**A guide to PBL**

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This guide outlines the approach of problem based learning as a teaching methodology. It draws on the literature from the medical sciences to describe the roles of students, tutors and faculty teams.

### *Introduction*

Problem based learning (PBL) is a teaching strategy to promote self-directed learning and critical thinking through problem solving. This educational approach has become a distinct methodology (Barrows, 2002) and has been widely adopted within medical education as the method of teaching. PBL is the focus of systematic reviews (Colliver, 2000). Significant advancement in PBL curricula have occurred in medical faculties such as McMasters University (Ca), Maastricht University (NL), and Manchester University (UK). Its application within initial teacher education has been described by McPhee (2002). The term problem based learning is specific but similar methodologies describe case based or enquiry based learning (Justice et al., 2007).

Key to the success of PBL is the recognition that students are active participants in their own learning. In education, the PBL activities would focus learning towards the goal of becoming an effective teacher. Opportunities to engage with challenging problems and case-based scenarios mean that students can integrate theory towards a better understanding of effective classroom practice, how pupils learn and the roles of staff within the school. The problems are designed by staff tutors to reflect realistic experiences within the school environment and to encourage students to synthesise and incorporate relevant information into their learning.

PBL fits student-centred learning based on the accepted principle of constructive alignments (Biggs, 2003). It transfers autonomy and responsibility for their own learning to the students, and promotes information seeking and independence. Student autonomy is reinforced by the tutor's facilitation role in sessions, and at department or faculty level through the provision of flexible resources that support self-directed learning.

### Problem Design

The problems are written by a team of experienced staff around realistic cases or situations. Problems should be practical, realistic and authentic. They should address multidisciplinary issues to mimic the school environment. They can be delivered as a series of separate but inter-related problems, with a reading list or other learning resources to support the student's enquiry. Guidance on accessing online and resource-based material and specific links to recommended websites directs the students to the expected depth and breadth of study.

As described by (Moust, Berkel & Schmidt, 2005), problems need to be in a relevant context; for example they could be taken from a classroom experience. They need to be realistic and to identify important and relevant learning outcomes for the students that can be applied to their study. Tutors need to help students to transfer this new knowledge to professional practice (McPhee, 2002). Sometimes there is no single solution to the problem but attention is drawn to the need to critique what is understood by *best practice* or *best evidence*.

### Delivery

PBL can be delivered flexibly (there are examples of its use in online courses(Wheeler, Kelly & Gale, 2005), although more generally it involves students meeting in small groups for sessions, two hours in length, usually twice a week (Moust, Berkel & Schmidt, 2005). Courses last several weeks or a full semester and each week students collaborate on a new problem or scenario. Problems are usually paper-based around 500 words but can also use the online multimedia learning environment, such as the *Penfield Virtual Hospital* (Ward & Hartley, 2006).

One of the key elements to PBL is the small tutorial group. The correct group size for PBL is critical with six to eight students as an optimum (Moust, Berkel & Schmidt, 2005). If the number of students exceeds this there is less time for individuals to make meaningful contributions. Group dynamics may also be affected if the group is too small or too large.

### Steps in PBL

Problems act as the starting point for student learning. The collection of ideas generated in the group may be based on prior learning from a previous course or topics within the curriculum. The detailed learning outcomes of a problem are held by the tutors and not provided to students directly but are explored through the process of personal enquiry.

1) The problem is analysed by the group often by brainstorming ideas onto a whiteboard.
2) The group generate their shared learning goals.
3) These are transformed into hypothesis driven reasoning or questions.
4) The group then collaborate to set their agreed learning goals.
5) This should be followed by prioritising learning goals to be completed during a specific period of self-study.
6) During the next session parts (3) and (4) are revisited as students attempt to draw out coherent explanations of the problem.

Sufficient time for students to adequately research the problem is vital and requires a few days between sessions so that students can work either independently or collaboratively. Access to a range of library and internet resources is essential for students to be able to locate and evaluate learning materials. During this time other teaching may provide further enlightenment on the problem or develop associated skills, such as communication skills.

The problems need to be structured to elicit appropriate self-directed study and literature searching and encourage sufficient preparation for the sessions. Student should understand that they not only report back to the group their research, but need to engage in continued debate as new issues or complications arise to confound the preliminary explanations.

Students should be equipped by the second tutorial with sufficient knowledge to engage in the group dialogue and put forward their explanations to the problem.  Producing spider diagrams on whiteboards or using mind mapping software help students to begin to organise and explain the information coherently and encourage the collaborative nature of learning between members of the group.   Students are encouraged to hypothesise and construct tentative explanations to address the problem, appraising the evidence and sharing the process of reflection.

Students need to recognise that they have control over their learning within the tutorial and that decision making has been transferred to the students group and away from the tutor. Students should be committed to the PBL approach and have the opportunity to reflect on how this impacts on them as learners. They may need to be taught successful strategies for co-operative learning and problem solving.

### *Role of tutors*

PBL should take place within an environment for learning, facilitated by the tutor that is supportive and non-threatening. Tutors need to facilitate students to develop their own learning strategies focused on self-directed learning, motivation and empowerment.  The tutor needs to see their role as less prominent but still necessary. Colloquially this has been termed *the guide on the side*, compared to traditional lecturer roles as *the sage on the stage*. Successful tutors are able to guide student groups through iterative cycles towards reflection and increasing knowledge (Neville, 1999). As student skills of independent learning flourish there is a reduced need for directed teaching. Roles of chair and scribe within a group pass to the student; ideally these roles should rotate between individuals throughout the semester.

Once the group is established the tutor can turn his/her attention to engendering collaboration between individuals within the group. In the early part of the term this may include providing additional guidance on setting appropriate learning goals and supporting the group in time keeping.  As the group dynamics develop, the tutor can continue their support by encouraging questions that help students to contextualise their research endeavours.  A continual role of the tutors is to ensure that iterative cycles within the PBL process are completed because if students by-pass steps or fail to elaborate on existing knowledge the effectiveness of PBL will be diminished.  For more guidance on tutors refer to (Azer, 2005) who describes 12 steps towards understanding the tutor role.

When large numbers of tutor facilitators are needed it is prudent to have written tutor guides. These should explain the rationale and pedagogical approach to using PBL and also include copies of the intended learning outcomes and any necessary explanatory notes for each problem/scenario. To prevent the sessions becoming traditional seminars, tutors should consider undertaking staff development or consult the literature on how to tutor small groups and facilitate PBL effectively (Azer, 2005).   Good tutor role-modelling and coaching in the early PBL group sessions should encourage students to reflect on and discuss the effectiveness of their group.


### *Self-study*

Supporting students in independent learning requires access to a range of resources; these can be online journals and websites, textbooks and other literature. These resources together with lectures or seminars should enable students to apply new knowledge back to the problem.  Support from an academic subject librarian is vital as different demands will be placed on material compared to traditional teaching methods, such as increased emphasis on short-loan resources.

Students need sufficient time for researching information that is different from their peers; students need to be directed to a range of resources, reporting back on the same chapter in a text does not lead to stimulating debate. Consider providing access to a range of different sources of information, library packs or short Talis-lists. To bring diversity of ideas encourage students to make connections to what they observe in school placements or reflect on the nature of their own schooling.

The next step is to bring the debate about using problem based learning to your department. Consider the pedagogical issues and benefits of the change in methodology and the benefits to students as future teachers.  Assessment strategies will need to reflect the PBL approach.

In summary, PBL is a proactive approach to teaching that is motivating for students and staff.  Whilst the debate on measuring its effectiveness in disciplines is unlikely to cease (Colliver, 2000, Norman & Schmidt, 2000) and the concept of causal relationship to improvements have been questioned (Kember, 2001), there is sufficient reason to endorse this approach.

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