Problem-Based Learning (PBL)

“True learning is based on discovery guided by mentoring rather than the transmission of knowledge.”

--John Dewey

“The principal idea behind PBL is that the starting point for learning should be a problem, a query, or a puzzle that the learner wishes to solve.”

-- D. Boud

PBL in Education for the Professions

Problem-based learning (PBL) was first introduced in the 1980s in the context of medical education at Mcmaster College in Canada[1]. Medical education at Mcmaster was restructured to revolve around multi-disciplinary problems that integrated traditional course work and clinical training. Since then, the PBL approach has spread to many disciplines such as biology, law, chemistry, physics, business, and others with great effectiveness. So what is problem-based learning? Briefly, it is a systematic way to introduce active, student-centered learning to both large and small classes. The essential features of problem-based learning include [2]:

1. Learning begins with a problem, which is complex and based on real-world scenarios.
2. Not all information is given; students need to make assumptions and estimations.
3. Students learn how to identify, search for, and use information outside the textbook.
4. Students work in groups and learning is active and connected.
5. Faculty role is that of a guide and mentor.

Since learning occurs through work on a central problem, PBL problems differ substantially from typical homework or other “problems” in a course. A good PBL problem is engaging, multi-staged, complex, open-ended, and perhaps most important, covers course content naturally [3-4]. The draw of problem-based learning in many disciplines is that classroom instruction more naturally resembles the organic process of research and how the field is actually practiced is in the real-world: students confront purposeful, open-ended, and ill-defined problems whose answers shed light on an interesting situation/question.

Why Problem-Based Learning?

In every course we expect our students to master the course content. However, most of our students will never become faculty or earn doctorates or follow in our footsteps. Moreover, most of our students may not necessarily even continue on in our field. For example, as a physicist most of my students go on into pre-health fields or into teaching or engineering or into any other number of fields. What students can take away from my courses that will serve them well in any profession are skills such as problem solving, interpersonal communication, teamwork, writing, and time management. These are exactly the types of skills that students will develop in the problem-based learning classroom in addition to the course-specific content.

The Problem-based Learning Classroom Cycle (or How to Implement PBL in the classroom)
The PBL cycle begins with a good PBL problem. Problems should go beyond typical, back-of-the-textbook problems. A good PBL problem should be:

1. Motivating to students: it must connect the course material to the real-world or real-world situations
2. Vague or open-ended enough to require students to use their own judgment, make assumptions, and search out information.
3. Multi-stage or multi-part (this helps with quality control – instructors can have groups check in when completing a stage)
4. Designed to be completed in a group. A good PBL problem should be hard enough and involved enough to require the cooperation of 3-4 students.
5. Linked to course learning objectives and higher order thinking skills (think Bloom’s Taxonomy).

A typical day in a PBL classroom might look like the following:

1. Having been given the problem the last class period, students meet in groups
2. Students list, identify, and rank learning issues (what they need to know to begin to solve the problem).
3. Students work on these issues while the facilitator floats from group to group.
4. Students report-out what they have learned and what they still need to know.
5. The facilitator may engage in a mini-lecture or lead a group/class activity.
6. Repeat step #3
7. Student groups list and assign jobs/tasks for work outside of class and for the next period.

Models for Facilitation

There are many ways to implement PBL in the classroom. Several models are:

1. Floating facilitator model: Use formal class time for work on projects while the instructor moves among groups.
2. Medical School model: 8-10 students are assigned to a mentor. Work progresses outside of formal class time. The faculty mentor is consulted as needed.
3. Large class/Peer tutor model: assign undergrads or former students to groups (for large classes). Class time is used for work on projects.
4. Hybrid model: PBL is used non-exclusively. Other class sessions may involve lectures, discussions, problem solving sessions, etc.
LINKS:

The PBL Clearinghouse: https://primus.nss.udel.edu/Pbl/

Project LEAP: http://www.le.ac.uk/leap/

4-Day Conference on PBL: http://www.udel.edu/pbl/deu-june2006/

Problem-based Learning Faculty Institute (UCI): http://www.pbl.uci.edu/whatispbl.html

IMSA PBL Network: http://pbln.imsa.edu/pd/index.html

PBL Online: http://pbl-online.org/

Samford University PBL Newsletter Archive: http://www4.samford.edu/pubs/pbl/

Stanford University PBL Site: http://ldt.stanford.edu/~jeepark/jeepark+portfolio/PBL/whatish.htm

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REFERENCES:


[2] Institute for Transforming Undergraduate Education: Problem-Based Learning at University of Delaware, http://www.udel.edu/inst/
