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Is problem based learning a suitable curriculum model for training complementary and alternative medicine practitioners?

Abstract

Problem-based learning (PBL) is curriculum model in which students acquire knowledge by working through complex, real-life problems. PBL is widely used within undergraduate and postgraduate training programs for conventional health care professionals and is thought to produce long-term improvements in diagnostic and other knowledge related skills and well as improved interpersonal and general work-related skills. There is a paucity of data on curricula for training of CAM practitioners and in this review the potential for using PBL within CAM practitioner training explored.

Introduction

Problem based learning (PBL) is a curriculum model that has been adopted by educators in a number of medical and allied health disciplines including medicine, nursing and dentistry with the most data on implementation and outcomes derived from experiences within medical schools. PBL has become a popular curriculum model that is seen as the answer to contemporary educators' desire for students and graduates to be able to problem solve, be self-directed in their learning and to be all-round better health professionals. The benefits of PBL are thought to be particularly beneficial to training of health professionals as their clients will have complex health and other issues that are only poorly dealt with by textbook or lecture/tutorial examples. These benefits would be expected to be of value in training of complementary and alternative medicine (CAM) practitioners. In this context the term 'CAM practitioner' refers those who have received specific training in, and practice, one or more CAM modalities (e.g. naturopathy, homeopathy, herbal medicine). Further it might be suggested that PBL would provide a more appropriate learning environment for CAM practitioners as it presents clinical problems in context and promotes higher levels of integration of knowledge than traditional curriculum based on discipline specific subjects.

A search of the major bibliographic databases (e.g. Medline, PubMed, ERIC) and Google Scholar found only one discussion of use of PBL for training of CAM practitioners (osteopaths) (1) however systematic evaluation of the outcomes of this program have yet to be reported. In fact there is a paucity of literature on research in educational issues and curriculum for training of CAM practitioners; this is in contrast to the large body of literature covering these topics from the perspective of training of conventional healthcare professionals. In lieu of research data on curriculum research in training of CAM practitioners the Internet-based course information for Diplomas and Advanced Diploma offered by Australian private colleges, Universities and TAFEs (Technical and Further Education organisations). No organisation stated using PBL within their program and curricula were based on completion of a number of discipline-specific subjects/units/modules (e.g. anatomy & physiology, professional ethics, western herbal medicine, iridology) taught primarily by traditional means (e.g. lectures, tutorials) in which the theory of each area is presented. Integration of core areas

then occurred in later, clinical subjects where case studies are incorporated into the curriculum of individual subjects; however these were still separated from subjects in professional practice or other areas. Based on this information it would seem that CAM practitioner training follows a primarily traditional theoretical knowledge focused model; as PBL was introduced to address the shortcomings in this model it would seem that there is an opportunity within CAM practitioner training to also move to a more PBL style of instruction.

This review will explore PBL as a curriculum model from the perspective of the health and medical sciences; the potential and actual benefits as well as the costs and challenges inherent in this model. This is then viewed a possible model for training of CAM practitioners.

Principles of problem based learning

Before moving to exploring the benefits and challenges of this model it is first necessary to define what is meant by PBL. PBL is promoted as a student-centred means of experiential learning which used 'real-life' and complex problems to guide students through their study (2-4). It has been described as "*a way of constructing and teaching courses using problems as the stimulus and focus for student activity*" (4) or a process whereby "*the learner is required to solve a specific problem whilst acquiring knowledge on how to solve similar problems*" (2). PBL can be applied to a whole course curriculum, a sub-set of the curriculum (e.g. in the later clinical years) or to an individual subject or unit. All definitions of PBL are quite broad and PBL have been interrupted differently by various groups using the model however at the centre is problem solving/investigation as means of knowledge acquisition (as opposed to knowledge acquisition from other sources which is then applied to solve a problem).

Barrows (5) developed a taxonomy of PBL in an attempt to capture the range of activities that might be considered as PBL while Harden & Davis (6) describe a continuum of curriculum models that incorporate problems as a learning tool. In this continuum of 11 steps the proportion, and focus, on rules and concepts relative to examples defined the different models. At one extreme theoretical

learning was based in acquisition of rules and concepts which were separated from real-life; at the other were PBL (step 10) and task-based learning (step 11) in which the real world problem/task was central and knowledge acquisition was an integral part of 'solving' the problem or completing the task. Most current CAM training appears to be at steps 1 (Theoretical learning), 2 (problem-oriented learning), 3 (problem-assisted learning) and 4 (problem-solving learning) where problems, when used, are there to be either solved or to illustrate a concept or rule. While these styles of curricula, with the exception of Step 1, use problems and examples within the learning environment the focus is still from a information-orientation with the problems and practical examples used to explore the information rather than the derivation of information from problem exploration. PBL takes this to the next stage and places the problem at the forefront of knowledge and skill acquisition. Like many later authors Harden and Davis believed that the transition to PBL increased students' discovery of learning, that it provided more of a challenge for students and would result in deeper, more meaningful learning because of the real-life context (4, 7-9).

Dolman et al. (7) further state that there are four key learning principles in PBL; these are that learning should be a:

1) constructive process,
2) self-directed process,
3) collaborative process, and
4) contextual process.

These statements go to the heart of true PBL. Learning is at the core of PBL and this should be an active process where students engage in a process that allows for elaboration and integration of existing knowledge with new knowledge gained as a result of investigating a problem. This process should be directed by the student and they have control over the direction of the enquiry process. This allows the student to develop skills in self-regulating their learning and is thought to establish the foundations of life-long learning. Integral to the PBL process is team or groups work. This stimulates real-life health care teams, for example, and fosters development of communication and other

interpersonal skills, as well as the ability to consider problems from a number of perspectives. Last, but not least, the learning must be in a meaningful context of the learning is to provide long-term benefits and transferability to post-graduation professional life. In addition the multi-perspective, context relevant and student driven knowledge acquisition is thought to foster deep rather than surface learning (2, 4-8).

It is perhaps interesting to note PBL shares many of its underlying principles with Knowles' concept of andragogy (10). Knowles stressed the important of self-directed, experiential learning that used problem-solving and material directly relevant to the students' personal or professional life in adult learning. PBL has had the greatest uptake and claims of success in post-graduate degrees (e.g. post-graduate medical programs) and the later years of undergraduate programs where students are older and have more life-experience, perhaps showing a convergence of the two models. This is also applicable to training of CAM practitioners and PBL may provide a more motivating environment for learning.

Problem based learning – does it work?

Much of the debate about PBL is whether, as a curriculum model, it actually achieves it aims and whether the graduates of PBL programs perform, in a professional setting, significantly better than their peers from more traditional lecture-based programs. It should be noted at the outset that there is considerable difficultly in comparing the outcomes from PBL to other types of curricula. This is part due to the variety of curricula types in so-called traditional models (e.g. extent of lectures, tutorials, case-based learning) and the style of PBL used. Reviewing the literature on implementation of PBL in medical schools (the most abundant of the literature on this topic) it is readily apparent that PBL is used to describe a range of activities that can include, but is not limited to,

- whole curriculum PBL in which there is no disciple specific teaching and all material is presented in a PBL format;

- mixed curricula where PBL is supported or supplemented by more traditional teaching models (e.g. lectures and laboratory classes for foundation sciences such as anatomy) or traditional curricula in the pre-clinical/early years of the course followed by PBL in the clinical or later years; and
- predominantly traditional curricula where one or more units may be taught according to PBL principles.

The nature of the PBL may also vary from a 'pure' PBL as described by Harden and Davis (6) to problem-solving, case-based, project-based or other PBL-like models. These other models draw to various extents on a stimulus question or problem which the student/s then need to solve (6, 8).

Hmelo-Silver (8) has reviewed the literature about the effectiveness of PBL in five domains – the ability to construct extensive and flexible knowledge; development of effective problem-solving skills; development of self-directed learning skills; capacity to effectively collaborate and development of intrinsic motivation for learning. The results are inconclusive and mixed and the caveat to all these comparisons is that, as described above, there is so much variety in the types of curriculum models used that the validity of comparisons may be questionable. Hmelo-Silver (8) found that in tests of ability graduates of PBL programs generally perform more poorly than those from traditional curricula expect where the question is presented in a problem-solving context. Students in PBL-type programs were also found to have better information processing ability and were more able identify concepts and information that could solve a particular problem. Problem solving skills were, perhaps not surprisingly given PBL's focus on problems, found to be better in students taught using a PBL approach; however there does not appear to be conclusive evidence that these students were better collaborators. Twari et al. (11) reported that there were significant differences in critical thinking ability between first year nursing students taught by PBL compared with those taught by lectures, this was attributed to the active nature of PBL learning rather than passive attendance at lectures. In contrast while Beers (12) found no difference in objective content knowledge, students were found to have improved long-term retention of knowledge following PBL (13). Schmidt and collegues (14)

also report that there is a long-term improvement in a number of cognitive, interpersonal and general work related (e.g. task planning) domains in graduates of PBL programs. One of the difficulties in interrupting data in this area is that the comparisons are often done on a single cohort of students making generalisability problematic. Hoffman et al. (15) have reviewed 10 years worth of United States Medical Licensing Examination data from their medical school and conclude that graduates from PBL programs are better prepared, and able to cope, with the complexity of contemporary health care practice. There is no reason to believe that CAM practitioners would not also benefit from the improvement in knowledge and skills that PBL may offer.

One of the concerns raised about PBL is that the gains in some skill areas (e.g. problem solving) are off-set by reduced knowledge in specific discipline areas such as core sciences. Jones, McArdle and O'Neill (16) found that medical graduates from a PBL course were more likely to report that their knowledge of underlying disease processes (pathophysiology) was weak, however this was not supported by the students' supervisors and the PBL students feel more prepared than students from the traditional curriculum in areas such as diagnostic skill, using informatics and coping with uncertainty. Prince et al. (17) found few differences in anatomy knowledge following PBL and noted that where differences did occur it was related to the inclusion of a clinical context in teaching, however this was independent of whether or not the clinical context was within a PBL framework. Perhaps the best approach is that offered by Smith (18) where PBL is supported by lectures or other more traditional types of teaching to ensure comprehensive coverage of core sciences. This produces a blended curriculum model which draws on the best aspects of several models.

Whether PBL improves self-directed learning or intrinsic motivation is less clear; these are complex phenomena which relate, in part, to the characteristics of individual students (8). Harvey, Rothman and Frecker (19) found no significant effect of PBL on self-directed learning, in fact these authors showed a trend to decreased self-directed learning with increasing curricular year. Telor et al. (20) found mixed student responses to PBL – some found the approach gave them confidence and fostered integrated learning while others found it frustrating and felt they were wasting time on irrelevant

material. The lack of guidance and direction about what to learn, and what was important, was for some students a source of anxiety and uncertainty. This study also reported that students found the curriculum increased their motivation to be doctors.

In summary, PBL has been shown to offer a number of benefits to students and may provide a better training for professional life. However, the preceding discussion is based almost exclusively on data from medical schools and it is unknown whether the improvements seen in medical graduates as a result of PBL would also been seen in CAM practitioners. The data from other health professionals, such as nurses, pharmacist and dentists, although less extensive would suggest that the improvements are not profession specific and that improvements would also be seen in CAM practitioners.

The costs and challenges of PBL

PBL as a curriculum model presents a number of costs and challenges to successful implementation. The most obvious is perhaps the design of effective problems. Too simple and the students are insufficiently challenged, too complex and the aim of the exercise is lost. The problems need to be relevant, real, and sufficiently complex to allow students the opportunity to explore the problem in some depth and to meet the course or unit outcomes (2, 7). Eschach and Bitterman (21) add that the problems should increase in complexity as they are presented, that new cases should "*violate expectations from prior cases*" and they should change behaviour and be presented in a variety of verbal and nonverbal formats. Several authors provide guides to the development of valid and reliable problems (9, 22, 23) however these do not provide mechanisms for evaluating whether the problems developed following these guides are aligned with key learning objectives or simulate the types of behaviours and learning activities that are at the heart of PBL.

Other significant problems within PBL relate to staffing and tutorial group dynamics. PBL can be a time-consuming and staff and resource-intensive model – more staff are required to numerous small tutorial groups rather than one large lecture and libraries need to cope with the increased demand for resources. Small colleges training CAM practitioners may have difficulty meeting the increased

infrastructure needs of PBL, however this may prompt sharing of resources (e.g. library facilties) between colleges or between colleges and universities Few staff are trained specifically in PBL, rather they learn 'on-the-job' or by attending training workshops and seminars. This can be a significant cost to organisations in terms of recruiting and training suitably qualified new staff, training existing staff in PBL principles and in ongoing monitoring of PBL tutors to ensure that the appropriate level of guidance is achieved. Again the cost to colleges of implementing these training and monitoring systems may negate the benefits of introducing PBL. While tutors have reported satisfaction, and interest, from their PBL experiences they also report a sense of uncertainty about the underlying philosophy of PBL and when to intervene in students' discussions (24). Others report problems that can arise when staff find it difficult to relinquish control of the information transfer process to students (5). Another concern is that students are no longer exposed to inspirational lecturers or practitioners within the field and that this will have negative effects, particular within some CAM modalities, on the traditions of oral transfer of knowledge from experience to inexperience practitioner. Dysfunctional student groups can further complicate this and tutors need to be trained not only in PBL but in general group/tutorial teaching.

One further issue which is rarely addressed in the literature is the question of appropriate assessment for PBL. While there is much written about the implementation of PBL and graduate outcomes comparatively little attention has been given to assessment models which assess both knowledge acquisition and other, PBL specific, learning objectives. The question is whether traditional assessment methods which tend to focus on declarative knowledge are suitable for PBL and to what extent knowledge acquisition can, or should, be assessed separately to the PBL process. Hoon and Gwee (25)and Macdonald (26) present a summary of a number of process-oriented test strategies which are designed to assess the acquisition of process skills. One example is the triple-jump or three stage assessment which requires students to, over three separate occasions, orally work through a problem with an assessor in controlled and standardised conditions. However this method is reported to have low inter-rater correlation. The difficulties with assessment in PBL have also meant that many

programs grade on a competency basis (Pass/Fail; with opportunities for resit) basis rather than a range of numerical or letter grades (e.g. High Distinction, Distinction etc. to Fail)

Conclusion

PBL is widely used in the training of conventional health professionals. As a curriculum model it has many actual and potential benefits however there are significant costs and challenges associated with implementation of PBL. To date it been used primarily in on-campus, professional courses where professionally relevant work skills such as team work, problem-solving and communication skills are seen a more critical in graduates than theoretical knowledge. Whether PBL has a place in training of CAM practitioners is unknown however it is suggested that there is significant potential for PBL implementation in CAM training. Given the paucity of data on training of CAM practitioners generally, and on best practice curriculum models specifically, there is a need for more research in these areas. Key questions that need to be answered including, but are not restricted to: Is current training producing practitioners that can work in the ever-changing modern healthcare system? What are the strengths and deficits of current training? Are traditional/current curriculum models producing the types of graduate we want? Perhaps considering PBL in CAM training will help to address at least some of these questions.

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