Problem-based learning in initial teacher education: taking the agenda forward

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Abstract

Problem-based learning (PBL) is not new; in one form or another, it has been around for considerable time. Indeed, as Menon (1997) points out, it may be seen as originating with Dewey at the turn of the century. In this article I examine definitions of PBL, and some of the challenges and problems it presents. I look at the evolution of PBL, and some of the applications of this methodology - together with some of the detailed research which has been undertaken in this field. I also discuss the current United Kingdom models of initial teacher education, outline possible uses of PBL in this area, and describe research carried out in the University of Glasgow. Finally, I provide some discussion about the applicability of PBL in the area of initial teacher education.

The context of PBL

PBL has attracted a great deal of attention in recent times. It is recognised as useful, and indeed used extensively, in the education and training of students involved in the health care professions (Alavi 1995). Entire courses of medical education are now designed around PBL principles (for example, Lloyd 1999). It might be thought, in view of the deluge of material developed concerning PBL and the teaching and learning techniques associated with it, that this is a methodology which has a great deal to offer in the wider contexts of professional education - and it is my task with this paper to examine the potential of PBL for the initial education of teachers, to look at this within the contexts of professional teacher education in the United Kingdom (UK), and to refer to some research on the use of PBL in courses of initial teacher education within the University of Glasgow, Scotland.

One text that might be seen as an origin of PBL as it has evolved in recent times is that by Barrows and Tamblyn (1980) entitled: *Problem-based learning - an approach to medical education*. With this text, Barrows and Tamblyn offered a complete approach to medical education, based on the premise that it is better for a

student to discover and learn for her/himself, rather than to be informed by others and have to investigate a 'subject'. They also examined the approaches employed in contemporary medical education of the time, and developed a methodology that came to form the basis of the present day PBL.

In this methodology of PBL, students work in groups, so that there is a maximum of interpersonal communication and interaction. A teacher facilitates the groups during a tutorial process, presenting students with a medical problem - a case of a patient with particular symptoms or experiences. The students are then encouraged to consider, and if necessary to investigate for themselves, the causes and solutions to the particular set of problems presented by each patient. Emphasis is placed in this approach on reasoning, teamwork and the role of the teacher in understanding and presenting each individual problem. Barrows further developed this process and the role of the teacher in a subsequent work *The tutorial process* (1988).

The Barrows approach has been augmented and commented upon by several researchers since. Schmidt (1983) offered a developed rationale; and Walton and Matthews (1989) examined the implications of PBL in terms of a problem-solving curriculum, notions of student learning and the associated teaching methodologies developed around PBL.

The implications of PBL and its many problematics have not escaped the attention of learning theorists either: Boud and Feletti (1997) have offered a wide ranging discussion of these in the articles they edited. Interestingly, this discussion goes beyond medical and health care issues, extending PBL into other professions such as engineering, architecture, social work and law.

By 1993, Albanese and Mitchell were able to offer a review of what had been achieved over a number of years in terms of a burgeoning literature and research studies which not only covered the methodology and results of PBL, but also the costs of implementing it. However, also in that year, Vernon and Blake (1993) conducted a meta-analysis to compare PBL with more traditional methods of medical education. This supported the view that PBL was superior to the more traditional methodologies, particularly where student evaluation was concerned.

Berkson (1993) was, however, less convinced of the global effectiveness of PBL methodology. It was her view that PBL graduates were not distinguishable from those who had followed traditional courses: moreover, there were serious cost disadvantages in PBL courses as well as a perception of additional stress on students and tutors. Colliver (2000) conducted a further review of the literature relating to PBL, concluding that there was no convincing base of evidence that PBL improved either knowledge or clinical performance.

Chen et al (1995) have contributed a set of articles reflecting upon the process of PBL and encouraging debate about it; there were already controversies about its inflexibility and mechanism at this time. Chen's work is particularly interesting because it shows that PBL was by this stage not solely North American,

but rather a globally recognised approach in medical education. Hoffmann and Ritchie (1997) have described ways in which technology can cope with some of the 'problems' of PBL such as structure in learning, and offer potential multimedia-based solutions.

It is perhaps also interesting that recent debate on PBL has returned to the basic definitions and is focused on questions such as 'Do we all mean the same thing by PBL?' and 'What counts as PBL?' (Margetson 1998; Maudsley 1999). Distinctions are now made between *problem-based* courses and *problem-focused* ones (Maudsley 1999). Problem-focused courses may well retain the traditional learning techniques of the old disciplines and apply principles learned through these to problematic situations. On the other hand, the current vision of PBL is that of an interlocking web of experiences, where the problems themselves constitute the basis of learning (cf Margetson 1998) - and this is the definition which appears to offer a clear distinction between PBL and other, though related, experiences and situations.

It is also interesting to note that the principles of PBL as it has developed in these contexts place it firmly within constructivist principles - much in favour in current educational thinking. Knowles (1980) stressed the importance of mature learners having the freedom to use their own experience and learn from situations in which they are placed. Jarvis et al (1998) place PBL firmly within constructivism in defining and developing the concepts of experiential and social learning. Sivan et al (2000) have pointed out the importance of active learning in promoting critical thinking skills, while the significance of the social context of learning and the importance of providing opportunities for adult learners to work collaboratively has been well established. Thus, PBL sits well within current understandings of the process of effective learning and in that sense, is supported by much of the literature.

Challenges and dilemmas

PBL offers many challenges to the teacher educator. It is founded, as we have observed, upon the premise that it is better for the student to be an active learner rather than a passive one (Brookfield 1996). It is seen widely as a mechanism for enabling students to engage with materials and sources in a far more personal and meaningful way than might be the case were they to remain passive, or unchallenged learners. It questions disciplines and conventional perceptions of learning and teaching. It creates its own dynamics in the relationship between teacher and learner (Beardon 1995). It reconstructs and redefines the role of the tutor and it allows interaction to be the principal mediation between learner and defined learning objectives (eg Davis et al 1992; Dolmans et al 1996; Holmes & Kaufman 1994). Some research (Bridges 1992; Vernon & Blake 1993) indicates that students develop more positive attitudes towards learning when PBL is the modus operandi.

In all these respects, PBL may be seen as entirely favourable to achievement and learning. The question may then be legitimately asked: why does PBL not enjoy a much higher profile in a wider sphere of professional education, and indeed, why is it not the standard methodology in this area (cf Fenwick & Parsons 1998)?

The answers to these questions might lie within the nature of PBL itself, and also within the contexts in which it has developed. Firstly, it may be necessary to distinguish between PBL and problem solving activities within learning experiences. PBL is a whole methodology; courses are predicated upon it. It is not an add-on, but an entire approach (Engel 1991). On the other hand, I venture to suggest that there are few courses of professional education of any merit which do not include problem-solving activities of some nature, such as case simulation (eg Wasserman 1995). This does not mean, however, that the entire course is composed of these activities, and it is quite likely that there will be the usual mix of tutorials, seminars, lectures and practical activities in addition to the problem solving ones. It is also likely that many of these activities will be organised within a framework of disciplines of some kind, even if there are elements of an integrative nature within it: an example of this would be the 'professional studies' element of many teacher education courses (see Christie 1999; Humes 1995; McPhee & Humes 1998).

PBL, on the other hand, means bringing together many disciplines and allowing the *student* to make sense of their integration (eg Harland 1998; Newble & Cannon 1987). An example of this approach would be that of a patient who has been involved in a car accident: students would be required to research the anatomy, physiology and biochemistry of the case; to define, investigate and analyse the injuries incurred; and then to suggest suitable regimes for managing them.

This kind of integration has tended historically to be alien to teacher education, as it has to medicine (Papa & Harasym 1999). In initial teacher education at least, holistic approaches based upon the centrality of the child have had to sit - sometimes uneasily - alongside the need for competence-based approaches as required by government; considerations of systems and management; and knowledge of the latest policy dictates.

Secondly, it is necessary to look at the contexts in which PBL has developed. It has already been noted that it has, until the present, tended to be focused upon the health care professions, and on medicine and medical education in particular. In that context, it has developed on a global scale. Herein are a number of similarities and dilemmas. Both medical and teacher education are preparing entrants for caring professions of one sort or another. Both professions would claim to be concerned with the development and wellbeing of the entire person. Both are subject to central governmental control in one form or another. However, it is indisputable that hitherto medicine has been based much more upon information gathered from investigative processes into the natural sciences than education. Education is much less precise in many of its understandings; much more subjective. And while governments do not hesitate to prescribe what teachers should do in their spheres of activity, they are perhaps a little more reticent in their dealings with the medical profession (Downie 1990).

There are further similarities in that at their best, training and education for both of these professions involves close relationship between tutor and taught; modelling of good practice; appropriate reflective activity; and a substantial element of practical, hands-on experience (Graves 1990). Medical PBL involves all of these,

and stresses their integrative nature. But there are also methodological dilemmas in that unlike in medicine, the education of teachers can rarely afford to problematise: rather, it tends to deal with issues and themes. These may or may not be integrative in nature.

The use of case studies of individuals is also considerably less, reflecting the fact that the practitioner-client relationship is different both in scale and in nature: doctors do not tend - at least in so-called developed countries - to see their patients in groups of thirty or more. And teachers, although they are party to confidential information which has great impact upon their pupils' lives, share different experiences with their clients from those of doctors.

The assessment of students where PBL is utilised may be more difficult than in more conventional situations (Hoffmann & Ritchie 1997) - possibly because greater use is made of the collaborative dynamic. Although individual assessment is by no means impossible or incompatible with PBL methods (Chen et al 1995), once more the thrust to recording and certifying defined competences, in terms of the individual achievements, may prove a barrier to the acceptance of PBL in initial teacher education.

The contexts of UK teacher education

The systems of teacher education of the UK share certain characteristics, and have some notably distinctive features. Competence-based education is now accepted and understood: both in Scotland and England, teachers are required to be certified in a number of defined competences, and the nature and number of these is laid down by government (Scottish Office Education and Industry Department 1998; Teacher Training Agency 1998). Even the revised systems of benchmarking, introduced as a result of the assimilation of initial teacher education in Scotland within a university-based context, require students to 'demonstrate' prescribed knowledge, skills and attitudes (Quality Assurance Agency for Higher Education 2000).

A number of obligatory hurdles are specified, which each beginning teacher must clear in order to progress to Qualified Teacher Status in England and Wales, or to be eligible for provisional registration with the General Teaching Council for Scotland (Sutherland 1999). Within the overall frameworks provided by the training regulations, there are further requirements that teachers must be able to deliver national curricula; be knowledgeable about government initiatives and policies, school management and the raising of standards of pupil attainment; and should possess certain 'professional' attitudes and qualities. There is limited space available for considerations of a theoretical nature within contemporary teacher education (Ball 1995; Carr 1993; Hellertz 1996). Further, there are nationally prescribed regulations governing the length of school experience placements, and the roles of students and school professionals within these placements.

However, in Scotland the amount of time spent on practicum is somewhat less than that prescribed in England and Wales: conversely the amount of time available within the institution of higher education is theoretically greater.

Moreover, in Scotland the detail of prescription seems to be somewhat less precise. For example, whereas in England and Wales the methodology for the initial teaching of reading is prescribed in detail (Department for Further Education and Employment 1998), this is not the case in Scotland, where it is ostensibly a matter for the individual teacher education institution. In England and Wales, mentoring is a feature of school experience placements, with substantial proportions of the education of the beginning teacher being undertaken by the classroom professionals (cf Tomlinson 1995).

Recent research (Furlong 2000) indicates that 'entrusting' greater proportions of the teacher education experience to the schools has resulted in a great improvement in the satisfaction within the system with initial teacher education. In Scotland, however, although a limited experiment in mentoring was carried out some years ago, teacher education is at present still firmly located within the higher education system, and school experience issues are dealt with by institutions in collaboration with school partners - although at present, the arrangements for initial teacher education are once again under review. It would however appear that in general terms, the amount of room for a negotiated curriculum of teacher education is slim in respect to both UK systems, although the degree of flexibility afforded in Scotland may seem somewhat greater.

Within both systems, however, it is fair to say that there is an emphasis on knowledge of the school curriculum, the fundamental skills of class management and control, systems knowledge, school experience placement and educational theory of one sort or another. These are delivered within elements of curricular study, practicum and educational or professional study. The latter may be characterised by the presence of elements of child and developmental psychology, learning theory, sociology, language and, more recently, information and communications technology.

PBL in initial teacher education

Given the perceived advantages of PBL as defined above and as practised for some time within health care professions, there would, on the face of it, appear to be a good case for the introduction of this methodology within initial teacher education. This case is considerably strengthened if the approach to initial teacher education is carried out from a child-centred perspective, and if it is located within a constructivist approach to learning. It would then be possible to look at particular instances of child experience and to put in place the learning necessary to enable beginning teachers to understand that child experience and then to be able to cope with it.

Let us consider an example of this. A pupil in a secondary school has been perceived and assessed as bright and intelligent. That pupil's performance has not only been equal to national standard for the age, but has also excelled it. The pupil has also been seen as involved and motivated to learn by the teachers. Suddenly there is a drop-off in the student's attainment and with it, a concomitant worsening

of behaviour and attitude to learning. This may be a situation all too familiar to many teachers in contemporary schools.

But it also offers us a great deal in terms of PBL opportunities. Within this scenario, students can look at a whole range of important issues. Opportunities exist for study of learning theory, behaviour, and issues relating to motivation, discipline and control, and for investigation of national standards and policy. If a tutor were to introduce further considerations, as PBL techniques recommend, then students could investigate causality within the social and community domains and look at such issues as the relationship between learning and wider society, family factors associated with learning and even drugs use amongst teenagers. From the one scenario, a whole range of opportunities for student learning is opened out.

There is of course nothing new in utilising case studies or simulations in education (Taylor & Walford 1972) or teacher education (De Jong 1997). The difference between these and PBL, is however, a significant one. Whereas case studies and simulations may essentially be illustrative in nature, they do not necessarily problematise the issue. Moreover, they are most likely to lead to tutor explanation and/or exposition rather than to further student-driven investigation (Wasserman 1995) and reporting back. In other words, such studies and simulations do not necessarily constitute the *spine* of the learning - whereas in PBL this is generally the case. Utilising PBL techniques involves an important power shift from the tutor to the learner, as well as significant developments in the role of the tutor her/himself (eg Silver & Wilkerson 1991).

Preliminary experimentation with this approach by tutors within the Faculty of Education of the University of Glasgow - where limited use of PBL techniques was made in the professional studies element of the Postgraduate Certificate in Education (PGCE) secondary course, and also within the Professional Integrated Programme (where issues are investigated on a thematic basis) - suggested that indeed there was merit in employing these PBL techniques.

The technique need not be restricted to consideration of individual child learning cases, valuable though these might be. Aspects of management can also be subjected to the PBL approach. For instance, it is possible to propose a school management scenario, with groups of students cast in the role of school committees empowered to address the management issues, dealing with complications and further refinements fed in by tutors.This particular PBL session has proved highly effective and popular at the University of Glasgow, and certainly much more enjoyable than listening to formal lectures. By practice and experimentation, a base of experience was built up at the postgraduate level. The approach was developed on the basis that tutors opted-in to employ it.

Research within the University of Glasgow

In session 2000-2001, it was decided to conduct research on the feasibility of PBL techniques and strategies in initial teacher education in a broad sense. In addition to continuing the development of PBL materials within the tutorial groups of those

staff members who were comfortable in working in this way at PGCE secondary level, it was arranged that work would also be carried out with some undergraduate classes. These classes were generally - though not exclusively - taken by one tutor who had experience in using and devising PBL materials in the postgraduate course.

The University is engaged in a number of courses of concurrent initial teacher education, where students pursue their teaching area as a university course in its own right, sometimes in different faculties and even in different institutions. In session 2000-2001, there were two opportunities where students from the two largest of these specialist courses were taught together - the first and third-year classes of the Bachelor of Technological Education (B Tech Ed, co-taught with the Faculty of Engineering) and the Bachelor of Education in Music (B Ed Mus, co-taught with the Royal Scottish Academy of Music and Drama). These opportunities occurred within a Year 1 module in the Primary School in Scotland, in which students are introduced to basic concepts in the teacher education process such as planning, motivation, communication, class management and so on; and also in a Year 3 module on Education and Society, in which students encounter concepts such as social inclusion, issues of gender and ethnicity and urban education. In the past, this latter module has been taught fairly traditionally, whereas the Year 1 module has had a mixture of traditional didactic teaching and experiential learning. What it has been lacking is an issues-based context and materials such as scenarios and case studies for the students to interrogate.

At this point it is perhaps worth mentioning that the actual scenarios were, as described earlier, case studies of individual schools and institutions: by necessity, these had to be anonymous, thus great care was taken to avoid identification of people and places involved. Sometimes composite scenarios involving evidence from more than one source were used, and these were also complemented by fictional cases in circumstances where the issue under consideration demanded material of a particular type which was not immediately available.

Within the Faculty and in particular within the Department of Educational Studies, there had been a fairly long-established tradition of interactive and experiential teaching of various sorts; thus the move towards an issues-based approach was not completely alien to the staff involved. It is also recognised at this stage that these innovations could not be seen as constituting a PBL conversion in the sense that other components of the learning experience remained as they were; practical and other considerations did not permit the movement of the whole course in this direction. The modules therefore are perhaps best described as problem-focused, in the terms described earlier, and were described to the students as issues-based learning - in order to avoid the difficulties with terminology I previously referred to.

Method

Within the teaching of the material and the achievement of the learning outcomes of each module, the following strategies were adopted:

There were virtually no formal lectures: the nearest to this didactic approach would be a short tutor input where deemed necessary for providing a background for the interaction. The core of the learning experience for each session lay within the material the students had to investigate.

Both small groups and larger groups were used, depending on the nature of the interactive experience. Students were obliged to form composite groups of technologists and musicians, and they were encouraged - though not obliged - to retain the same group structure where this could be shown to operate effectively. In the event, the changes to the groups on a weekly basis were in fact minimal, with respect to both year groups involved.

Pair work, with the use of critical friends, and triads were encouraged for specific activities.

Reporting back - for example, pairs reporting to the group and group representatives reporting to the whole class in a plenary session - was encouraged as a valuable means of allowing the students to rehearse their presentation skills before their peers.

The material for study included video, overhead transparencies and print, as appropriate.

A typical session would involve a short tutor introduction to the issues and learning outcomes concerned, followed by the presentation of the scenario/issue to be discussed. Students would then take the tutor-prepared material into their groups and work towards a resolution of the problems and issues embedded within it. A preliminary evaluation of student perceptions of these issues would be made. This was followed by a deeper discussion, often time-limited in order to obtain a group view or decision on the case, within the constraints of the timeslot available (either one hour or 90 minutes). Towards the end of a given session, each group would make a short presentation of its findings and this would be followed by a brief plenary discussion, often with tutor input.

The decision to evaluate the performance of this enhanced methodology included a need for appropriate research methods to be used. Thus, at the end of each teaching session, students were asked to evaluate their learning in a feedback situation. They were asked to state what they had learned during the session which they felt they did not know, or could not do, when the session had commenced. It was enlightening to use this approach, as the feedback from the students was a useful source of information for the structure and often revision of the following session. Additionally, students were asked to complete an anonymous questionnaire at the end of the two modules, each of which lasted for a semester. These questionnaires were carefully structured to investigate the students' experiences of issues-based learning in the classes, and they covered the following key areas:

- prior experience of issues-based learning and interactive teaching

- ability to relate to the materials and their effectiveness in individual sessions

- student motivation and understanding

- teamworking and interactive skills

- evaluation of the effectiveness of the issues-based approach

- student responsibility for learning

- perceived advantages and disadvantages of the issues-based learning strategy
  (free-text response).

These questionnaires were provided in addition to the normal class evaluation sheets, and related solely to the methodology. In this way it was felt that the students' perspective of the learning experiences they had undergone could be obtained. Taken in conjunction with the tutor perspective through evaluation of student responses in the sessions, it was felt that an assessment of the methodology in undergraduate initial teacher education might be obtained through this means.

Results

Year 1 (n = 30 respondents) - which included students straight from the school system, but also some with experience of work and other learning - were generally (60%) found to have had little experience of this kind of learning or of similar methods. It appears that most of their other learning had taken place within formal didactic teaching methods, even in music, where there is one-to-one and small group tuition. The students were of the strong opinion (76%) that issues-based learning made them think more about the topics than with traditional methods.

The majority of students (57%) reported finding the materials challenging and often difficult, and this was supported both in the questionnaire findings and in the session debriefs. In general, there was a consensus that issues-based learning helped to focus learning (70%) and that it increased motivation (63%): the majority of students (76%) went on to find out more about the topics in private reading and further study, although this was not always consistently done.

Group work was generally popular (83%), but surprisingly, not universally so. The case studies and scenarios used were generally (76%) reported to be helpful, and by far the most popular were those relating to control and discipline. As school experience days ran in parallel with this module as it progressed, there was a feeling amongst the students (56%) that the issues-based approach helped them with the skills they needed in the classroom.

The majority of problematic areas in Year 1 related to the dynamics of group work and in some cases to particular personalities. There was a unanimous view that

issues-based learning was much more demanding than didactic teaching, and that it genuinely fostered students' responsibility for their own learning. Year 1 students recorded the following advantages for issues-based learning (free-text responses):

- makes you think about practical situations and gives you real life studies

- sustains interest; forces you to think for yourself

- you have differing perspectives and can bounce ideas off each other

- prepares you for the classroom

- gives immediate and in-depth involvement: you retain information better

- group working expands your ideas.

Disadvantages felt by this year group included:

- some students felt they had to conform to the norms of the group;

- sometimes the group could be dysfunctional, with personality clashes limiting group effectiveness;

- too much time was spent on fruitless discussion

- some students did the thinking for others, which made them lazy

- not receiving notes made understanding difficult

- reporting to peers in plenary was a daunting experience.

In Year 3 of the concurrent undergraduate courses (n = 26 respondents), there were several significant shifts in perception. Nearly all the students (84%) thought that they had experience of issues-based learning or similar methods, although in their other classes there was still an emphasis on formal didactic teaching. These students, too, endorsed the view that issues-based learning made them think (77%), and there was a strong opinion (77%) that the learning of key points was strengthened through this medium.

A substantial majority (69%) reported an increase in motivation, and that they were moved to find out more about the topics under review (73%). All reported finding the group work helpful and the scenarios and case studies useful; interestingly, there was a unanimous view that they felt obliged to read up on the material.

There was a strong feeling (61%) that issues-based learning was helpful with crucial classroom skills (note that these students had experienced the benefit of much more extended teaching). These Year 3 students also felt that communication,

analytical skills, selecting and using information, teamworking and information gathering were improved - and there was a clear feeling (65%) that issues-based learning was much more demanding than didactic teaching, particularly in the sense that it increased their awareness of having responsibility for their own learning. This was supported by 53% of these students wanting it to be expanded into other areas of their course.

The Year 3 students reported the following advantages of issues-based learning:

- increases motivation - feelings as well as facts;

- encourages responsibility for own learning;

- helps retention of material after the task, resulting in a better understanding and greater depth of learning;

- use of communication and teamworking skills allows differing perspectives and the possibility of testing views on others.

The disadvantages reported by the Year 3 students were far fewer than those of Year 1, and in some respects were similar:

- Individuals dominate group sessions: some do not take them seriously enough.

- The sessions are too open and no real learning takes place (1 student).

- There is a lack of tutor feedback (1 student).

The research, then, seems to indicate an incline of acceptance from the first to the third year stages, although several constraining factors need to be borne in mind. For instance, the third-year students had a greater practical knowledge and experience from their school experience placements; they had had more opportunities, it seems, to work interactively. Greater maturity may have led to a greater sense of responsibility in terms of undertaking the necessary background reading and extended study.

But the research also seems to suggest that there are clear practical advantages to the employment of this methodology in initial teacher education courses. The students feel that they are more challenged by issues-based approaches, and that interactive working and confronting real-life scenarios and case studies improves their practical skills - in particular those of presentation and communication. Teamworking allows a kaleidoscope of different views, and teaches valuable skills of relating to others and listening to their opinions.

Areas of diffidence also relate to the collaborative experience, with dysfunctionality of groups being reported as the greatest barrier to progress and

acceptance of the learning method. Again, this may be due to aspects of maturity and unfamiliarity. It is interesting that the students who felt the absence of notes a major drawback were revealed in debrief not to be recent school leavers, but were students from non-traditional backgrounds who had studied in colleges of vocational education. Nevertheless, it is clear that the students in general, albeit the reservations expressed, saw issues-based learning as challenging and demanding, and this fits in with other research findings (cf Bridges 1992).

Discussion and conclusion

PBL seems a feasible methodology for teacher education. It is well proven within professional education, and our research suggests that it has much to offer in terms of student learning and motivation (Blake et al 2000) - within the context of the specific course components investigated. However, there are likely to be a number of serious caveats in terms of its adoption for the design of an entire course of initial teacher education.

Firstly, there is the issue of problematising. It may be questionable whether it is desirable to view child development in terms of problems, rather than issues. Focusing on problems - although perhaps entirely appropriate in terms of medical education, where something may be perceived as going wrong with a healthy person - suggests a negative, deficit-based approach: which may not be desirable in terms of investigating children's development and learning (MacKinnon & Scarff-Seatter 1997).

Secondly, there is the issue of context. As we have seen, teacher education seems to be much more circumscribed in terms of required methodologies and approaches than other fields of professional education. Given the circumstances of expectations and accountability referred to earlier, the leeway available for the introduction of a PBL approach - even if it were proved feasible, desirable and effective - might not be particularly great. We may ask whether teacher educators in the UK are in a position to permit this type of shift to occur. PBL-centred courses of initial teacher education would require addressing the issue of specified competences, and critically, the assessment and certification of their attainment. Since the advent of the last conservative government and its policy writings on teacher education (Lawlor 1990), this assessment has tended to ensure fairly tight control of both content and methodology of initial teacher education courses - particularly in an environment of stringent tutor accountability and even external inspection. There would be, it is suspected, a rather understandable reluctance to relinquish this control on the part of many teacher educators.

This then raises two issues: the effect of such external control upon innovation and development in teacher education; and the question of how assessment and certification might be carried out in a PBL teacher education environment. With regard to the former there seems little that can be done at present, and few signs that the environment is changing - even within the context of devolved Scottish government (Munro 1999). Innovation in courses of initial teacher education is subject to a stranglehold of external regulation. With regard to

assessment and certification, it is certain that the adoption of PBL approaches would bring pain as well as gain to initial teacher education.

A third issue is that of the developmental cost of setting up a PBL course of initial teacher education. Since the majority of courses of initial teacher education within the UK occur within the university or higher education sectors, revalidation and approval of courses would be recurring issues, as would the constraints internal to the actual institutions. In Scotland, the General Teaching Council for Scotland would need to accredit a PBL course (Sutherland 1999), and a similar body is in the course of formation in England and Wales, where currently Teacher Training Agency approval is required (Teacher Training Agency 1998). One must ask whether adoption of a PBL approach would be endorsed by these agencies in the current climate, given their briefs as enforcement agencies for governmental policy in this area.

Fourthly, there would be staff development costs within institutions. PBL, with its small group methodology, is expensive in terms of staff time and either requires extensive staff availability or creative timetabling (Berkson 1993). Institutions would have to estimate whether this is an opportunity worth bearing the costs of. Finally, it is perhaps worth noting that there currently seems to be a re-emergence of debate about the viability of PBL in medical education and a sense that it is time to re-evaluate the approach (Albanese 2000; Colliver 2000; and especially Norman & Schmidt 2000).

Many papers end with a plea for further research, and this is no exception. To a certain extent, it is impossible to say whether PBL represents a bright new future for teacher education, with motivated independent learners and a new dimension of professionalism, or whether it is a blind alley, a passing fad. Certainly its growing use in other professional spheres suggests that the latter is not the case. The introduction of technology may well also offer opportunities for reducing the amount of staff time necessary for its operation, but this also runs the risk of reducing the human interaction so essential in courses for the caring professions.

We need to construct and operate teacher education courses based upon PBL principles before we can wholly calculate its effectiveness, and clearly this entails a substantial element of risk which may be judged 'unacceptable'. We need to know whether a PBL-designed course can cope with the demands for competence-based education and training, and with the regulatory frameworks within which UK initial teacher education has to operate. We need to gauge whether the promise is borne out by the reality. And the only way we can answer these questions is by trying it out in practice. The danger of not doing so is that teacher education will be left behind by education for other professions in quality and methodological considerations (Harland 1998) – an occurrence we can ill afford.

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