Problem-based Learning:

A Learner-centered Teaching Model for Community Colleges

Wendy Flint
College of the Desert
Palm Desert, CA 92201
wfint@collegeofthedesert.edu

Introduction

Problem-based learning is a learning strategy that incorporates specific instructional pre-planned activities, focused on a relevant learner problem, and allows for the flexibility of the situation and the learners in the classroom. This course model has its foundation in the theories of humanistic, learner-centered, and problem-centered design approaches.

Higher education institutions are evaluating alternative learning methods for the 21st century. Part-time versus full-time, work-based versus institution-based, face-to-face versus distance learning, to name a few (Bridges, 2000). These changes bring student experience and an informal curriculum that is increasingly diverse. Problem-based learning, a sister of experiential learning and learning internships at the workplace, brings the real life work-based scenarios into the classroom to offer the practical application of the theory or content of the course objectives.

Students, and the organizations hiring them, want education to be relevant to the real world they will work in. Managers want employees and new supervisors to come to them with critical thinking skills and the ability to solve problems. If students do not practice problem-solving in the classroom, how will they be prepared for the real world? If our teaching is not designed to lead to desirable learning outcomes, we are wasting our students' time and the valuable resources of the community.

Characteristics of Problem-Based Learning

Many of the new ways of teaching and learning offer instructional activities by which students can gain experiences that enhance their self-knowledge. "Problem-based learning, an instructional model based on constructivism, is the concept that learners construct their own understanding by relating concrete experience to existing knowledge where processes of collaboration and reflection are involved (Office of Educational Research and Improvement, 1996)." Posner (2001) gives scientific support for problem-based learning. He notes that "a crucial determinant of learning is students' thinking or cognitive processing, and this processing is directly influenced by the kind of tasks in which students actually engage (Posner & Rudnitsky, 2001, p.153)."

In problem-based learning, students are presented with a loosely structured problem – one that has no obvious solution and for which problem-solvers cannot be certain they have the right answer. The problem must be content relevant and represent a real situation faced by an individual, group, company, or community. Solving the problem takes students through the following processes (Savoie & Hughes, 1994):

1) Engagement. Problem-based learning requires students to self-direct their search for a solution, often by assuming the role of a key actor in the problem situation.
2) Inquiry. Students brainstorm with others and gather information from multiple sources.
3) Solution Building. Students work in teams discussing alternatives and examining possible solutions.
4) Debriefing and Reflection. Students share information, opinions, and idea with others based on what they have learned through the experience.

5) Presentation of Findings. Students write plans, reports, and other forms of work documentation to include in their portfolios (or students present their findings back to the class; or both).

Problem-based learning is a strategy choice for workplace trainers and instructional designers because "in a society where change is constant and teamwork is a way of life at work, the lessons learned through involvement in problem-based learning are essential for students' career development (Office of Educational Research and Improvement, 1996)."

Case Studies

Case studies are often used in problem-based learning. The case study method originated in the teaching of law and medicine and has most often been extended to the teaching of business, including business ethics, leadership, and project management. Students are presented with a real-life problem. "A good case study presents a realistic situation and includes the relevant background, facts, conflicts, and sequences of events – up to the point requiring a decision or action. As students analyze and discuss the case, they retrace and critique the steps taken by the key characters and try to deduce the outcome (Davis, 2001, p. 19)." In workplace training, the case study is a simple descriptive scenario of employees, managers, customers, or projects that are in crisis. A specific set of questions is often asked to help learners generate some solutions for the "real life" situation. These type of case studies can be real stories obtained during a needs assessment of an organization, "borrowed" from other instructional designs, created by the instructor or designer to best reflect the course objectives and learners, or created by the students themselves during the facilitation of the course.

Simulations

A simulation attempts to "approximate realistic conditions so that the concepts learned and problem-solutions generated are transferable to the real world and to understanding and performing

tasks related to the content of the simulation (Joyce, Weil, & Calhoun, 2000, p. 59)." Some simulations are games, some are competitions, and some create a business environment with tables, chairs, and supplies, such as a bank or a customer service company. Technical simulations are often in manufacturing sites to prepare people for the real assembly line or for safety practices. Students in a medical billing class can simulate doing billing on a software program to prepare for the real world. All the simulations give students an opportunity to practice, problem-solve, and find solutions through an individual or team process when problems are encountered.

Corporate Examples of Problem-Based Learning

Hewlett-Packard Ink Jet Printer Division, Vancouver, WA

Hewlett-Packard training departments have often used the "Starship Simulation" as a problem-based learning activity to encourage total quality control – process improvement. A simulated classroom environment is set up to reflect a manufacturing site of paper starships. Each table is a "department" of the company. There are "painters," "cutters," "supply," "assembly 1," "assembly 2," and "quality control." The problems, purposely built into the game simulation, include: a shortage of supplies, a required paper trail for supplies, defective painting tools, dull scissors, vague directions, no training, and an incompetent, uninformed supervisor (very reflective or corporation real life). In addition, the rules and processes that are enforced by the facilitator are non-empowering, lower morale, and limit productivity. Following 30 minutes of poor production and Starships that fail quality control, the learners are asked to identify what the problems were. Using a problem-solving tool, called the Fishbone Diagram, learners identify major categories of tools, people, resources, equipment, and policy and then list specific problems in each area. They then prioritize their problem identification through a multi-voting system and determine the top five problems they will address. Then in give groups, each team takes one of the problems, brainstorms solutions and writes an action plan. At the end of the training, the learners reflect on a real problem

in their department and write an action plan to propose to their supervisor. The intent and outcome of this instructional design is to teach employees to problem solve, process improve, communicate with supervisors, and take responsibility for the success of the organization.

Mechanical Engineering and Biomedical Engineering, Technische University, Canada

Problem-based learning (PBL) has been implemented as a partial strategy for Mechancial Engineering and Biomedical Engineering at Technische University in Canada. In its original form, the PBL curriculum is delivered as a set of problems that provides the starting point for the learning process and is the backbone of the curriculum. Other educational methods such as lectures and skills training are present, but only to support PBL. Students first encounter problems, instead of facts and theories. Professional reasoning skills are developed and learning needs are identified in a cooperative setting with a tutor. Next is the individual self-directed study, motivated by the previous stage in the cycle. The cycle is closed by a co-operative phase again: applying newly gained knowledge to the problem and summarizing what has been learned. The next cycle starts with a new problem. "Although lecturing seems to be an easy and efficient way of just giving students the knowledge they need, it does not take into account students' ability to absorb that information and its later usefulness. There is also little concern for the students' ability to reason or their self-learning skills (Perrenet, 2000, p. 3)."

South Carolina Advanced Technological Education Center of Excellence

The South Carolina Advanced Technological Education Center of Excellence is teaching students through an innovative approach that brings relevance to the learning process by simulating a real world, high-tech workplace. "The center uses an integrated, problem-based curriculum, collaborative teaching strategies and extensive active-learning techniques that are implemented through faculty and student teamwork (Reese, 2001, p. 1)." For example, instead of learning an area of math that will be used months later when they are studying physics, both are explored at the

same time. Students start with a problem, learn the math, science and communications necessary to solve the problem, then arrive at the solution by working in teams. Problems are sometimes open ended, so different teams come up with different solutions (as in the real world). "With more than 15,000 technology-based jobs to be filled in South Carolina – and a projected continuing growth of technology jobs – this initiative has drawn attention and praise from the business and industrial community in the state, including Honda, Roche Carolina, Robert Bosch Corporation and Michelin (Reese, 2001, p. 2)." The Honda Manager of Administration, Jeffrey Helton says, "The ATE program is right inline with what industry needs today (Ibid)."

Summary

Donald L. Finkel and G. Stephen Monk are professors at The Evergreen State College, Olympia, Washington. They have used learning groups and problem-based learning for the past ten years and have worked systematically with teachers from diverse disciplines to change their teaching style. They note that "a teacher who takes responsibility for all that goes on in the class gives students no room to experiment with ideas, to deepen their understanding of concepts, or to integrate concepts into a coherent system (Finkel & Monk, 1983, p. 87)."

In problem-based learning, the role of the teacher changes from expert to helper. Finkel and Monk propose that teachers will have to distinguish between teaching and learning roles and "functions." Roles imply the duty and responsibility of the teacher and of the student. Function implies who or what can best serve the student to assist transfer of learning (Ibid). In problem-based learning, students can access available resources and methods to solve the problem or case study put before them. It truly becomes a learning journey, where more is gained from the process than from the final outcome.

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