Problem-based learning: a dissemination success story?

Robert W Sanson-Fisher and Marita C Lynagh

ABSTRACT

- The demand to implement clinical and educational strategies based on evidence has increased in the past two decades.
- Over a similar time frame, the problem-based learning (PBL) approach has been widely adopted by undergraduate medical schools, in spite of empirical reviews suggesting that its effectiveness may be limited.
- Students claim that PBL provides a more satisfying learning experience than traditional methods. While such an outcome is desirable, it is substantively less than the original promise of the approach.
- We hypothesise that the widespread adoption of PBL may be more a consequence of the approach meeting criteria for successful dissemination than of demonstrable positive educational outcomes.
- We suggest that greater effort should be taken to articulate and measure important undergraduate educational outcomes. Alternatives to the PBL approach should be actively considered.

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There is now widespread agreement that there is a need for evidence to underpin as much medical education as is feasible. Without such evaluation, educational funds may not be used in a rational and effective manner. Of the many issues in undergraduate medical education under scrutiny, it is the problem-based-learning (PBL) curriculum that has recently generated intensive discourse.[1-3] For most people, PBL is synonymous with small-group learning, study directed by specific clinical problems, student identification of personal knowledge deficiencies, encouragement of self-directed learning, and an integration of the basic and clinical sciences.

It has been argued that the PBL approach satisfies the assumptions underlying adult learning theory[4] and therefore facilitates a greater understanding and integration of the basic and clinical sciences,[5] improves retention and recall of important units of information,[6] fosters life-long self-directed learning skills[7,8] and encourages and strengthens hypothetico-deductive reasoning[9] (a form of reasoning in which predictions deduced from a hypothesis are tested by empirical data), hence better preparing students for their future as medical practitioners.[6]

The use of PBL in undergraduate medical education and other professional training programs has increased exponentially and remains on the rise. For example, most of the existing and impending medical schools in Australia are, or will be, implementing PBL in their curricula. A number of interest groups, organisations and Internet websites promoting PBL have also been established. The PBL revolution has also spawned a growing body of research that attempts to evaluate the effectiveness of the approach. Given the government's recent expression of intent to review undergraduate medical education in Australia, it would seem timely to examine this research.

Evidence surrounding PBL

Six reviews of PBL have been published in the past decade. Norman and Schmidt's[10] 1992 review found that students taught with PBL curricula were superior in knowledge retention but inferior in overall knowledge and competence when compared with students taught by traditional curricula. Vernon and Blake,[11] in their 1993 review, concluded that PBL students' attitudes, class attendance and mood were better than those of students in traditional teaching institutions. Albanese and Mitchell[12] reported similar findings. Colliver's[8] 2000 review concluded that, although some studies show marginal outcome advantages for students educated under PBL, there is no evidence of educational superiority to the extent one might expect given the resource-intensive nature of the PBL curriculum. The review by Nandi et al[13] in the same year concluded that PBL students consistently find their course more enjoyable and demonstrate better interpersonal skills compared with traditionally trained students. The most recent review, conducted by Newman[14] in 2003, indicated that PBL students report greater satisfaction and employ more productive approaches to study. However, in terms of knowledge accumulation and practice-based outcomes, results from the articles analysed were mixed, with some showing benefits for PBL students and others indicating benefits for traditionally taught students.

In summarising the evidence to date, it appears that the most consistently demonstrated advantage of the PBL approach is the personal satisfaction of medical students engaged in this form of learning and their superior interpersonal skills. The importance given to these aspects of the educational process is, perhaps, a matter of social and institutional values. One could speculate that a more enjoyable, formative educational experience may translate to a greater resilience when coping with potential difficulties in one's professional life. However, testing such a hypothesis would be difficult. Students following a PBL approach consistently graduate with a knowledge of the basic sciences that is inferior to (or at most on a par with) that of students taught in traditional courses.[9,10,15] PBL may be more effective in some topic areas, such as behavioural sciences[14] and psychiatry.[16] The amount of basic science knowledge that is enough to equip an undergraduate to successfully and confidently function as a medical practitioner is unknown and would be difficult to determine.

Evidence that PBL curricula lead to greater retention and recall of information and a strengthening of hypothetico-deductive reasoning is not robust and is mostly absent from research findings. As this is one of the educational rationales for adopting a PBL curriculum, one must question the reasons for the continuing growth in popularity of PBL. This is particularly

Faculty of Health, University of Newcastle, NSW.
Robert W Sanson-Fisher, PhD, Professor of Health Behaviour;
Marita C Lynagh, PhD, Lecturer.
Reprints will not be available from the authors. Correspondence: Professor Robert W Sanson-Fisher, Faculty of Health, University of Newcastle, David Maddison Building, King Street, Newcastle, NSW 2300.
Rob.Sanson-Fisher@newcastle.edu.au

pertinent given the political negotiation and resource expenditure required in adopting a PBL approach to undergraduate medical education.

Questions have been raised about the appropriateness of meta-analyses and randomised controlled trials for evaluating medical curricula.[1,2] Farrow and Norman suggest that, because of the complex and social nature of educational interventions and settings, controlled trials are not appropriate and that this has contributed to "the difficulties ... in coming to a definitive answer".[2] Others have echoed these sentiments, arguing that controlled educational trials are "doomed to fail".[7] There needs to be debate over the use of alternative methodological approaches that would allow us to examine the effectiveness of educational interventions and also enhance our understanding of the conditions under which certain interventions are most or least effective. Researchers must find a research design that suitably overcomes the many obstacles, both ideological and practical, associated with evaluating this type of intervention, yet still maintains an acceptable standard of scientific rigour.

It is reasonable to question why, given the lack of substantive evidence in favour of PBL, medical schools have expended substantial effort and energy in implementing it. Some of the reasons offered for the explosion in popularity of PBL programs include increased interest from applicants seeking to experience a PBL program; consistency of PBL with current philosophical views of human learning, particularly constructivism (ie, the belief that learning is affected by the context in which information is taught as well as students' existing knowledge and beliefs); and the desire of medical schools to be innovative and not lag behind educational trends.[17] While these factors may have influenced its rise to prominence, we believe that one of the principal reasons for its ready adoption has been the fact that it satisfies the five criteria for "successful dissemination" cited by Rogers in his "diffusion of innovations" theory.[18]

Why the dissemination of PBL has been so successful

Perception of relative advantage over current practice

Although empirical data do not strongly support claims that PBL leads to advantageous educational outcomes, there is a strong perception that PBL represents an improvement on traditional methods of education. Proponents of PBL have claimed that it "is one approach to reform that has international credibility"[19] and that "medical schools are turning to problem-based curricula to develop in graduates the capacity to 'self-direct' further learning".[20] Supporters of the PBL curriculum promote the belief, without substantive empirical evidence, that this mode of learning is advantageous.

Compatibility with sociocultural values, past experiences and needs

There has been a shift in the community's perception of its relationship with the medical profession. Complaints can be voiced, second opinions garnered, and demands made of the medical provider directly. Given this cultural environment, modes of medical education that appear more democratic and less hierarchical in their methods gain favour.[21] PBL is seen as more democratic and humanistic: the individual's voice is valued, and students are no longer silent receptors of knowledge from their superiors.

Furthermore, the adoption of PBL provides an opportunity to achieve change in curriculum content,[22] reflecting the ideology of the educational change agents promoting the approach. This has led to a greater emphasis on topics such as community medicine, interaction skills, palliative care and other learning areas that were traditionally marginalised or neglected in the curriculum.[23] This change has strengthened the community-centred flavour that PBL medical schools promote. PBL is therefore ideologically commensurate with current community attitudes towards medicine.[21,22,24,25]

Lack of complexity in the understanding and use of the innovation

Learning about medicine from a clinical problem and the questions the problem generates seems straightforward and appears superior to learning about medicine via an organ-based model of teaching.[26] Students deal with data that are integrated into a problem, not dissected out into neat strands dissociated from the contexts in which they are bound to occur in actual clinical situations. Having this integration in the learning of medicine sounds appealing both for the educational rationale it supports and for the community values it emulates. If a student has had to digest all of their medical knowledge in a patient-centred, integrated and "holistic" manner, then perhaps patients will be treated with compassion, as individuals with an illness, rather than as the unfortunate biochemical read-out of an ill-functioning kidney.[27] Schools with a PBL approach are seen by the public and the medical community alike to be contributing something positive to the health care system.

Opportunity to trial the innovation before complete adoption

Another reason for the successful dissemination of PBL has been the opportunity for medical schools to institute trials or partially adopt the method.[28,29] Individual academics can learn about the approach and practise the skills needed to implement it, either within their own institution or in a host institution. Being able to trial the approach in a supportive environment increases the probability that it will be adopted. It allows individuals in the system to experience components of the PBL approach and eases in the adoption of the wider components such as devolution of departments and merging of clinical and basic sciences.

Ability to observe the results of adoption relatively quickly

PBL is an eminently observable process. Visitors can come, watch, and be impressed with sessions in which PBL is demonstrated using collaborating tutors and students. This strategy was used with considerable success by McMaster University, Canada, in introducing many to the approach. Such observations invariably excite and enthuse the observer. The experience of watching a vast lecture theatre filled with an anonymous, silent mass that dissipates after the lecture does not generate as much enthusiasm as watching a small group of engaged individuals, each contributing to the development of a relevant clinical problem. In general, the students approach this task with enthusiasm and collaboration, their impressive intellectual capacity on display. The demonstrability of the approach has been an important component in the successful dissemination of PBL. Students

enjoy PBL more than the traditional forms of medical education. Enthusiasm is, by its very nature, contagious. The approach sells itself, in part, because it looks appealing to an external observer.

Other factors

In addition to satisfying Rogers' five criteria for the successful diffusion of innovations, a number of other factors may have played a role in the successful dissemination of PBL. First, there have been strong and charismatic advocates who have championed its use, including academics at McMaster University; Maastricht University, The Netherlands; and Newcastle, Australia. These individuals were highly motivated about the need to effect changes in the undergraduate course and possessed a strong belief in the power of PBL to achieve the necessary reforms.[30] Many of the medical schools adopting the PBL experiment in the early stages were newly founded and dedicated to the method — a factor that may have increased the levels of allegiance. Staff came to these institutions with the knowledge that they were part of a radical, utopian-type reformulation of medical education. These new faculties were hives of innovation, with no bastions of traditional methods to overthrow.

Secondly, PBL has high face validity, as it appears to mimic, in a perhaps structured and artificial manner, the perceived thought processes that a physician may use in diagnosing and managing a patient's illness. Dissolving the barriers between preclinical and clinical education has further appeal for clinicians, and they can now be involved in all years of a doctor's education.

Conclusion

The PBL approach to medical education has been widely adopted and has spawned great interest in evaluating its effectiveness. Available evidence, although methodologically flawed, offers little support for the superiority of PBL over traditional curricula. Given the current emphasis on evidence-based practice, PBL's explosion in popularity needs to be explained. We postulate that PBL may have been successfully disseminated because it meets the criteria for diffusion of innovations rather than meeting requirements of evidence-based practice. We need to articulate undergraduate education goals in such a way that outcomes can be measured in a robust manner. Additionally, alternatives to the PBL and traditional undergraduate educational experience should be actively explored.

Competing interests

None identified.

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