Problem-Based Learning (PBL)

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Many graduate courses now employ problem-based learning (PBL) paradigms to promote student participation and communication, provide vocational relevance and problem-solving skills, foster holistic and interdisciplinary perspectives, engender critical thinking, hypothetico-deductive logic and/or clinical reasoning, critically acquire knowledge and aid the transition from directed self-learning (DSL) to self-directed learning (SDL). In its simplest form, PBL provides small group teaching and learning experiences centred on a series of problems which the students address systematically. They must activate their prior knowledge, develop relevant learning objectives, acquire new pertinent knowledge and apply it to the problem. PBL is merely a vehicle for students to identify what they already know, what they do not know, what they need to know, how to get it and what to do with it. PBL does not completely replace conventional forms of teaching, but complements fixed resource sessions and facilitates the integration of knowledge and skills from cognate disciplines. It has found a niche in many university faculties, especially those graduate schools catering for professional vocations. PBL can be used to mimic workplace practices thereby providing realistic vocational context to training programs.

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The emphasis in modern universities should not be on teaching but rather on learning. Educational models must be conducive to good learning practices so that students gain maximum benefit from their courses. They can increase their knowledge through the acquisition and retention of information, the recognition of principles/ideas/concepts, making sense of data and understanding, and through direct action by developing skills and competencies. Such educational gains fall within three domains: cognitive (about knowing); affective (about feeling); and psychomotor (about doing). Most students experience information overload, not only from their courses but also from daily life in our IT-endowed society. Being presented with fact after fact often leads to surface learning where knowledge is atomistic, isolated, elicits limited understanding and is quickly forgotten. Universities yearn for deep learning where knowledge is holistic, relational, facilitates good understanding, is remembered and applied.

Teachers can engender deep learning approaches by using educational tools which are activity based and interactive, provide context, motivate and excite students, lay solid foundations and are transparent to students. Such tools not only allow students to acquire information but also construct meaning and provide understanding. One such tool used in graduate schools, and more frequently in undergraduate schools, is that of Problem-Based Learning (PBL). Small groups of students are presented with a problem which they address. They must activate prior knowledge, critically evaluate that knowledge and then decide on lines of inquiry and methods to acquire new knowledge. They then reconvene and re-examine the problem in light of their new knowledge, repeating the cycle as necessary. PBL is distinguished from other problem-centred approaches in that the problem is presented first, before students are exposed to relevant learning resources. The problems provide a context for the student to learn problem-solving skills and acquire knowledge. PBL allows students to develop thinking and reasoning abilities (such as problem-solving and critical thinking) as well as facilitates independent learning (self-directed life-long learning skills). In effect, PBL models professional life.

In the pursuit of information, students must differentiate between internal and external sources. The life and educational experiences of everyone in the group provides a great deal of information that is already known. It must be activated and then deliberated upon. Such reflection and review is mandatory so as to audit that information and make sure that it is appropriate and correct. More than anything, however, it serves to identify gaps in their knowledge which then becomes the basis for developing learning objectives. Students decide what information is required and they go to external sources to gather relevant data. Within a weekly timetable, PBL meetings may be scheduled for only five hours (two hours on Monday to begin a problem, two hours on Thursday to progress the problem and one hour on the following Monday to provide closure to the problem before beginning the next). At other times, fixed resource sessions are scheduled whereby lectures, practicals and tutorials are orchestrated to provide material pertinent to the problem. Students may also access print and electronic media (books, journals, data-bases, web sites) and seek out other knowledgeable people (such as teachers, workers, colleagues, or family). PBL courses are therefore not 'do-it-yourself' or 'teach-yourself' courses but are carefully-designed courses providing an orchestrated series of learning interactions addressing a central topic.

The presentation of the problem can be paper- or web-based and generally consists of a series of triggers releasing information about the problem. In medicine, up to six successive triggers may release information pertinent to patient presentation, history-taking, physical examination, diagnostic tests, management plan and patient response. PBL groups develop a system for working through the triggers. Many use whiteboards in the meeting rooms to provide a focal point for the group and facilitate systematic analyses of data. For example, students may first list cues from the trigger on the whiteboard, then brainstorm possible hypotheses and explore their knowledge of associated mechanisms, and finally suggest lines of further inquiry and identify learning objectives. These objectives form the basis for further study by all group members throughout the week.

It is essential that the learning objectives generated at each PBL meeting are clearly articulated and documented. They must address key issues and should preferably be phrased as specific, not general, questions. Students therefore have to undertake focused research in order to answer particular questions. At the beginning of many courses, students may seek to reconcile their learning objectives with those of the curriculum to reassure themselves about the depth and diversity of their studies. However, as they become comfortable with the process, their confidence grows and they accept responsibility for their own learning objectives without the need to check. All group members research their learning objectives and they nominate individual members to provide a summary report on one objective to the group at its next meeting. These 'report-backs' form a valuable component of the PBL process as they revisit the problem, review previous status, respond to agreed lines of inquiry, benchmark collective wisdom, and facilitate further progress. Students are encouraged to provide written annotated reports and to share their sources of information. The reports provide a focal point for group discussion and their accuracy should be challenged and any discrepancies resolved. Critical reflection is an integral part of self-directed learning but it must be practiced to become entrenched. The cycle of problem analysis, inquiry development, research and report continues through the week until the final session when closure is brought to the problem.

Small groups of people go through various phases of social and interpersonal interaction. Some believe there are five stages to PBL groups: the 'forming' stage where best behaviours dominate; the 'storming' stage where people and procedures are criticized and challenged; the 'reforming' stage where new structures and definitions are proposed; the 'performing' stage

where purposeful self-directed learning occurs; and lastly, the 'mourning' stage' when the group disbands at the end of the course. Individual members will exhibit some behaviours that are unacceptable but control of group members is best handled within the group itself rather than by executive control. PBL groups need to be cognizant of group dynamics. As in the workforce, they should model professional behaviours, work cooperatively and appreciate the diversity of their life experiences and opinions. They do not have to like each other but they must respect each other and work together. All members must participate and none should dominate. Most groups decide to appoint members to official positions to bring order to the proceedings and members take turns being chairperson or secretary (scribe). The objective is to encourage self-management, ultimately independent of conventional academic authority.

This places the PBL tutor (better termed facilitator) in an invidious position. They begin by being the socializing agent and by suggesting appropriate methodologies and strategies. They should not be perceived as content-experts although they must be familiar with the material to satisfactorily progress the problem. Rather, they are responsible for ensuring the process is in place and functioning smoothly. They keep the pace and sequence moving, probe knowledge through challenge, ensure student participation, provide interpersonal management and give educational support. Gradually, their role changes from that of modeling to coaching and ultimately, they fade from the group as it becomes self-reliant. The role of PBL facilitator is non-traditional and personnel must be trained to focus on student learning instead of content delivery. Many academics are initially sceptical about PBL facilitation but they rapidly become converts when they experience the high degree of student involvement, empowerment and satisfaction.

PBL is a powerful social constructivist model of education. It produces better communicators, problem-solvers, critical thinkers and life-long learners. It not only allows students to better learn vocational knowledge and competencies but it also provides them with learning management skills for life. PBL rules!