Education for Health, Vol. 14, No. 1, 2001, 11–19

PROBLEM-BASED LEARNING

The Potential Utility of Problem-based Learning in the Education of Clinical Psychologists and Others

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ABSTRACT *Clinical psychologists, like most health professionals, are in essence clinical problem-solvers. However, dealing with mental health problems may necessitate a greater relative reliance upon inductive clinical reasoning during the problem-solving process. To develop a provisional problem formulation mental health professionals may have to make sense of the co-occurrence of complex and poorly delineated problems. Claims have been made, predominantly in the literature on medical education, regarding the utility of problem-based learning (PBL) for achieving aims central to the effective performance of this role. In this article, after characterizing clinical psychology and PBL, we briefly explore the benefits claimed for PBL and assert that the putative cognitive and interpersonal consequences of the approach may be particularly pertinent to mental health practice. Particular emphasis is placed upon the necessity of facilitating effective clinical reasoning, that is, teaching future practitioners how to, rather than what to, think about complex psychopathology. PBL is also considered in the wider context of models of experiential learning and methods for teaching problem-solving. Finally, future research questions are suggested which may provide answers relevant to the facilitation of effective clinical reasoning in all health professions.*

KEYWORDS *PBL, clinical reasoning, clinical psychology, problem-solving, mental health.*

Clinical Psychology

A decade ago an independent review of the role of clinical psychology within the British National Health Service (MAS, 1989) emphasized the attributes peculiar to the profession, concluding that a distinguishing factor (called level III skills) is a flexible and generic knowledge of psychology,

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Education for Health ISSN 1357–6283 print/ISSN 1469–5804/online
http://www.tandf.co.uk/journals
DOI: 10.1080/1357628001002193 2

which facilitates an ability to draw upon multiple theoretical sources to devise individually tailored strategies for complex presenting problems. Congruent with this view, the primary task of clinical psychologists is problem-solving: 'at its best this approach solves the immediate problem, enables the person or organisation to be more competent and self-directed when confronted with a similar problem in the future and also creates new knowledge and methods which can be used by other people facing similar difficulties' (BPS/DCP, 1994, p. 2).

The role as defined necessitates practitioners to engage in an intricate process of inductive and deductive reasoning. These thinking processes precede and infiltrate clinical decision-making and the selection of intervention strategies. In what has been described as the great *terra incognita* of applied psychology—wherein some of society's most important problems reside (Peterson, 1997)—there is inevitably a heavy loading on the inductive element of the reasoning cycle. That is, clinical psychologists often have to practice in the absence of knowledge and need to be able to do it well (Stricker, 1992).

Regardless of the amount of relevant, domain-specific knowledge available, differing philosophical assumptions may predispose psychologists towards more inductive thinking. For example, viewing science as a method of inquiry rather than as a collection of facts (Kingsbury, 1987) may lead psychologists to take a *more* idiosyncratic approach to defining psychological problems. However, rather than being specific to one health profession it may be more accurate to consider this approach to be a predicable consequence of reasoning from a broad conceptual framework, such as taking a psychobiosocial approach (Rutter, 1986), rather than from a specific model or therapeutic school of thought.

Clinical psychology training (CPT) should, therefore, aim to provide information on and facilitate skills in problem-solving. There are many variations of the basic stepwise problem-solving process. Following problem identification, the steps generally involved are included in the DADIE acronym:

- *Define*: define the problem, e.g. in psychological terms
- *Alternatives*: generate alternative solutions
- *Decision-making*: evaluate possible solutions
- *Implementation*: implement the selected solution
- *Evaluate*: evaluate the consequences (and as necessary Define the problem, etc.)

Clinical reasoning infiltrates all aspects of the problem-solving process but is particularly relevant to the initial definition of the problem.

A problem in CPT is, then, how to achieve the kind of level III skills claimed for the profession and demanded by the work environment. How can we increase future practitioners' awareness and flexible use of a number of

theories and models whilst minimizing a propensity for over-reliance upon these constructions? We will now describe the aims of PBL, comment upon selected efficacy data and consider how PBL can help with the aims of CPT. In doing so the issues explored are assumed to be relevant to scientific mental health practice in general and, at least in part, to the training and practice of other health professions.

Problem-based Learning

Problem-based learning (PBL) is a form of discovery learning (Bruner, 1961). Whereas the term discovery learning is applied within a variety of contexts, generally characterized by learning through discovering answers rather than via being given them, e.g. the Socratic method within psychological therapies (see Overholser, 1993a,b), the term PBL is usually more specifically defined (see Engel, 1992; Gallagher, 1997).

The aims of PBL can be grouped into better acquisition and integration of scientific and clinical knowledge, improved clinical reasoning and other skills, and more effective lifelong learning skills. The putative cognitive effects of PBL can be viewed as underlying the perceived benefits of the approach or as the mechanisms via which the benefits are achieved. These include activation of prior knowledge, elaboration of prior knowledge, restructuring of prior knowledge, learning in context, and triggering of epistemic curiosity (Schmidt, 1993).

Schmidt (1993) places PBL firmly within the rationalist philosophical tradition and emphasizes its deductive nature. However, the method as typically described involves a central process of inductive reasoning, inferring a generalized conclusion from the problem statement. This conclusion, a hypothesis, is then tested on other data. This combination of induction and deduction is often referred to as hypothetico-deductive reasoning (Bisanz *et al.*, 1994). In relation to teaching and learning this process is best exemplified in the four types of learning tasks that make up the experiential learning cycle (Kolb, 1984): concrete experience, reflective observation, abstract conceptualization, and active experimentation (see Milne & Noone, 1996); a model with more of an empiricist flavour.

There are obvious parallels between the experiential learning cycle and the stepwise problem-solving process previously outlined. PBL incorporates aspects of both conceptualizations in its structure. However, if we want to produce better problem-solvers, are there not specific teaching methods for this? If so, how well does PBL incorporate these?

Nickerson (1994) describes eight specific methods: problem decomposition (subgoaling), working backwards, hill climbing, means–ends analysis, forward chaining, considering analogous problems, specialization and generalization, and considering extreme cases. He goes on to stress that

there is no reason to believe that any particular strategy is adequate to ensure effective problem-solving by itself and concludes that, as the strategies are not mutually exclusive, a mixed approach is likely to be the most advantageous.

It is unclear from the various published depictions of PBL how well the method as applied to any given tutorial group has explicitly incorporated these kind of strategies. It is worth noting that benefits similar to those claimed for PBL are claimed for methods of learning by discovery which do not rely upon the group format and protocol of PBL approaches but which have more obvious similarities with the essentially Socratic heuristics listed above (e.g. see Overholser, 1992).

How Well Has PBL Achieved its Aims?

There have been a number of meta-analyses and systematic reviews carried out to assess whether the theoretical benefits are demonstrable (see Albanese & Mitchell, 1993; Berkson, 1993; Vernon & Blake, 1993; Woodward, 1996). The aim of this section is to describe points from the reviews, and more recent studies, which may have particular pertinence for CPT. We will then go on to further explicate their relevance in the next section. The perceived benefits can be separated into the following areas.

Are There Direct Effects on Knowledge Acquisition?

There were originally concerns that medical students taught by this method would be disadvantaged in basic knowledge acquisition. The reviews mentioned above provide little evidence to reinforce this concern with PBL students typically doing at least as well as LBL (lecture-based learning) counterparts (see also Distlehorst & Robbs, 1998). One potential problem with this conclusion is that participation in PBL programmes has often been optional.

A recent study by Antepohl and Herzig (1999) used a randomized control trial to overcome this potential confound. They compared students' performance on a basic pharmacology examination [comprising of multiple-choice (MCQ) and short-essay questions (SEQ)] after one semester of PBL ($n = 55$) or non-PBL ($n = 57$). The examination results of the groups were similar, with a tendency ($p = 0.07$) favouring the PBL group on the SEQ component. Interestingly, within the non-PBL group scores were significantly lower on the SEQs than the MCQs ($p < 0.001$), whereas there was no significant difference between the PBL group's scores. These results may reflect differences in 'levels of knowledge' acquisition between the groups, that is, the SEQs assessing more understanding than the MCQs, which may tap more surface level, cue-dependent knowledge.

Does PBL Improve Clinical Reasoning Skills?

Effective clinical reasoning entails the thinking and decision-making processes necessary for an appropriate understanding of presenting problems and provides the basis for intervention (Scott, 1996). Historically, acceptance of the proposition that we can teach people *how to think*, rather than increase their domain-specific knowledge, has oscillated between waves of optimism and nihilism (see Lehman *et al*., 1988, for an overview). Scott (1996) outlines the extreme process- and content-orientated approaches as specifically related to clinical reasoning, describes a hybrid model (organized knowledge–cognitive processing integration), and neatly summarizes the commonsense mid-ground: 'clearly, both knowledge and ways of thinking are important to reasoning competence' (Scott, 1999; p. 2).

Hmelo *et al*. (1997) showed that PBL students could be differentiated on measures of knowledge, reasoning and learning strategies. For example, in relation to reasoning, PBL students were more likely to use hypothesis-driven reasoning in their explanation of a clinical case (F (1,36) = 15.59, $p < 0.001$) and generated longer reasoning chains (F (1, 36) = 7.22, $p < 0.01$), suggesting an elaborated causal understanding. Hmelo and colleagues relate the importance of this to the observation that 'experts' use more hypothesis-driven reasoning strategies when dealing with complex problems which they primarily appraise as being novel. They conclude that the demonstrable differences observed in the PBL students should lead to more flexible knowledge and problem-solving.

Hmelo (1998) compared volunteers from two medical schools—both of whom conjointly ran PBL and more traditional curricula—on the quality of the pathophysiological explanations they generated as being the mechanisms underlying a medical problem. Her sample consisted of 38 students exposed to PBL (19 full-time and 19 part-time PBL) and 36 non-PBL students.

Students were assessed at three points during the first year of medical school, on variables considered important to expert problem-solving performance: accuracy, coherence and comprehensiveness of explanation, reasoning strategies, and use of science concepts. In relation to reasoning, she found that, over the course of the year, the PBL students used more hypothesis-driven reasoning strategies than the non-PBL students ($\chi^2(4) = 42.1$, $p < 0.001$) and made fewer unjustified assertions, although there was a decrease overtime irrespective of condition ($\chi^2(4) = 25.0$, $p < 0.001$). Hmelo (1998, p. 92) concludes 'PBL students generate explanations that are more accurate, coherent, and comprehensive than non-PBL students. They transfer the reasoning strategies that they are taught and are more likely to use science concepts in their explanations'.

The results obtained by Hmelo (1998) and colleagues (Hmelo *et al*., 1997) suggest that students are likely to use the method of reasoning modelled and practised in PBL sessions, i.e. think through problems in the way considered most effective. The methodology used also demonstrates a means of measuring reasoning process which could also be used to assess the utility of different

reasoning strategies, e.g. by comparing strategy use with outcome for different types of clinical problem. Along with differences observed in clinical judgement, e.g. diagnostic accuracy (Schmidt *et al*., 1996), and the relatively strong clinical skills noted in PBL students (e.g. Blake & Parkinson, 1998), Hmelo's findings (1998; Hmelo *et al*., 1997) represent a step towards Thomas' (1997) suggestion of testing whether the patients of PBL-trained clinicians enjoy an improved outcome.

Other Beneficial Effects

The group format of PBL is a fruitful environment for trainees to hone attitudes and skills relevant to mental health practice. Block (1996) comments upon how exposure to diverse viewpoints, intratutorial conflict, and general group dynamics often found during PBL offer good learning experiences for group members. She draws a parallel with psychotherapy and suggests that in negotiating these difficulties group members learn to confront their own contribution to resolving or exacerbating problems. Aronowitsch and Crafoord (1995) similarly draw a comparison with psychotherapy and comment that the use of PBL in psychoanalytic training reduced unhelpful regression and improved integration of theory and practice.

Thomas (1997) describes differences found between PBL and non-PBL students in relation to self-learning skills. These differences include increased use of learning resources, more versatile study methods and increased likelihood of reading for meaning. As Norman and Schmidt (1992) emphasize, the importance of this may be mainly post-qualification, i.e. whether this difference is maintained and facilitates continued professional development.

Particular Benefits to CPT

PBL has at its core a necessity for students to engage in an intricate process of induction and deduction. In essence its function represents a microcosm of a central feature of clinical psychology itself (Kanfer, 1989). Implementing PBL within CPT would provide a prolonged period for practice of reasoning skills through which cross-domain strategies, or rule systems, could develop. Lehman *et al*. (1988) suggest that the domain-independent inferential rules that we are most likely able to teach are those that people require, in some measure, for their daily existence. They suggest a number of candidates, including rules for assessing causality and rules for determining argument validity (p. 441). If reasoning skills cannot be markedly improved by practice, then there are implications for selection. That is, selection should be biased toward variables which are related to effective practice but difficult to train (Dobson & Shaw, 1993).

Effective reasoning would have little impact without the presence of other variables related to effective practice, such as appropriate personal character-

istics and interpersonal skills (see Peterson *et al*., 1992). The group format of PBL provides an opportunity to identify interpersonal difficulties and to consolidate and build upon existing skills.

Given the inherent difficulty of the task of appropriately defining problems in a domain with a relative paucity of 'facts', with the risks of confirmatory bias, unjustified assertion and subsequent practice in the face of knowledge (Lazarus, 1990; Stricker, 1992; Watts, 1980) if theories are treated as facts, it is important that future practitioners are adequately prepared to be neither blinded by prejudices nor jump at conclusions (Flexner, 1925, p. 4). The epistemic curiosity and improved reasoning skills claimed for PBL appear good safeguards for scientific mental health practice.

Conclusion

PBL appears to have particular promise in facilitating attributes relevant to the practice of clinical psychologists and other mental health professionals. The optimal process for achieving the predicted general and cognitive effects of PBL requires further investigation. To demonstrate a specific method-based effect, it would be more relevant to compare PBL with alternate small-group teaching methods traditionally used within CPT. It also appears prudent to evaluate whether the aims of PBL can be facilitated by further integration of heuristic methods brought to light by the problem-solving literature (Nickerson, 1994). Or indeed, whether the aims of CPT can be more easily achieved via an alternate discovery learning teaching method that flexibly incorporates aspects of both, e.g. the combination of PBL with a specific course in cognitive skills (Scott, 1996). Any subsequent evaluation should include alongside outcome measures—e.g. domain-specific knowledge and clinical competency—sensitive measures of observed problem-solving process (e.g. systematic questioning and experimentation), reasoning and epistemic curiosity.

These aims may be the most relevant to scientific mental health practice. If PBL can be shown to facilitate the development of these cartography skills[1] through the great *terra incognita* of applied psychology, then it will have earned a central role in the education of all health professionals for whom ethical practice is dependent upon an ability to think through problems that they assume may be relatively novel.

Acknowledgements

The author would like to thank Peter Britton, Ian James, Derek Milne, and three unidentified reviewers for their comments on an earlier draft, and Charles Engel for inspiration and encouragement.

Note

1. Thanks to Guy Dodgson for this metaphor.

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