

Problem-based learning: how do the outcomes compare with traditional teaching?

INTRODUCTION

Problem-based learning (PBL) was first introduced into the medical curriculum in the UK in 1995.¹ With the support of the General Medical Council, who state that 'modern educational theory and research must influence teaching and learning',² it has now been adopted in the majority of UK medical schools and is a core component of teaching in the four new English medical schools.³ It is thought that PBL will better equip doctors for lifelong learning, but is there a good evidence base for such a paradigm shift beyond the application of modern educational theory?

DEFINITION

PBL essentially involves small groups of students discussing some trigger material (the problem), determining what they need to study, then meeting again to share the results of their learning. However some see PBL as a more general educational strategy embracing philosophy, curriculum, learning environment and outcomes.⁴ There is no agreed definition of PBL making comparison of studies difficult.⁵

LITERATURE

PBL is one of the most researched educational interventions,⁶ but little published has been of high quality.⁵ Authors frequently cite five reviews⁶⁻¹⁰ covering 91 papers, only four of which were randomised controlled trials. There was little overlap in the papers included between these reviews indicating the potential for bias, and unsurprisingly some contradictory conclusions were reached. Consequently none can be regarded as definitive.

Randomised controlled trials may not be the best method to study PBL since medical students are highly selected, and motivated to overcome shortcomings in their teaching, which would bias any results. More able students were found to

select PBL courses where there was not strict randomisation at entry, again introducing bias,¹¹ and this calls many supportive studies into question.¹² It is also hard to imagine that contamination would not occur, consequently there continue to be calls for more rigorous and appropriate studies of PBL.

OUTCOMES

Knowledge

Knowledge and test performance have been the most widely researched outcomes. PBL is thought to improve learning and retention of information and Norman and Schmidt, in their review,¹³ found several studies supporting improved retention of knowledge. Three other reviews found PBL students scored lower in basic sciences or knowledge,^{7,8} or demonstrated inferior exam performance.¹⁰ However the effect size was small,¹² and not reproducible. The exam has also changed over time, and Newman *et al's* meta-analysis showed marked heterogeneity of studies with an overall small non-significant difference in favour of traditional teaching.⁵ Berkson found no difference in her review,⁹ thus there is no consensus of evidence to support the superiority of PBL over traditional methods of knowledge acquisition.

Norman has questioned the comparison of formal assessments as students are not blinded to the intervention and factors such as motivation or enthusiasm are likely to influence outcome,¹⁴ and such tests do not address the intended outcomes of PBL. However, relatively little is known about the actual activities and learning processes of PBL¹⁵ and the profession and society in general rightly have an interest in our future doctors' ability to demonstrate objective standards of learning.

Skills

Since clinical problems provide the basis for learning in PBL it is assumed that

knowledge should be better integrated in the clinical setting.

Three reviews found that PBL students scored comparably or better than traditionally taught peers in clinical skills.^{7,8,10} Schmidt also reported higher diagnostic skills in Dutch students following integrated or PBL curricula compared to conventional teaching¹⁶ although only part of this variance may be attributable to PBL *per se*.¹² At Harvard PBL graduates showed higher ratings for humanistic and psychosocial skills¹⁷ and better relational skills,¹⁸ but differential dropout rates are likely to have confounded this finding.

Career choice

Albanese and Mitchell⁸ reported graduates were more likely to enter family medicine, and at Harvard a higher frequency of PBL graduates favoured family practice and psychiatry.¹⁷ Critics see the move to PBL as a future threat to some other specialties such as anatomy and pathology.

Weaknesses

The commonest concern is the higher delivery costs of the PBL curriculum, both financial and in staff time.^{8,9} The PBL approach is dependent on the functioning of the group,¹⁹ and requires an effective tutor who should be expert in facilitation rather than subject matter.²⁰

Preference

Students report high satisfaction ratings for PBL²¹ and a preference for small group learning,²² and four reviews also suggest that it is more enjoyable.^{5,6,8,10} It seems unlikely that the PBL approach could be the preferred learning style for all medical students, and more information on negative outcomes such as dropout rates or postgraduate career development is needed. The paucity of contrary published findings is troubling and may indicate publication bias.¹¹

DOES PBL CONTINUE TO BENEFIT GRADUATES?

Self-directed or deep learning is thought to be more suitable to continuing medical education (CME),²³ but harder to achieve with a heavy clinical workload.²⁴ Two reviews found that PBL promoted self-directed learning and that this was sustained.^{5,13} Higher resource uses by PBL graduates has been observed⁸ but another review of PBL in CME found little evidence for superiority.⁶ Shin *et al* found higher levels of current knowledge in PBL than traditional graduates,²⁵ but the PBL graduates were more likely to be involved in teaching, which confounds this finding.

CONCLUSION

In summary, there is evidence that PBL is popular with its students, associated with better clinical and problem-solving skills, that it promotes lifelong learning skills and probably does not sacrifice important areas of knowledge. However, it needs additional resources compared with traditional approaches. Little trial evidence yet exists from the UK, so these widespread and costly changes in our medical schools remain theory rather than evidence based.

There is a large international body of published literature, much of poor methodological quality, which quantifies the outcomes of PBL, but there is still a need for rigorous large studies covering a range of outcome measures before PBL can be demonstrated to be the training method of choice for the next generation of UK doctors.

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