Seven semesters of problem-based learning at a Caribbean medical school

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My opinion

Problem-based learning (PBL) in medical schools/courses uses patient problems as a context for students to learn problem-solving skills and acquire knowledge about the basic and clinical sciences. In PBL learning begins with a problem [1] but the activity is not directed at solving the problem/case but rather learning from it.

Characteristics of PBL: PBL is compatible with the modern theories of learning. A recent article highlights that PBL is based on information processing theory, student interactions, mixed practice, constructivism, self-determination theory, self-directed learning and adult learning [2]. Activation of prior knowledge, elaboration, context matching, student interaction and cooperation are important. PBL cases bring together information from the basic and the clinical sciences (mixed practice). PBL has a number of advantages with the learning process being active, and in addition to knowledge acquisition, also promotes communication skills, team work, problem solving, and students acquire increasing responsibility for their own learning [3]. Disadvantages mentioned have been students may not have teachers available as role models, certain faculty may consider facilitating as demotivating and inefficient, knowledge may be less systematic and well organized, there may be a greater requirement for facilitators, and greater time requirement for self-directed study.

The institution: Xavier University School of Medicine (XUSOM), a Caribbean medical school situated in Aruba, Kingdom of the Netherlands admits students from the United States, Canada and other countries to the undergraduate medical (MD) course. Recently the MD curriculum has undergone a number of modifications [4]. Among these were shifting to an integrated curriculum, use of standardized patients, early clinical exposure, initiating a medical humanities module, introducing sessions on personal drug selection, prescribing skills and on the critical appraisal of scientific literature. The school shifted to a fully integrated curriculum from January 2014 with all basic science subjects being learned together integrated as organ systems [5].

PBL at the institution: PBL sessions were initiated during the summer (May-August) 2013 semester for the partially integrated first and second semesters. A PBL working group was formed with the PBL Chair, the chair of the Curriculum Committee and selected faculty as members. The partial nature of integration created challenges with regard to conducting PBL sessions as the first and second semester students were only learning the normal human subjects of anatomy, physiology and biochemistry. After discussion among faculty members we decided that during PBL students will define their learning objectives from the normal human subjects during the first two semesters. The same PBL scenario would be revisited during semesters three and four and students would define and work on learning objectives from the abnormal human subjects of pathology, microbiology, pharmacology and clinical medicine and social and behavioral sciences. There were challenges in implementing this especially during semesters one and two as students were strongly driven to understand and 'solve' the clinical problem which was difficult without adequate knowledge of pathophysiology. The clinical scenarios used were common/important diseases from the organ system being covered during the particular period. The PBL working group selects the diseases/conditions for the sessions with inputs from different subject faculty members. The prevalence and public health importance of the selected disease condition in the United States and Canada, the primary area of practice of the graduates and the ability of the case to incorporate 'must know' teaching-learning objectives from different subjects are criteria considered while selecting diseases/conditions for the PBL cases.

PBL under a fully integrated curriculum: A fully integrated organ system-based curriculum with early clinical exposure was started from January 2014. An additional semester was added to the basic sciences program. Like in most offshore Caribbean medical schools a semester at XUSOM is of 15 weeks duration. During the first semester Fundamental concepts and musculoskeletal system are addressed. The organ systems learned during the second semester were Nutrition and Nervous system while during the third semester Respiratory and Gastrointestinal system are
addressed. During the fourth semester Cardiovascular and Hematopoietic system are taught while during the fifth semester the systems covered are Renal, Endocrine and reproductive system and Infection and immunity. Patient, doctor and society and Healthcare quality improvement run concurrently with the organ systems during all semesters. Table 1 shows the disease conditions/clinical scenarios used for PBL during different semesters. Sessions are held once every week from 10 am to 12 pm. The brainstorming session is followed by the discussion/presentation session during the following week.

**Faculty and the PBL process:** External experts conducted sessions for faculty before PBL was initiated in the institution. Writing PBL cases, facilitating sessions, and assessing students were addressed. A PBL working group was constituted in April 2013 to prepare the groundwork for conduct of the sessions. A PBL chair was also designated. The PBL chair writes the PBL case with inputs from faculty. As XUSOM is a ‘small’ medical school most faculty are involved in providing inputs on the PBL scenario, defining student learning objectives from their subjects, facilitating sessions and assessing students. Table 2 shows selected PBL case scenarios used in the institution. Every year the scenarios are refined and modified. The finalized and refined scenarios are circulated among faculty to provide learning objectives from their subjects. New faculties are mentored by faculties who have experience with facilitating sessions. Following this they facilitate a couple of sessions under the observation and guidance of senior faculty before they facilitate sessions independently.

**Challenges with PBL:** As the school follows a hybrid curriculum with didactic lectures being the predominant teaching-learning method there were many challenges with regard to conducting PBL. There were challenges for the faculty in managing time to facilitate the sessions, to refine patient problems, define learning objectives and for frequent meetings. As didactic lectures and other teaching-learning strategies occupy a considerable portion of curriculum time students are challenged to find time for self-study and preparing for the discussion sessions. In a hybrid curriculum students and faculty may face challenges in switching from the teacher-centered instructivist learning strategies employed during didactic lectures to the student-centered constructivist learning strategies during PBL sessions [6]. At XUSOM during initial sessions some students had used power point slides of faculty members as resource material to prepare for PBL discussion sessions.

There were differences noted in the learning objectives defined and presentations and discussions among different groups. Another observation was that sometimes the groups concentrate on a disease or condition which was not being learned during the particular organ system. For example during the nervous system we had used a case scenario of a patient suffering from prostatic cancer which had spread to the vertebrae to serve as a base for students to explore the issue of pain management. However some groups defined most of their learning objectives and discussion time on prostatic cancer, a topic covered during the endocrine and reproductive system (fifth semester). We had a similar problem with the case of an obese lady also suffering from type 2 diabetes mellitus. Type 2 diabetes mellitus is again covered in the fifth semester. We are considering having a PBL wrap up session where the facilitators can come together and discuss various aspects of the PBL process including the group work and the PBL case and mention areas which require improvement and approaches to further improve future sessions. A structured format is being used to obtain feedback from the facilitators about the PBL case based on their inputs regarding how their student group handled the case provided. The issue of whether the case was effective in stimulating the student group to work out the different learning objectives is emphasized.

**Defining learning objectives:** Also during certain instances it was noted that the student groups were not able to derive all the learning objectives from the case scenario as defined by the faculty. A solution for this suggested by the external experts was for the PBL chair to invite learning objectives related to the disease condition first from different faculty members and then write/construct the case so that these objectives could be derived from the case by student groups during the brainstorming process. During the fourth and fifth semester after extensive deliberation it was decided not to cover the disease condition addressed during the PBL session in didactic lectures. If any deficiencies in knowledge were noted after the discussion then a resource session would be conducted by the faculty.

**Group dynamics:** The problem of the ‘free rider’ or the student who may be non-performing or under-performing and relies solely on the efforts of the competent members of the group has been mentioned
in the literature [7]. We have noted problems with group dynamics and group work in a few PBL groups. These problems are usually handled first by the group members and if they cannot address it by the group facilitator and if no solution is forthcoming even at that level by the PBL chair. We had studied student perceptions regarding effectiveness of small groups during PBL sessions recently using the previously validated tutorial group effectiveness instrument [8]. Student perception about small group effectiveness was mostly positive though the issue of certain student not contributing fully to the group activities was commented on by a few respondents.

Assessment during PBL sessions: The facilitator assesses individual group members using a rubric developed by Elizondo-Montemayor [9] which was modified to suit the requirements of PBL at the institution. Application of knowledge base, clinical reasoning skills, self-directed learning, collaborative work, and attitudes towards learning and professionalism are among the criteria being considered. At the end of the second session the facilitator and the group members engage in self-reflection and provide peer feedback. The facilitator assessment during the PBL sessions accounts for a certain percentage of final marks in the organ system. The assessment scheme is posted on the student learning system at the beginning of the semester. We are considering introducing a short content assessment at the end of the discussion/presentation session. In a medical school in Nepal students had a positive reaction toward PBL and wanted more session with a short content assessment at the end of the sessions [10]. We plan to evaluate the scores provided by different facilitators over the different semesters during which they have been facilitating PBL sessions to examine whether they are consistently providing lower or higher scores to their group compared to the mean facilitator scores.

Conclusion

Despite various challenges PBL continues to be an important learning modality at the institution. We plan to further develop and strengthen PBL in the institution.

Abbreviation(s)

PBL Problem-based learning

References