deeper understanding than possible in lectures and also stimulates the development of clinical reasoning and critical appraisal skills. It encourages students to think about social and environmental problems and to pay more attention to humanities and ethics. For those who focus on knowledge from textbooks, knowledge of such fields is a very important reinforcement and improves their ability to acclimatize to work settings where doctors provide oral health care for patients. It should be said that the multidisciplinary setting is much enhanced by the spirit of PBL.

For a new problem-based curriculum that is just being established, it is essential that students, faculty facilitators, and administrators understand the basic concepts of PBL and receive training about how PBL works. Student preparation for PBL is not enough. Because our students were not previously exposed to PBL, allowing more time before starting the PBL curriculum would have made the process more effective. Increased preparation will also stimulate prior learning and provide guidance, feedback, and successful experiences with the method. Facilitators would be less anxious and more effective if they were given additional preparation in the form of workshops and team discussions. Students and facilitators have expressed their desire to continue the use of this method after experiencing the advantages of PBL. When the concepts and format of PBL become well accepted among the whole faculty, the application of PBL in subsequent years will promote their own and students' self-efficacy in this teaching/learning method and enhance students' ability to solve more complex problems in the future.

Future growth and success of a PBL curriculum at any medical university in any nation depends on investment in the future including the following: creating an adequate budget for PBL so that needed resources are available to conduct a high-quality program; inviting PBL experts to provide faculty development on this technique; enhancing financial reward and time available for the case writers; and building a substantial library of resource materials, including biomedical journals, to assist students in their exploration of the literature during the analysis of cases.

Conclusion:

A multidisciplinary PBL program in the IMU is an innovation in our educational pursuits. It is a big challenge for Malaysian students because of the traditional culture in this nation. To take into consideration the probable side effect of education innovation, only 20% of the lectures were changed in the PBL curriculum. All the new cases have the characteristics of being multidisciplinary in nature and are related to some problems of society, environment, humanities, and ethics. There are clear benefits for the students from the use of the PBL format, including increased autonomous learning, critical thinking, and problem-solving. Moreover, it helps in primary application of knowledge, due to greater knowledge retention and recall skills.

References

- Fincham, A. G. & Shuler, C. F. (2001). The changing face of dental education: The impact of PBL. *Journal of Dental Education*, 65(5), 406–421.
- Gillian, H. R. & Elizabeth, T. (2003). Providing support for problem-based learning: The Manchester experience. *European Journal of Dental Education*, 7, 3–12.
- Hmelo-Silver, C. E. & Barrows, H. S. (2006). Goals and strategies of a problem-based learning facilitator. *Interdisciplinary Journal of Problem-based Learning*, 1, 21–39.
- Lohman, M. C., Finkelstein, M. (2002). Designing cases in problem-based learning to foster problem-solving skill. *European Journal of Dental Education*, 6, 121–127
- Morales-Mann, E. T. & Kaitell, C. A. (2001). Problem-based learning in a new Canadian curriculum. *Journal of Advanced Nursing*, 33(1), 13–19.
- Rideout E, England-Oxford, V, Brown, B, Fothergill-Bour-bonnais, F, Ingram, C. & Benson G, et al. (2002). A comparison of problem-based and conventional curricula in nursing education. *Advances in Health Sciences Education: Theory & Practise*, 7, 3–17.

Schmidt, H. G. (1993). Foundations of problem-based learning: Some explanatory notes. *Medical Education*, 27:422-432.

Song, G. T., Kwan, C. Y., Bian, Z. & Tai, B. J. (2005). Exploratory thoughts concerning educational reform with problem-based learning. *Teaching and Learning in Medicine*, 17(4), 382–384.

Susarla, S. M., Bergman, A.V., Howell, T. H. & Karimbux, N. Y. (2004). Problem-based learning and research at the Harvard School of Medicine: a ten-year follow-up. *Journal of Dental Education*, 68(1):71–76.