

Problem-Based Learning

Presented by Associate Professor Saowalak Rattanaich, Department of Curriculum & Instruction, Srinakharinwirot University, at the Seminar and Workshop “The Development of Lecturers’ Instruction”, September 4, 2008, Burapha University, Chonburi.

What is Problem-Based Learning?

Problem-based learning is a total approach to Education that challenges students to learn through engagement in a real problem. It is both a curriculum and a process. It consists of carefully selected and designed problems that demand from the learner acquisition of critical knowledge, problem solving proficiency, self-directed learning strategies and team participation skills. It also replicates the commonly used systematic approach to resolving problems or meeting challenges that are encountered in life and career.

Historical Origins of Problem-based Learning

Problem-based learning began in the early 1970s at the Medical school at McMaster University in Canada. It has been since implemented in various undergraduate programs, elementary and secondary schools as well as the community colleges around the world. (<http://www.mcli.dist.maricopa.edu/pbl/info.html>)

Why Problem-Based Learning?

Traditional education practices in terms of teacher-centered and lecturing approach at different educational levels produce students who are disenchanted and bored with their education. Students are usually faced with a vast amount of information to memorize much of which seems irrelevant to their future needs outside of school. They are unable to reason effectively, unable to assume responsibility for their own education. They are not prepared to work with others in collaborative team situations. Motivation in class is usually low.

According to research studies in educational psychology(cited in <http://www.pbli.org/pbl/change.htm,2007>), it has been found that traditional educational approaches do not lead to a high rate of knowledge retention. What students learn, despite intense efforts on the part of both students and teachers, is largely forgotten and naturally problem solving skills may actually be impaired. In fact, studies have shown that in 90 days students forget 90% of everything they have been told .

Problem-based learning is an exciting alternative to the traditional classroom learning. Through problem-based learning, students genuinely enjoy the process of learning . They are motivated to learn by a need to understand and solve real world problems. Students are encouraged to take responsibility for their group and organize and direct the learning process with support from a tutor or instructor. Problem based learning can be used to enhance knowledge and foster the development of communication,

problem-solving, and self-directed learning skill. (<http://www.studygs.net/pbl.htm,2007>; <http://en.wikipedia.org/wiki/problem-basedlearning,2007>)

How does Problem-based learning work?

Through problem-based course, the teacher presents students with a problem, no lectures or assignments or exercises. Since the students are not handed “content”, their learning becomes active in the sense that they discover and work with the content that they determine to be necessary to solve the problem. In problem-based learning, the teacher acts as facilitator and mentor, rather than a source of “solutions”. The students are provided with opportunities to examine and try out what they know, discover what they need to learn, develop their skills for achieving higher performance in teams, improve their communication skills, state and defend positions with evidence and sound argument Besides, they can also become more flexible in processing information and meeting obligations as well as practice skills that they need after their education.

A Model of Problem-Based Learning

John W. Gardner (<http://www.studygs.net/pbl.htm,2007>) suggested a simplified model of problem-based learning as follows:

Step 1. Explore the issue.

The teacher introduces an “ill structured” problem to students and let them discuss the problem statement and list its significant parts. The students can later gather information and learn new concepts, principles or skills engaged in the problem-solving process.

Step 2. List” what do we know?”

The teacher allows students to ask themselves what they know to solve the problem, including both what strengths and capabilities each team member has. They can consider or note everyone’s input, no matter how strange it may appear, it can hold possibility.

Ste.3. Develop, and write out the problem statement in students’ own words.

A problem statement should come from students or their groups’ analysis of what they know, and what they will need to know to solve it. Students should have a written statement, the agreement of their group on the statement, and the feedback on the statement of the instructor (optional but good). The problem statement is often revisited and edited as new information is discovered, or “old” information is discarded

Step 4. List out possible solutions.

Let students list all solutions and then order them from the strongest to the weakest and choose the best one, or most likely to succeed.

Step 5. List actions to be taken with a timeline.

The teacher asks students to go on listing their actions to be taken of what they have to know and do to solve the problem, how they rank those possibilities, how those relate to the list of solutions and whether or not they agree.

Step 6. List “what do the students need to know?”

In this step, students have to research the knowledge and data that will support students’ solution. They need information to fill in the missing gaps, discuss possible resources (experts, books, web sites etc.) ,assign and schedule research tasks for special deadlines

Step 7. Write up the solutions with its support in documentation, and submit it.

When students have finished their task in step6, let them present the findings and /or recommendations to a group/classmates. The findings should include the problem statement, questions, data collection, data analysis ,and support for solutions or recommendations based on the data analysis in short concerning the process and outcome

Step 8. Review performances.

Let students review their performance and take pride in what they have done well and learn from what they have not done well either.

The steps can be repeated and recycled. Steps two through five may be repeated and reviewed as new information becomes available and redefines the problem. Step 6 may occur more than once, especially when the teacher place emphasis on going beyond “the first draft”.

Problem-based Assessment

With problem-based learning is not separate from instruction. Rather, assessment is integral to learning. The focus and purpose of assessment is on learning, on how it is done, and how it can be better, not on comparative comparison. In general, and at minimum, students will be assessed in 3 broad areas: 1)applied competence, 2) critical thinking, problem-solving and communicative competence and 3) collaborative and leadership competence. The authentic performance based assessment is usually used in the problem based course. For example, reflective problem log, self assessment, peer assessment, presentation /demonstrations, reflective essays, role play, videotape presentation, newspaper articles, and position paper. Group-based assessment is also conducted to help facilitate on what students learned, receive direct feedback from your team members on their performance, contributions, and intellectual achievement.

What are the components of the successful problem-based learning model?

The use of open-ended probing questioning when initiating and perpetuating inquiry into ill-structured problem is a key component to the success of the problem-based learning experience. As the teacher or instructor of the problem based learning acts as a facilitator or a tutor ,so the teacher should practice the necessary skills in

facilitating students in learning effectively. The examples of the necessary skills for the teacher or instructor are questioning ,facilitating, group processing brainstorming etc.

Socratic questioning strategy is effectively used in the problem-based classes. It is designed to elicit a wealth of ideas and facts from any group.

When using the Socratic questioning with audiences, considerable patience, coupled with a warm and inviting classroom atmosphere is essential. It also promotes synthesis of information into discernible category of “fact” and “opinion”. Socratic questioning strategy is aimed at raising basic issues, probing beneath the surface, pursuing problematic areas of thought, helping students discover the structure of their own thoughts and develop a sensitivity to clarity, accuracy, and relevance. Most importantly this kind of questioning helps students arrive at judgments based on their reasoning, note claims, evidence, conclusions ,questions at issue, assumptions, implications, consequences, concepts, interpretations, points of view, and all considered to be elements of thought. Socratic questioning includes a taxonomy of questions that may be utilized diagnostically as the teacher/facilitator moderates discussion and verbal inquiry. The categories are as follows:

- Clarification
- Probe assumptions
- Probe reasons and evidence
- Reveal differing viewpoints and perspectives
- Probe implications and/or consequences
- Questions about questions

Skills in facilitating teaching are expected in the problem-based learning. Those skills are as follows:

- asking non-directive, stimulate questions, challenging students as appropriate;
- presenting consequences of student conclusions, opposing views, cues as needed;
- indicating when additional external information is required
- referring students to resources as appropriate;
- avoiding lecturing to the tutorial group unless an exception has been recognized, justified, and agreed to be made.

Necessary skills in promoting group problem solving and critical thinking can be done by helping students to examine a range of phenomena, to assess or appraise critically evidence supporting hypotheses, and to define issues and synthesize information. In promoting efficient group function ,the teacher can assist the group to set early goals and a tutorial plan which may be modified later including an organizational and an evaluation plan, to sense problems in tutorial functioning and helping the group to deal with them, to make students aware of the need to monitor the group’s progress, to serve as a model to demonstrate productive ways of giving feedback and to help students improve study methods including the collection of appropriate learning resources.

In many problem-based learning courses, scaffolding techniques have been successfully used in many ways to assist learning. Brainstorming in problem-based learning using "Mind Maps"(concept maps)and Know/Need Charts will benefit students in the following ways:

- capture ideas as they are generated.
- organize ideas in a meaningful manner.
- prioritize ideas generated from class discussion.
- separate "facts" from "opinion".
- help to establish learning issues and develop focus areas for group work.

Rules for brainstorming can be set as follows:

- establish a "starting point" based on the "ill-structured" problem.
- students brainstorm ideas surrounding the starting point.

(Tutorial on Problem-Based Learning Research Plan,
<http://www-ed.fnal.gov/trc/tutorial/mindmap.html>,1999)

Explore the Approaches

Problem, Project, and Inquiry-Based Learning closely relate to the information processing approach. They all fit well with technology-rich learning environments on the learning experience. In each case, technology is used to facilitate learning. The focus of learning environment is the student's excitement about solving a problem or addressing an issue they find meaningful. Problem-based learning focuses on the process of solving a problem and acquiring knowledge. It is also inquiry-based learning when students are active in creating the problem. A specified problem is specified by the course instructor. A "case study" method is a useful focus in teaching/learning. Project-based learning focuses on developing a product or creation. It may or may not be student-centered, problem-based, or inquiry-based. Inquiry-based learning is a student-centered, active learning approach focusing on questioning, critical thinking, and problem solving.

(<http://eduscapes.com/tap/topic43.htm>)

Barbara Duch, recipient of 1999 Hesburg Certificate of Excellence, defines problem-based learning as:

"An instructional method that challenges students to "learn to learn", working cooperatively in groups to seek solutions to real world problems. These problems are to used engage students' curiosity and initiate learning the subject matter, Problem-based prepares students to think critically and analytically, and to find and use appropriate learning resources." (Duch, B,J.,Groh,S,E.,& Allen, D.E.(eds),2001)

References

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