Problem-based learning and the medical school: another case of the emperor’s new clothes?

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Butler, Richard, David Inman, and Derek Lobb. Problem-based learning and the medical school: another case of the emperor’s new clothes? Adv Physiol Educ 289: 194–196, 2005; doi:10.1152/advan.00032.2005.—For almost four decades, problem-based learning (PBL) has been the stated cornerstone of learning in many medical schools. Proponents of PBL cite the open nature of the learning experience where students are free to study in depth, unencumbered by the burdens of broad courses based on the memorization of facts; detractors, on the other hand, cite the lack of breadth and factual knowledge required for professional qualification. Both points of view have merit. Professional schools have a different set of needs and requirements, and it is these that drive the curriculum and learning philosophies. The constraints of the professional school are so different from those of the purely academic environment that PBL, while admirably suited to the latter, is just problem solving in the former.

PROBLEM-BASED LEARNING (PBL) in the medical school no longer has a single universal definition. As a result, a great deal of misunderstanding surrounds the interpretation of this educational philosophy. Here, we attempt to explain our perception of PBL and why we believe it to be useful.

The “our,” “us,” and “we” that appear throughout the text refer to the three authors of this Personal View. Each of us has been involved in the educational programs of the Faculty of Health Sciences at McMaster University, mostly with the delivery of McMaster University’s version of PBL in various health professional programs. We have all contributed to the various roles encountered in PBL, especially as tutors and expert resource teachers. In total, we have 76 years of PBL experience (R. Butler, 31 yr; D. Inman 31 yr, and D. Lobb, 14 yr).

Tutors are faculty who lead tutorial groups of six students. The tutors need not be (and hopefully are not) experts in the areas under current consideration by the students. Their real role is to ensure that students know how to go about learning and ensure participation in tutorial discussions. The faculty members’ professional expertise is utilized when they act as resource teachers when the students begin to study their (i.e., the faculty member’s) area of expertise.

We wish to emphasize that this is a Personal View, in other words, our opinions. For many of the things we say, we have no “proof” backed up by data, only perceptions (opinions), but the three of us concur about these perceptions, and we find no evidence to suspect that they are not correct.

PBL: WHAT IT IS AND WHAT IT ISN’T

The contemporary incarnation of PBL in medical school began in the late 1960s at McMaster University’s School of Medicine and is now widely disseminated. Those who set up the McMaster University Program envisioned a learning style very different from didactic lectures. In his history of the early years at McMaster University, Spaulding (13) specifically mentions the education committee’s first report in January 1967, which placed an emphasis on problem solving. It seems to be Howard Barrows (first as a visiting professor from July 1968–1969 and then as a member of the faculty from January 1971 to September 1980) who introduced the more advanced concept of PBL (4, 13). Significant medical education literature has developed as PBL has matured. One of the first reviews of publications on PBL in undergraduate medicine is that of Albanese and Mitchell (1), who point out that

“Barrows (2) felt it necessary to develop a taxonomy of PBL types to help clarify the situation.”

Even at that time, it was becoming clear that PBL was both difficult to define and meant quite different things to different people. Barrows doesn’t have a problem with different types of PBL, but when they become teacher centered more than student centered, it’s not really PBL anymore—it’s problem solving (3).

One problem with PBL is the word “problem.” Problems have solutions, and, to many, PBL is actually problem solving (sometimes referred to as case-based learning).

The clearest explanation that we can offer as to what pure PBL implies was first given metaphorically by Inman (personal communications) in an invited address to the Faculty of Humanities at McMaster University. The following is from that address:
“My objection to the word ‘problem’ in this approach to learning is that problem-based learning and problem solving are regarded as the same thing by many people and confused by many others— including a regrettable number of educationalists who profess to be experts in the latest trends in innovative learning methodology. They are, of course, entirely different. One leads to a solution but not necessarily to understanding; the other leads to understanding but not necessarily to a solution. Profound problem-based learning may arise from a problem which has a multiplicity of solutions or from one which has no solution at all.

Let me offer you a trivial domestic analogy to illustrate the difference between problem solving and problem-based learning. You go into the basement of your house and find to your dismay that it is flooding. You have a problem to which there are a number of solutions. For example, you may choose, in panic, to take a convenient sledgehammer and flatten the water main entering your house. The immediate problem is solved, but the solution is one of many and perhaps not the best one. This is problem solving. If you consider the situation from all angles, discuss it with your family and neighbours, read relevant books and talk to appropriate experts, you could acquire a great deal of knowledge about and understanding of, for example, the physical and chemical properties of water, plumbing technology, corrosion, the biology of unicellular organisms, the effect on the family group of the intrusion into the home environment of an unfamiliar and potentially malignant force, mechanisms of action of domestic appliances, domestic architecture, principles of meteorology—to mention only a few. This is problem-based learning. Should the situation recur, you will probably be able, as a result of the knowledge and understanding you have gained from the resource pursued generated by the original problem, to deal more efficiently with every aspect of it and to come up with a better solution than the flattening of a pipe.

When I talk about problem-based learning, I am bowing to convention. I would prefer to think of it as situation-based learning.”

Each institution that claims to provide PBL programs has its own concept of what PBL is. The above metaphor conveys the original concept of how PBL would operate at McMaster University.

PBL: IS IT FOR EVERYONE?

When PBL is adopted, fewer facts may be memorized than in lectures, but understanding can be greatly enhanced. We can all estimate the degree to which lectured facts are forgotten. In our opinion, it may be in excess of 50%. As expert teachers in anatomy and physiology, we get to see the students not just for one course but repeatedly throughout the entire duration of their program. It becomes all too apparent how much information is forgotten and how little is retained. Forgotten information may have some value, but we claim that its loss can be more than compensated by an increase in the level of understanding. The authors of this paper are all associated with a medical school in which pure science, applied science, and clinical practice are taught. In an environment such as this, we appreciate the advantages and limitations of PBL.

On one side, there is the academic graduate program in which graduate students and their supervisors pursue knowledge. On the other side are the professional programs: medicine, nursing, midwifery, occupational therapy, and physiotherapy. The well-known McMaster University version of PBL is the version applied to the medical program, and herein lies a contradiction. True PBL is not skills oriented—it is understanding oriented. Again, Inman (unpublished communications) provides a useful domestic analogy, and it deals with riding a bicycle. The ability to ride without falling off is a skill, and, once accomplished, no further understanding need be applied. A true problem-based learner would acquire the skill but then proceed to explore and develop an understanding of gearing, wheel ratios, friction, physics, applications of gyroscopes and, above all, where the bicycle could take them. All clinicians learn skill sets, and we all want our clinician to possess an in-depth understanding of our problem. Training time is limited and fixed, so it is the extent (i.e., depth) of PBL that must vary. In our opinion, how PBL is implemented, and the expectations for it, will differ for purely academic students on the one hand and professional students on the other, although the essence of the activity is the same. Barrows and Tamblyn (4) point out that the emphasis in medical education is the application of knowledge.

Traditional tests and examinations are not suitable for student evaluations in PBL programs. Students either enhance their understanding or they do not. So a pass/fail or satisfactory/unsatisfactory evaluation, with comments, is suitable. But how do you know whether a pass or fail is warranted? PBL students in our tutorial-based medical program have ongoing oral evaluations from their peers and tutors and more formal evaluation exercises at the middle and end of program units. In our opinion, the “triple jump” is a very effective way to evaluate PBL students. This day-long exercise has three components: 1) an initial interview with a tutor to discuss the healthcare problem and establish the envelope for learning, 2) the student’s use of any or all resources available to allow him/her to understand those negotiated aspects of the problem, and 3) a second interview with the tutor to discuss what the student has come to understand about the assigned problem.

Beyond the universities’ granting of degrees or certificates, the final common path for professional students must be licensing examinations administered by their regulatory colleges, which tend to be massive multiple-choice exercises. Our PBL taught students rarely do worse than average on these examinations despite their lack of experience with multiple choice (5, 7).

In answer to our question “is it for everyone,” it can be for everyone if implemented correctly.

THE QUESTION WITHOUT AN ANSWER: IS IT BETTER?

This is one of the commonest questions and one of the most difficult to answer. Colliver (6) concluded that there was “. . . no convincing evidence that PBL improves knowledge base and clinical performance . . .”

but this is based largely on examination results and clinical skills evaluations and does not address understanding. Farrow and Norman (9) suggest that statistical analyses may be an inappropriate tool when trying to compare PBL against traditional outcomes. Again, the level of understanding is not addressed. It is only recently (11) that other aspects of PBL are now being considered.

In our view, to say whether something is “better” than something else means you have to know what both “good” is and what “best” is, as in “good,” “better” (comparative), and “best” (superlative). Everyone thinks that their doctor (or

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A Personal View

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lawyer, or dentist, etc.) is one of the best, yet 50% of all graduates were in the bottom half of their class. Can you define a “good” practitioner? It seems that it is very subjective and in the eye of the beholder. Could you define a “better” doctor? We think not. Is PBL “better”? Proponents say yes, critics say no, and it is a question without an answer.

It is to the few reasoned critical papers that we look for comparative assessment. Albanese and Mitchell’s (1) extensive review of PBL in medical schools supports some aspects on the one hand and warns about certain deficiencies on the other. For example, they state that,

“PBL graduates tended to engage in backward reasoning rather than the forward reasoning experts engage in, and there appeared to be gaps in their cognitive knowledge base that could affect practice outcomes.”

We do not dispute this; indeed, this is precisely why we included the section “PBL: IS IT FOR EVERYONE?” and why we differentiate between academic and professional students. Problems do exist and are recognized by a widening circle (8, 10, 14). The problems range from implementation on the one hand (10, 14) to a failure to fully understand the nature of PBL on the other (8). Effective implementation of PBL requires student-centered learning (3), which will degenerate into problem solving when it becomes teacher centered (3). Pining for teacher (expert)-centered learning (8) indicates a lack of understanding of the true nature of PBL. Glew (10) makes an interesting point and one with which the authors of this commentary agree,

“When you consider that an extensive literature seems to indicate that the PBL approach has worked well in many educational settings other than medical schools, you are left with the question of whether the disappointing record of undergraduate medical PBL has been due to some fundamental flaw in the philosophy behind PBL or if it is the result of a failure of proper implementation.”

Rangachari (12) agrees and goes further, indicting both faculty who won’t buy into the system and failures in teaching even the most basic science concepts. This is especially true in an institution that converts an existing program to PBL. It is easier to develop a PBL program de novo. Although Rangachari’s indictment of some faculty is valid in many cases, the students themselves are not totally without blame. New medical students will go where accepted, PBL or not. Once enrolled, they naturally want to do as well as possible, and there is tantalizing evidence that the use of resources may be geared toward being seen to perform well in tutorials, where evaluations are centered, rather than for learning and developing understanding (15).

No one doubts the rapid increase in information and facts. Just walk around the library or go on-line and note the proliferation of new journals and the increase in the published word count.

Professional programs are unlikely to increase in duration, and we are left to wonder how these programs will cope with this deluge of factual information. We believe that the solution will be to develop in our students a life-long ability to acquire an understanding of fundamental principles supported by a minimal database of facts. It is for this reason that we support PBL.

Medical schools that use PBL, whatever the type, have every right to claim so. Schools whose curriculum is based on teacher-centered problem solving should own up to this fact and not dress themselves up as something they are not.

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