Problem-Based Learning: A Paradigm Shift or a Passing Fad?*

Gwendie Camp, PhD, The University of Texas Medical Branch

Abstract: The use of problem-based learning in medical education and other educational settings has escalated. What once was considered a "fringe" innovation has become much more mainstream. The author raises issues surrounding whether PBL will become such a successful innovation that it becomes the "norm", or whether its popularity and widespread adoption will fade and be replaced by another, newer innovation.

History of the PBL Explosion:

Problem-based learning (PBL) in medical education began with the Faculty of Medicine at McMaster University in Canada in the mid 1960's. Soon after, three other medical schools - the University of Limburg at Maastricht in the Netherlands, the University of Newcastle in Australia, and the University of New Mexico in the United States - adopted and adapted the McMaster model of problem-based learning and developed their own spheres of influence in addition to the "mecca" at McMaster. A variation of problem-based learning at Michigan State University called "focal problems" antedated some of these efforts, but did not develop "followers" as did the McMaster model. From these four institutions sprang one of the more important educational movements of this century. The educational significance is that, unlike other important innovations, such as "organ-based" curricula or "interdisciplinary" courses, the use of problem-based learning in medical schools incorporated goals for students that are much broader than the acquisition and application of content. Indeed, PBL is expected to influence the "whole" student, or, at least, many aspects of the students' learning experience. There is so much that is different about a PBL curriculum as contrasted with the curriculum model of the previous decades that any real movement to PBL would have to be considered a "paradigm shift", implying a very different way of providing medical education.

From the origin at McMaster thirty years ago where the model for student-centered, problem-based, small-group learning took shape, adoption of PBL at other medical schools experienced a slow, though gradual increase through the 1970's and 1980's. Now, however, we are seeing an explosion in the use of PBL in its various adaptations. Today, most US medical schools and many in almost every country of the world are implementing (or are planning to implement) PBL in their curricula to a greater or lesser extent. In addition, PBL has spread into schools of health sciences, nursing, dentistry, pharmacy, veterinary medicine, and public health. Further afield, schools of architecture, business, law, engineering, forestry, police science, social work, education and many other professional fields have picked up the strategy. And at the collegiate level, there are also a growing number of faculty who are changing courses and curricula to a PBL format. The movement has extended into the K-12 arena as well.

(For those who are interested, there are several Internet Listservs and Home pages on the Internet devoted specifically to problem-based learning. There are also interest groups, newsletters, and organizations which promote the use of PBL and facilitate communication among its practitioners. See the Note at the end of this article.)

PBL shows signs, then, of becoming a "successful" innovation. Since we know that most innovations fail--that is, they either fail to become institutionalized by gaining permanent status at the home institution, or to become disseminated beyond the boundaries of the originating institution - this phenomenon of problem-based learning is worth a close look. Will PBL take the path of a completely successful innovation, e.g. become part of the culture in which it is placed, or, as is more common, have a brief, flashy period of success followed by disillusionment and ultimately, abandonment? There have been many innovations, discovery learning and programmed instruction, for example, which have had brief "moments in the sun" and then faded into the background, as is typical of most fads.

Why has there Been a PBL Explosion?

Why, then, has PBL achieved its current success and will the PBL phenomenon last long enough to become the new "traditional" way of educating medical students? I think there are a number of reasons why the use of PBL is growing so exponentially.

In many ways, PBL was the right response for the time in which it gained a foothold in medical schools, when one considers the questions which were being raised at the time about problems with traditional medical curricula. Many of these problems seemed resolvable with a shift to a PBL format. For example, faculty who want students to learn, to remember, to apply, and to continue to learn once out from under their tutelage have, under the "traditional" format, often been disappointed. Too many students memorize, forget, fail to apply or integrate knowledge, and resist further learning. Problem-based learning curricula seem to foster the more positive attributes of learning in students. Positive attitudes toward learning have been noted as characteristic of students at all schools which have implemented PBL. This does not negate the possibility, of course, that other strategies might also develop similar positive learning attributes.

Another contributing factor to the success of PBL as an innovation is that in the first few schools where it was attempted, it was perceived as being very successful by faculty and students. This success in settings sufficiently different from each other gave some confidence to other schools that PBL could be applied "universally," or at least, at their school. In fact, there was considerable communication between the early developers of PBL and later adopters. Most schools learned about the specifics of implementation of PBL "at the feet" of established programs, either by visits to the established programs, or by consultations of faculty from established PBL programs to new programs, or both. This "mentoring", I believe, has led to the successful implementation of PBL in many places. Then, once PBL had been attempted successfully by several medical schools, it became a "known" innovation and less risky than some other, less "proven" methods might have been.

Once PBL began to be utilized more widely in medical schools, there has been increased interest by applicants who heard about these programs as undergraduates and who seek admission to schools which have a PBL program. Some medical schools are interested in offering a curriculum which would enhance recruitment of students who already have developed an orientation to self-directed learning.

Perhaps more important, however, are the reasons which have to do with the process of learning itself. PBL, at least in the "pure" implementation form, fits with tenets of adult learning theory. Student autonomy, building on previous knowledge and experiences, and the opportunity for immediate application are all well-known to facilitate learning in adults, and thus should foster the success of a PBL approach with medical students who are adult learners. Knowles(1), considered the "father" of adult learning theory, proposed that appropriate conditions for adults to learn effectively include the following: a learning environment characterized by physical comfort, mutual trust and respect, mutual helpfulness, freedom of expression, accepting of differences, where learners perceive the goals of the learning experience to be their own goals, where learners accept a share of responsibility for planning and operating the learning experience and therefore have a commitment to it, where learners participate actively, and sense progress toward their own goals. Adults feel a need to learn when the learning process relates to and uses their own experiences. Those familiar with PBL in practice will recognize all of these conditions as relevant to the PBL tutorial group experience and to the whole atmosphere surrounding a PBL curriculum. Thus, at least for adults, PBL is a good match with conditions believed to facilitate learning. Professional schools of all types, then, would have an interest in the potential of PBL to facilitate learning in their students.

PBL is consistent with current philosophical views of human learning, particularly constructivism. Three primary constructivist principles, according to Savery and Duffy(2) are that understanding comes from our interactions with our environment, cognitive conflict stimulates learning, and knowledge evolves through social negotiation and evaluation of the viability of individual understandings. Constructivism assumes that "knowledge" is not an absolute, but is "constructed" by the learner based on previous knowledge and overall views of the world. Thus, the opportunity to find knowledge for oneself, contrast one's understanding of that knowledge with others' understanding, and refine or restructure knowledge as more relevant experience is gained, (all of which are done by students in PBL curricula), seems to harness the reality of learning. Other views of knowledge, such as logical positivism, would expect that students could be told the "truth" about what is known about science and medicine, as is done in many lecture settings, and that, because they have been told it, they would all then have the same knowledge and understanding of the content. This philosophical view, and the logical consequences, no longer has the currency that it once did, either with scientists or with educators. The constructivist view of learning facilitates the adoption of PBL from pre-school to post-graduate training, and broadens its application far beyond medical training.

Norman and Schmidt(3) have written an important paper describing how PBL fit with established psychological principles of learning. They reviewed experimental evidence supporting possible differences in students' learning that could be attributed to PBL. They concluded that there is not yet any evidence that PBL curricula result in improvement in general (content-free) problem-solving skills, although they caution that problem-solving skills independent of content acquisition may not exist. However, there is evidence that PBL students retain knowledge much longer than students taught conventionally, although their initial learning may be less extensive. In studies requiring integration of basic and clinical knowledge, problem-based students tend to do better in providing causal explanations of the pathophysiologic processes underlying disease. They conclude that there are substantial differences in retention of knowledge and learning attributable to PBL. There is preliminary evidence that PBL students

may be better able to transfer concepts to new problems. And lastly, it is evident that PBL does have a large impact on self-directed learning skills, and on students' motivation. There is a nearly universal finding that graduates of PBL schools find the learning environment more stimulating and humane than do graduates of conventional schools. Thus, established principles of learning which have been elucidated through observation and research over the past century, principles such as motivation, relevance, practice (repetition), active learning, and contextual learning operate significantly in a PBL environment, and to a much lesser extent in conventional curricula.

And last, but not least of the reasons why PBL is "catching on" is the desire of faculty or administrators at schools which have not yet implemented PBL to avoid "missing the boat". In other words, there is a temptation to join the parade or get on the bandwagon so as to not be perceived as behind the times. Unfortunately, this motivation can too often lead to only half-hearted implementation of PBL, which does not capture the "spirit" of PBL. These are the conditions under which, I believe, innovations become passing fads. Which leads me to my next point.

When is PBL not PBL?

It is expected that when an innovation spreads to institutions beyond its original site that adaptations will need to be made to account for difference between institutions--but at what point have the adaptations been so drastic that the claim can no longer be made that the innovation still exists? This question is being hotly debated by those who are using PBL either in a version close to the "original" form as developed at McMaster or in a version which includes many of the characteristics of "traditional" curricula. What are the attributes which make PBL really PBL and not something else?

Several years ago, I participated in an e-mail discussion for a time with Howard Barrows, LuAnn Wilkerson, and Michael Ravitch during which we generated our version of the characteristics of "pure" PBL. Other groups might develop a slightly different list, however, we agreed that, for the learner, problem-based learning is active, adult-oriented, problem-centered, student-centered, collaborative, integrated, interdisciplinary, utilizes small groups and operates in a clinical context.

By our definition, then, any program which does not place students in tutorial groups of, say, 5-10 students is not "pure" PBL, nor are programs which operate in a single discipline, such as pathology, or pharmacology, or physiology, or neurology. In addition, if the program is "teacher-centered" rather than "student-centered," the heart of "pure" PBL has been lost.

Often faculty are reluctant to relinquish control of the learning process, so that PBL is implemented in a way which keeps the teacher "in charge" of what is learned, but packaged into cases and small group discussion. Edwin Bridges, in a description of a program he developed for the professional training of educational administrators(4) calls this "problem-stimulated" learning, but we would not call this problem-based learning, as it is not student-centered.

When, then , is it not "pure" PBL? When it is discipline-specific, case-based (or problem-stimulated) but not student-centered, when much of the instruction is still in traditional formats such as lectures and labs, and when the assessment of student performance rests solely or primarily on content acquisition. When a PBL course must be buried within a surrounding set of traditional courses, it is not "pure" PBL, as students will have lost the time necessary for independent study.

One of the complications of interpreting research on outcomes of PBL programs is that so many different variations of PBL exist, from very "pure" to very "impure" and each variation is called PBL for purposes of reporting the research. The same criticism could be made of lumping all "traditional" curricula together as if there were not significant differences between different types of "traditional" curricula.

What will be the "Natural History" of PBL as a Pedagogical Strategy?

Will PBL follow the natural history of many other innovations, i.e. become part of the general educational structure, but then, (as so often happens) be implemented poorly, only to be replaced by another innovation to address problems with PBL as implemented? Or will it remain true to the original conception as a real alternative to traditional curricula? There are numerous examples of other innovations which have become "routine" and also implemented poorly - for example, the use of lectures, the use of slides in presentations, multiple choice test items (MCQs) - which were promoted as strategies to improve education. Now we question these innovations for not delivering what was promised and we look for alternatives. Perhaps the early proponents of lectures, slides, and MCQs would be horrified to see how the use of these techniques deteriorated from the original intent. Will the same fate befall PBL? Instead of a paradigm shift, are we witnessing the current educational fad?

If not PBL Forever, then what Next?

Assuming that change and evolution is inevitable, what can be seen coming just over the horizon which might replace or enhance the use of PBL? Some of what I see coming is apprentice learning via computers, particularly in the use of virtual reality. As hardware and software become increasingly sophisticated, medical training would be an obvious application for "virtual" patients. Systems such as these are in the early stages of development. While standardized patients (SP) have been an important innovation in their own right, they are still people, after all, and one can't practice too hard or too invasively on an SP.

Another potential coming innovation could be interdisciplinary teams as small learning groups. A team made up of a nursing student, a medical student, a social work student, and a pharmacy student, for example, could operate differently from the PBL tutorial group as currently constituted. Rather than all students learning the same content as in most current PBL tutorial groups, these students could have different content needs even when studying the same case. While they may profit from the group discussion which addresses each professional's interest, they may not all study the same topic areas outside the tutorial group.

Another real possibility could be computer-based (or "virtual") groups, especially of students who are geographically separated from each other in practice sites for clinical training. Some would argue that computer-based groups are "better" than the "traditional" PBL small-group tutorial setting because the arrangement frees up faculty time for individual mentoring, observation, and feedback, which are more important for development than small group facilitation.

One of my close colleagues envisions a scenario where cases would define the medical school curriculum, but many of those cases would more closely mirror the "new" emphasis on health care, as opposed to medical care, with "problems" focused around prevention, health care delivery, and "wellness."

In Summary

PBL is an innovation which has definitely "caught on" in medical schools and in numerous other settings. The probable reasons for this are many. So, it is likely to become a strategy employed in most, if not all medical schools. Some will make more use of the "pure" model; other will make all kinds of modifications which hybridize with traditional methods.

PBL will undoubtedly change in its implementation from the initial conceptions because of both new demands and opportunities placed on schools, and because of "poor" or half-hearted implementation. Depending on whether these adaptions result in continued improvement of the educational process for students and faculty, or whether they are seen as "we tried it and it didn't work" attempts, will determine whether PBL s seen as a genuine paradigm shift or another one of those fads which come and then go.

Speaking for myself, I hope it is a paradigm shift. The part of me that sees the glass as half-full believes that this is the future for medical education. The other side or me, though, the half-empty side, remembers all those other educational "fads" and sighs.

References

1. Knowles ME. The Modern Practice of Adult Education. Cambridge/Prentice Hall, 1980, 57-58.

2. Savery JR, Duffy TM. Problem based learning: An instructional model and its constructivist framework. Educational Technology 1995;35(5):31-7.

3. Norman GR, Schmidt HG. The psychological basis of problem-based learning: a review of the evidence. Acad Med 1992;67(9):557-65.

4. Bridges EM. Problem Based Learning for Administrators. ERIC Clearinghouse on Educational Management, Eugene, OR, 1992.

Appendix

Home pages on the Internet related to PBL:

http://ddsdx.uthscsa.edu/pblist/pblisthome.html

http://pegasus.cvm.msstate.edu/acad/pbl/index.html

http://edaff.siumed.edu/DEPT/Index.htm

http://www-civil.eng.monash.edu.au/affil/pbl-list/index.htm

Internet discussion lists related to PBL:

PBLIST: send message (subscribe your name) to : listproc@sparky.uthscsa.edu

PBL-LIST: send message (subscribe your name) to: majordomo@eng.monash.edu.au

Organizations which promote the use of PBL:

Australian Problem Based Learning Network:

alpjl@cc.newcastle.edu.au

Network for Community-Oriented Schools in the Health Sciences:

secretariat@network.rulimburg.nl

Dr. Camp *is the Director of the Office of Educational Development and a Professor of Medical Education at The University of Texas Medical Branch. She can be reached via e-mail at Martha.Camp@UTMB.EDU*

Reference

Camp, G. Problem-Based Learning: A Paradigm Shift or a Passing Fad? MEO 1996;1:2.