Problem-Based Learning Institute

Using Problem-Based Learning in Management Education

> Prof. Dr. Philip Hallinger Executive Director Mahidol University

Program Objectives

- 1. What PBL is, research on its effectiveness, and how it operates in a classroom.
- 2. Key issues in implementation of PBL from the perspective of instructors and students.
- 3. How to design PBL projects.
- 4. Integrating technology and PBL.
- 5. How to assess student learning in a PBL environment.
- 6. Curricular and program implementation issues.

Day I Program

- Introduction to Problem-based Learning
- PBL Project: "Because Wisdom Cannot be Told"
- Break
- "Because Wisdom Cannot be Told" continued
- Lunch
- Group Presentations from PBL Project
- Instructor Leads Debriefing of the Project
- Break
- Key Issue Review of PBL
- Closing



Teaching does not equal learning

- Teachers should not just "cover" subjects
- Teacher-directed instruction can be learner-centered
- Our goal should be active learning
- PBL is one way to achieve that.







Goals of Professional Education

"Education in the professions should prepare students for action." Prof. Charles Gragg, Harvard Business School, 1940





Learning How to Learn

"In times of change, learners inherit the earth, while the learned find themselves beautifully equipped to deal with a world that no longer exists." Eric Hoffer



Because Wisdom Cannot be Told

Problem-based Learning Project

Because Wisdom Cannot be Told: Learning Objectives

- This PBL project is designed to assist you in learning:
 - What problem-based learning is. . .
 - How it operates in the classroom. . .
 - What research says about its effectiveness. . .
 - The role of the teacher and student in PBL.
- The project will simulate a typical PBL module.
- You will be given a:
 - Problem,
 - Learning resources
 - Product specificationsPeriod of time.
 - Period of time

The Problem

- Your management department is under pressure to reexamine its program.
- Budget cutbacks in the offing.Program content and outcomes have
- Program content and outcomes have been criticized by students, graduates and local employers.
- Your committee has been assigned to examine PBL as a possible approach to improving the curriculum.
- Other committees are examining other approaches (i.e., case method, case incident technique).



Process Instructions

- You will work in teams.
- Read instructions in the PBL project materials.
- Select a group leader, facilitator and recorder as instructed.
- Take a few minutes to discuss the problem as you understand it.
- Use a *jigsaw* approach to divide up the readings.
- Review these. Then report to your group on what you learned as it relates to the problem.
- Discuss the problem again in light of the new information.
- Decide on your recommendation to the dept.
- Be prepared to deliver your presentation at

Learning Resources

- Your knowledge & experience
- Extract from Review of PBL
- Videotape: *Can we make a better doctor?*
- Consultant Prof. Hallinger



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Product Specifications

- You will report to the Dean on *what you have learned about PBL* in a 15 minute presentation aided by a short hand-out of your own design.
- You will make a recommendation to the department as to the appropriate use -- if any -of PBL in your program.

Assessment of this PBL Project

- Team's Presentation Handout
- Team Presentation
- Individual Talk Back Sheet
- Team Participation Rubric
- Complete PBL/Case Matrix
- Reflective Essay (class)
- Objective Exam (class)



Evaluation Criteria for Your Presentation

- Did you address the questions?
- Was the information accurate in light of knowledge resources?
- Give information needed by other faculty?
- Create interest among your colleagues?
- Did your aids (e.g., handout, overheads) help?
- Was your recommendation reasonable in light of the facts of the situation and the information on PBL?
- Was your plan practical? Feasible?

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Debriefing

- How did it feel to work on this project?
- What skills did you notice you/your team lacking?
- What domains and capacities did the project draw upon that are not often addressed in classes?
- Based upon your experience in this workshop, what would be your strongest arguments for/against PBL?
- If you wanted to implement PBL what would be your next step? What would you need to proceed?

Some Key Points

- Early confusion is normal.
- Some problems are clear and others are messy.
- Provision of learning resources is optional.
- Assessment of student performance requires more attention and training.
- Video is a useful way to present the problem.
- PBL appeals to multiple modalities.
- PBL is NOT appropriate for all teaching/learning.

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Assessment 1. The starting point in problem-based learning is: a) disciplinary knowledge b) the student's prior knowledge c) a problem derived from practice d) problem-solving skills e) all of the above Which of the following elements distinguishes problem-based learning from traditional case teaching? a) PBL focus on an administrative problem

- b) PBL uses cooperative learning as an essential element
- c) PBL engages students in problem analysisd) PBL ignores theory
- e) None of the above
- f) All of the above

Assessment

- 3. Which does not represent a cognitive basis for problem-based learning? a) knowledge learned in relation to a problem context promotes transfer
 - b) decoding specificity leads to higher intrinsic value of knowledge
 - c) information is better understood if students have an opportunity to apply it
 - d) retention of learning is promoted by elaboration of concepts with peers
 - e) the student's prior knowledge is activated
- f) all of the above are part of the cognitive rationale for PBL
- 5. Which is not a motivational factor that supports the use of PBL?
 - a) focuses on the reproduction of knowledge
 - b) student opportunity for active response
 - c) quick formative feedback on student efforts
 - d) focus on a problem of practice
 - e) opportunity to apply prior knowledge
 - f) all of the above are part of the motivational rationale for PBL



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Assessment

- 15. Assume that you accepted the *balance* of empirical evidence in the medical education literature as supportive of problembased learning. What factors with respect to the practice of management are salient as you think about the applicability of the medical research to management education?
- 16. In the space provided, identify two key obstacles you would want to consider if you were part of team planning to introduce PBL into your department or institute.
 - a) For each obstacle/issue, offer two specific tactics you might use to facilitate the implementation process.

Defining Features Matrix: PBL and Case Method

Defining Features	PBL	Case
 Student-led teams 		
 Teacher-led discussion 		
 Emphasis on analysis 		
 Emphasis on implementation 		
 Problem is always the starting point for learning 		
 Emphasis on life-long learning skills 		
 Emphasis on problem-solving skills 		
 Concern for emotional aspects of leadership 		
 Practice in getting results through others 		
 On-going formative evaluation 		



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How Does PBL Differ From Case Teaching?

- 1. PBL starts with the problem rather than with theoretical content
- 2. Initial learning of concepts takes place in relation to solving the problem
- 3. PBL emphasizes both analysis and action or implementation of solutions
- 4. PBL always takes place in learning groups
- 5. PBL addresses the *emotions* of the workplace as well as cognitive skills

Problem-based Learning: A Definition

Problem-based learning is the learning that results from the process of working towards the understanding or resolution of a problem. *The problem is encountered first in the learning process*, rather than facts or information, and serves as a stimulus and focus for problemsolving and learning.

Barrows and Tamblyn, 1980

Problem-based Learning

is not. . .

- Problem-solving designed as an exercise for applying information previously learned in a subject-centered approach;
- Problem-solving intended to demonstrate the relevance of prior learning;
- Finding the answer to a question.

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Competencies Obtainable Through PBL

- Adapting to and participating in change
- Making reasoned decisions in unfamiliar situations
- Reasoning critically and creatively
- Adopting a more universal or holistic outlook
- Practicing empathy, appreciating other viewpoints
- Collaborating productively in groups or teams
- Identifying own strengths and weaknesses and undertaking appropriate remediation Charles Engel, 1991

Summary of Key Issues in PBL

- 1. Content coverage vs. depth
- 2. Motivation vs. control
- 3. Develop lifelong learners
- 4. Students as knowledge workers
- 5. Mix of lecture and PBL

Research on Outcomes of PBL

- 1. Results on most cognitive outcomes are comparable to those from traditional curriculum.
- 2. Students enjoy PBL curriculum more, show higher motivation and more productive attitudes
- 3. Students complete their programs at a higher percentage and in less time.
- PBL curricula cover less content but more depth.

References on Effectiveness of PBL

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Albanese, M. (2000). Problem-based learning: Why curricula are likely to show little effect on knowledge and clinical skills. *Academic Medicine*, 34, 729-734.

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Day II Program

- Designing PBL Materials
- Break

Integrating Learning Technology with PBL

- Assessment of Student Learning in PBL
- Lunch
- Group Reviews/Feedback of PBL Projects
- Instructor Debriefing of Project Review
- Break
- Implementing PBL in a University Degree Program









	Problem-stimulated	Student-centered
Time to develop materials	-	+
Time to update materials	-	+
Development of lifelong learning	?	+
Control of curriculum	+	-
Coverage of material	+	-
Less wasted motion	+	
Chance of student success	+	?
n 111 12 7 11	+	
Focus on high quality materials		
Focus on high quality materials Control over obj's & resources Confusion about how to proceed	+	+
Focus on high quality materials Control over obj's & resources Confusion about how to proceed Student uncertainty	+	- +



Unit of Instruction: Characteristics of the PBL Project

- Mirrors professional responsibilities
- Group task
- Clear goals
- Limited duration
- Operate under time constraints
- Expectation of product performance/action





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Example: Employee Selection

- Problem: Multi-cultural clientele at Starbucks
- Task: Hire shift supervisor
 Objectives: Design and implement hiring process to ensure effective selection
- Resources: artifacts from Starbucks, readings, video
- Products: Process and
- implementation of hire



Project Development: Identifying the Problem

- Problem comes first
- Problem derived from practice
- Related to expected role and work context
- Problem is common and/or has high impact
- Swampy problems that lack clarity
- Select mode of representation



Types of Problems

- Structured or "high ground" problems
 - problem may be fairly clear
 - solution is unclear
 - Wisdom Cannot be Told project
- Messy or "swampy" problems
 - unclear about what the problem is
 - often a complex of intertwined problems
 - often value-related problems or dilemmas
 - solution is also unclear

Features of Distinctive Problems

- High impact on manager, organization and/or clients;
- Typical problems confronted by professionals in the role;
- High importance to those experiencing it;
- Common across types of the organization;
- Messy rather than clear or narrowly focused;
- Realistic, not contrived;
- Sufficient info for reader to understand what's going on and prepare products, but not overload.

Sample problems Employee Selection at Starbuck Implementing new ERP System Reorganizing an SME Teacher performance E-marketing for SME







Information to Include: What

- is happening that is problematic?
- are the constraints on what can be done (e.g., legal, cultural, organizational, financial, political, personal)?
- resources available (e.g., financial, human, material)?
- is at stake (consequences for self, others, organization)?
- is the nature of external pressures to act (e.g., create a sense of urgency to act, to resolve a tension)?

Information to Include: When?

- is the point of entry for the problem?
- details about time in past, present, future
- have events occurred? (i.e., chronology)
- may other events occur that we need to know about?

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Information to Include: Where?

- details about the location and/or context
- important characteristics of the setting
- the organization, its clientele and its culture
- the environment of the organization

- You are employed as a middle level manager at Starbucks (Thailand). Assume that Starbucks Thailand is hiring a new **Shift Supervisor**, an entry level supervisory position in the company at its *Tong Lor* site in Bangkok. The site is an especially high volume location but has been experiencing a troubling trend of customer complaints in recent months.
- The customers at this upscale location include a very high percentage of foreigners of many nationalities, both Austral-Asian, European and North American. Meeting their needs with a strong service orientation and focus is essential to this site's success.
- This position will require someone with a variety of organizational, interpersonal, and technical skills. You have been appointed to the Selection Committee to hire for this position. One individual in your team will serve as the chair of the selection committee.
- Starbucks (Thailand) HR policy requires that selection committees use two methods in its selection process: personal job interview and a work sample that involves job tasks to be performed by the employee,
- Your selection team will be responsible for planning and implementing the full selection process including each of these selection tools. Your project can be divided into several phases.

PBL Project Introduction

- Short statement to clarify relevance of the project
- States how and why the project is relevant to the work of the manager or leader.
- Connects the problem and the learning objectives to the reality of the workplace



- Should be stated in terms of the students' learning
- Should NOT be a restatement of the product expectations
- Vary the domains of thinking (i.e., knowledge, comprehension, application, analysis, synthesis)
- In practice it's a fluid process in relation to

Employee Selection: Learning Objectives

- To be able to design an integrated process that increases the likelihood that you will hire the right person for the job.
- To understand purposes of different selection tools and research about the effectiveness of each.
- To be able to design and use systematic tools to make selection decisions.
- To know how employee selection links to business objectives and productivity.
- To evaluate candidates on clear criteria for making an effective selection decision.

Defining the Major Learning Issues and Resources

- What skills and knowledge are you assuming students will bring to this project?
- Which of these assumed skills and what presumed knowledge students may lack?
- What resources (readings, artifacts, videos, people) will be most useful?
- Access professors, clinical staff, and practitioners to identify issues/resources.

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Employee Selection: Learning Resources

- Readings on recruitment, employee selection, interviewing, work sample design
- Combination of practical and research-oriented resources
- Video interview with Country Manager
- Students suggested to go to interview people at Starbucks (informally)
- HR manager may come in as a consultant
- Internet resources on Starbucks

Developing Guiding Questions

- Purpose of guiding questions:
 - To direct students to key concepts
 - To assist students in thinking through the problem
 - To stimulate students to view the problem from alternative perspectives

Employee Selection: Guiding Questions

- How do the business environment and public perceptions of the company impact on recruitment and selection?
- How can you make use of positive aspects of the company's situation and limit the impact of negatives in the selection process?
- What is the information that you will be seeking? Why have you chosen to gather this information? How will you be gathering it?
- Is it reasonable to expect the selection tool to yield this information?
- Which selection tools seem to be the *most suitable and defensible* in light of research? Which ones are the *least suitable and defensible*?
- What are some of the purposes, other than choosing the person with the *right stuff*, for which the interview and the work sample might be used?
- How can you design the selection process to increase the likelihood that the employees that you select will accept your job offer?

Product or Performance

- Is a key action-oriented component of the project:
- Diagnosis or precise definition of the problem
- Design a process for dealing with the problem
- Develop a plan for dealing with the problem
- Create plan and implement it in some form
- Create plan, implement and make decisions based on it

Defining Product Specifications

- Performance characteristics demanded of students in connection with resolution of the problem in practice
- To the extent possible the product should be similar to workplace performance.
- Vary the types of products: memo, presentation, interview, conference, meeting etc.
- Access practicing administrators in design, performance, and assessment of products.

Employee Selection: Product Specifications

- Design a process for selection of the shift supervisor to include resume assessment, interview and work sample
- Design interview questions and work sample spec's aligned to job profile and company needs
- Implement the process with 3 candidates
- Assess the candidates and make recommendations
- Write memo to the HR Director with your recommendation and letter to each of the three candidates

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PBL Project Assessment

- Individual and group .
- Formative assessment
- Summative assessment .
- Skills, knowledge, attitudes
- Team participation . Integrative essays



Talk back sheets

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	Duration/Time (Constraints
Week	Topics	Assignment Due
• 1	Introduction to the Project	5
•	Resume Screen	
 2 	Job Competencies	Project Plan
•	Interviewing	
 3 	Interviewing and Work Samples	On-line Discussion
• 4	Work Samples Design Selection Tools	Draft of Selection Table and Questions
	Analysis of Interview Data	
 5 	Role Play	Interview & Work Sample Summary
• 6	Group Presentations	Work Sample Result Interviewing and Work Samples Make decisions and prepare memos and VCD
• 7	Exam	Memos and Peer
	Evaluation	

Pilot Test

- Project development as a formative and iterative process
- Not always sequential as outlined here
- Estimating time allocation based on experience
- Importance of obtaining student feedback in a systematic fashion
- Continuous process of refinement
- Expect the need for changes

Integrating PBL and Information/Learning Technologies

Developing Knowledge-able Students: Role of Technology

"Information technology -- the Internet, for example -- only gives us access to *information*. To understand that information requires knowledge. Applying that knowledge ethically requires wisdom."



Lee Kuan Yew, 1996 Senior Minister, Singapore

Ways of Incorporating Technology into PBL and Cases

- To Convey Problem
- To Facilitate the Instructional Process
- As Tools for Problem-solving
- A a Means of Demonstrating the Product

Convey the Problem: Experts vs. Novices

Develop ability to:

- "Notice key info"
- Recognize patterns
- "Find" problems
- Develop proxies or short-cuts for diagnosis
- Analyze situations

Multi-media Can be Used to Convey the Problem

- Embed info in video and text description
- Provide a query-based system of info-giving and retrieval
- Reduce the gap with reality
 Increase engagement and fidelity



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Technology as a Tool to Facilitate the Instructional Process

- Simulate a work process
- Embed a database of knowledge
- As a shell providing access to other knowledge resources



Tech as a Tool Students Use to Analyze and Create a PBL Product

- Tech can be used by learners to create a product
 - Word processor
 - Web design
 - Database program
 - CAD software
- Tech is a tool for generating or analyzing info to make a decision or solve a problem
 - Excel or SPSS



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After the Problem, the Product is the next most important component in PBL

- Enhances context dependence
- Places knowledge acquisition in an active mode of application
- Grounds assessment in norms of professional workplace rather than academia
- Motivating











	Four Tyj	pes of Eva	luation	
		Struct	ured by	-
•		Instructor	Student	
d by	Instructor	Type 1	Type 2	-
Judge	Student	Type 3	Type 4	
	L			-

Process Assessment

Process:Individual

- Skills in various team roles
- Leader, facilitator, recorder, team member

Process: Group

- Dealing with conflict
- · Displaying multi-headed syndrome
- Compromising quality
- Sacrificing learning objectives to get product out

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- Backsliding in use of Interaction Method
- Over-relying on discussion & brainstorming

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Knowledge Assessment

Supplement traditional knowledge reviews to assess understanding at other levels.

- Know it.
- Understand it.
- Use it.
- Apply it appropriately.

Student Product Assessment: Type 1

- Draw on relevant knowledge base, not merely regurgitate facts or theories
- Accurate application of theoretical content
- Sensible application in light of facts in case and salient constraints
- Solution is practical in terms of actions
- Addresses possible consequences
- Key assumptions are identified

Giving Feedback

- We identify areas of strength in the product
- We focus critical feedback on a limited set of issues and frame it as. . .
 - Here's what we see. . .
 - Here's why this concerns us. . .
 - Do you see it that way, or some other way?
 - Then, explore discrepancy and assess validity.
- We note opportunities for future development in key areas (formative emphasis)

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Students' Reflection on Their Work in PBL

Reflective essay: What was learned?

- Self
- Relating to others
- Leadership
- Problem-relevant knowledge
- How intend to use knowledge & skills
- Changes in attitudes and beliefs
- Reactions to experience

Talk-back Sheets

- Used for formative assessment of the product
- Used in every project
- Obtain ongoing feedback for improvement of the project
- Insights from students concerning the project outcomes, resources and process

Increasing the Reliability of Performance Assessments

- PBL projects emphasize performances and products
- Need to have a reliable means of assessment
- Need to be consistent across teachers and groups of students
- Should be able to indicate to students the basis of assessments <u>in advance</u>



When should you use a rubric?

For student performances or products where students are expected to include certain curricular content or skills and perform to a desired standard



Specific Applications in PBL

- Student performances (e.g., meeting management, presentations, role play, interview of candidates)
- Project products (e.g., website, strategic plan, marketing strategy, movie, business plan, employee selection process)
- *Examinations*, especially where there are multiple instructors

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Possible Rubrics Categories for Team Participation

- Quality of work
- Quantity of work
- Initiative
- Interaction
- Support of team members
- Dependability

			Team Participatio	n Assessment	(5 points)			
Team:					Team Member Names			
Categories	Peor: 1 point	Fair: 2 points	Proficient: 3 points	Excellent: 4 points				Self
Responsibility and Punctuality	Frequently failed to complete tasks on time	Sometimes failed to complete tasks on time.	Met responsibilities and completed most tasks on time	Exceeded our expectations on timely completion of tasks and follow up				
Quality of Work Submitted to the Team	Quality of work for team products often failed to meet our expectations	Quality of work for team products sometimes failed to meet our expectations	Quality of work for team products met our expectations	Quality of work for team products frequently exceeded our expectations.				
Cooperation	Uncooperative or unwilling to listen to and support others to achieve group goals	Oenerally cooperative, but occasionally unwilling to listen to or support colleagues	Consistently listened to others' ideas and worked cooperatively to achieve group goals	Consistently listened to others; willing to sacrifice personal interests to achieve group goals				
Leadership	Generally passive with respect to leadership roles in planning tasks and resolving problems	Provided occasional leadership but generally left others to take initiative and solve problems	Provided some leadership and initiative to help the team achieve its goals	Provided effective leadership to help the team achieve its goals and productively resolve problems				
Overall Assessment	l would avoid or refuse to work with this member again.	I'd be willing to work with this member again, but would not seek the opportunity.	l would be happy to work with this member again.	l would actively seek to work with this member again.				
Comments				Total Points				
				Instructor Notes:				

			Team Participatio	on Assessment				
Team:	Team:							
Categories	Poor: 1 point	Fair: 2 points	Proficient: 3 points	Excellent: 4 points				
Responsibility and Punctuality	Frequently failed to complete tasks on time	Sometimes failed to complete tasks on time.	Met responsibilities and completed most tasks on time	Exceeded our expectations on timely completion of tasks and follow up				
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Overall Assessment	I would avoid or refuse to work with this member again.	I'd be willing to work with this member again, but would not seek the opportunity.	I would be happy to work with this member again.	I would actively seek to work with this member again.				





Be Prepared to Provide Feedback to Others

- 1. Was the problem relevant for your context?
- 2. Did it address important knowledge and skill domains? Which ones?

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- 3. What were the strengths of the project in terms of your own curriculum?
- 4. What were its limitations?

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Implementation of PBL in a Curriculum

- Part of a Course
- Full Course
- Module
- Strand of courses (e.g., Capstone)
- Full Program



Curriculum Design Issues

- Use spiral curriculum approach
- Importance of Feedback
- Organize around significant problems
- Organize around key skills
- Organize around key knowledge domains



Implementing PBL in a University Degree Program in Management

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Background on C.M.M.U.

- Started 8 years ago
- Semi-private University
- Currently graduating its 6th class of Master of Management students
- Grown from 3 to 86 Program Areas
- Currently 750 M.M. students
- English instruction
- International Program

Results of Quality Audit, Sept. – Dec. 2000

- Instruction at CMMU was teacher-centered
 - Desks lined up in rowsTechnology not in
 - working order
 - Instructors using m-m projectors to show "expensive" o-heads
- Learning still focused on reproduction rather than application of knowledge



Decision Taken by Management and Faculty to Implement PBL

- Align practice & mission
- Voluntary participation
- 3-month timeline
- Implement a PBL track in the Capstone portion
- 6-credit, 2-term sequence of PBL projects as alternative to Thesis/IS



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Implementation Strengths

- In-house PBL expertise
- One PBL Project ready
- Strong faculty interest
- Management support
- Culture of innovation
- Shared vision of learning
- Small class size (< 30)
- Suitable class facilities



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Potential Implementation Obstacles

- Time for curriculum design
- Lack of instructor knowledge and skills
- Culture of student dependency on teachers
- Culture of VERY LOW teacher interdependency
- Potential popularity could make it a victim of success



Implementation Process

- Implemented in June 2001 with 110 students
- Instructors teams of 2 to 5Almost 300 students completed the
- 2-term course in 1st year2-Term sequence to consist of 5
- modules or projectsTopics covered range of MM specializations
- 27 instructors in 1st year



Features of PBL at CMMU

- We use problem-stimulated PBL projects
- Students study in teams of 3 to 6 per project
- Assessment covers both individual and team products
- All projects use technology





4 years and 12 terms of implementation later. . .

- PBL Capstone is the first choice of students
- PBL is introduced to students in their 1st term
- PBL has migrated through the curriculum carried by instructors from the Capstone

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- Is woven into courses selectively through the curriculum
- Many courses do not use PBL
- It's up to instructors and instructor teams
- PBL has become a signature of the College

Limitations of the PBL Effort

- Highlighted weaknesses in assessment in the college
- Required much higher instructor interdependency
- Heavy time commitment on assessment of student "products"
- High variance in quality/skill among instructors within a project team



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What We Have Learned?

- Local factors are critical in pace of implementation
- Keep class size under 30
- Develop instructor skills, especially in assessment
- Small instructor teams are better (4 or less)
- Use formative assessment Asian students can adjust



Recommendations for Implementing PBL in Other Institutions

- PBL can be a productive force for improvement of teaching and learning.
- Don't view PBL as the only way, but as one useful approach to learning many useful approaches to create active learning
- PBL will not be suitable for all instructors and students.
- Assess your strengths and limitations in advance to set the pace of implementation.
- Assess frequently and be prepared to adjust.



Insert Divider Here

Because Wisdom Cannot Be Told: Problem-Based Learning in Professional Education

> Developed by Edwin M. Bridges Stanford University and Philip Hallinger Vanderbilt University

> > Version 3.0s

General Instructions

- 1. Suggested procedures for the session:
 - read the project description that follows on pages 2-4;
 - discuss the problem in your group using the roles as described below;
 - review the and discuss the resource materials included with the project in relation to the problem presented in the project (see resources on p. 4);
 - discuss the guiding questions and complete the product (see p. 3);
 - present oral reports (described under product specifications on p. 4).
 - complete the assessment (described under assessment on p. 5).
- 2. One person at your table will serve as the leader of the project; a second will serve as the facilitator; a third will serve as recorder. Determine who will fill these roles as follows:
 - Leader, the person with the smallest hand size;
 - Facilitator, the person with the largest shoe size;
 - Recorder: the person with the second smallest hand size.

Role Definitions

Leader: Primarily responsible for organizing the project in order to accomplish the learning objectives and to complete the product. In the leader role, you...

- Provide initial direction and set the agenda (assign roles, tasks, and time allotments).
- Contribute your own ideas and views about the content of the discussion.
- Do not dominate the meeting; Let the facilitator run the meeting.

Facilitator: Acts as the traffic-cop for the group. Keeps group on-task and on schedule; helps group to reach consensus (not agreement on what is the best decision but agreement on a decision that everyone can live with). When acting as the facilitator, strive to follow the following guidelines:

- c) Do not evaluate or contribute ideas to the content of the discussion.
- d) Contribute your idea only if you signal that you are stepping temporarily out of your role as facilitator.
- e) Protect individuals and their ideas from personal attack.
- f) Encourage everyone to participate and do not allow anyone to dominate the discussion.

Recorder: Acts as the group's memory; records major ideas and decisions reached; presents the group's report. In this role, please strive to:

- (c) Record the words of the speaker.
- (d) Listen for key words and try to capture basic ideas, the essence of what they say.
- (e) Write down key phrases rather than every word, but don't substitute your ideas for those of the speaker.
- (f) Check periodically to ensure that you are writing what is meant by the speakers.

Because Wisdom Cannot Be Told Problem-Based Learning in Professional Education

So he had grown rich at last, and thought to transmit to his only son all the cut-and-dried experience which he himself had purchased at the price of his lost illusions; a noble last illusion of age. (Balzac)

This quote vividly highlights the difficulty that people experience in transmitting their knowledge to others. In 1940, Charles L. Gragg published an article (see attached Resources) in which he asserted that "the goal of education is to prepare students for action." The problem of knowledge transfer is particularly acute in the professions (e.g., education, law, medicine, management) where the application of knowledge is paramount.

Yet, there has been a growing recognition that professional education has fallen short of the demands of the workplace. Graduates often report that the content of their preparation programs is irrelevant to their work roles. Theory and research appear unrelated to the problems they face in practice. Studies confirm the belief that knowledge gained in professional education often transfers poorly to the workplace. Students often forget much of the material which they have learned and/or are unsure how to apply the knowledge they have retained. Moreover, professional education programs have generally ignored the affective domain of education despite its importance in the practice of many professional fields.

The challenge of preparing students for the workplace has taken on increased importance over the past decade as research continues to generate new knowledge at increasing rates. The explosion of knowledge and the use of more efficient information technologies have placed a greater premium on life-long learning as a legitimate goal of professional education. In most professional fields, important curricular domains have changed substantially over the past decade; change in the knowledge base of most professions is likely to accelerate in the future.

Professional education must increase its capacity to make both current and future knowledge accessible to practitioners. One potential vehicle for closing the gap between our aspirations for student learning and the reality of workplace application is problembased learning (PBL). This educational approach holds promise for making education more meaningful and for increasing students' ability to access and apply knowledge outside the classroom. In this project, you will have the opportunity to learn about problem-based learning by participating in the process of problem-based learning. It is hoped that you will learn about PBL in a manner that enables you to apply your knowledge to the development of your own educational program.

The Problem

Assume that your training institution is experiencing a 10 percent cutback in its budget. Further assume that the Director has conducted a thorough review of each department. His review reveals the following:

- Enrollments in your department show a downward trend over the past four years.
- A survey of program graduates and employers found them extremely critical of the quality of preparation. Graduates maintain that the content lacks any relevance to professional practice and that the instructors rely much too heavily on two methods of instruction -- lecture and teacher-led discussion.
- Local and national employers have asserted that your graduates seem illequipped to work with others in creatively tackling real problems.

The Director shares the results of her review with your Department Head and asks your department to develop a plan that responds to the declining enrollments and criticisms. Unless your department comes up with a reasonable plan, it is in danger of suffering a much larger cut than 10 percent and being phased out or merged with another department.

Your Department Head has created three sub-committees to look into problem-centered instructional strategies:

- case method,
- case incident technique, and
- problem-based learning.

You have been assigned to the sub-committee investigating PBL.

The Department Head has charged your sub-committee with reviewing the literature on PBL and preparing a brief report on what you have learned about PBL. You won't have time during this session to draft the report, but you will make a presentation to the Dean as well as the other faculty in your department.

Learning Objectives

At the conclusion of this project learners will know the following.

- 1. What is problem-based learning (PBL) and what is the rationale for its use?
- 2. What is the role of students in PBL?
- 3. What is the role of the instructor in PBL?
- 4. How does PBL operate in a classroom setting?
- 5. What do we know about the effectiveness of PBL in professional education?

Guiding Questions

- 1. What are major differences between the role of a student in PBL and traditional and case methods of instruction?
- 2. What are major differences between the role of an instructor in PBL and the traditional and case methods of instruction?
- 3. What facets of problem-based learning foster *transfer of learning* to the workplace?
- 4. What are some of the advantages and disadvantages of PBL from the teacher's perspective? From the student's perspective?
- 5. What characteristics of PBL make it appropriate for learning programs oriented towards application in the workplace?

[Note: the guiding questions are designed to orient you to important learnings/issues in the project. It is not intended that you will answer these questions explicitly.]

Product Specifications

- 1. Prepare an oral report that you will deliver to the Dean and the rest of your department's instructional staff; this report should address these questions:
 - a. What you have learned about PBL that is of greatest importance to your staff, particularly as it concerns the problems they face?
 - b. What should the department do next concerning PBL?
 - drop the idea of using PBL;
 - study the idea in more depth, noting what you want to know more about;
 - use PBL on a limited, trial basis
 - adopt PBL in a more substantial fashion.

c. Why you are making the recommendation?

Your group will have10 minutes to present its oral report to the other staff in your department.

Resources

For this PBL project, you will have the following resources:

1. Reading materials: see attached readings. Although each of you has been provided with all of the materials, we encourage you to jigsaw the readings. That is, have each person read one piece or section and then discuss what she/he

has read. If more than one person reads the same piece, one person reports and the other(s) offer(s) additional comments if this seems necessary or appropriate. Ordinarily, learners read the resource material outside class. Divide up the readings as you see fit given the varying lengths of the selections.

- 2. Your instructor(s) will be available during the session to answer questions.
- 3. As often is the case, there will be one or more group members who have read about the topic or who have firsthand experience with it. We encourage you to use whatever resources exist within your group. [In PBL, students, as well as instructors, serve as resources to the team.]
- 4. Videotape: *Can We Make a Better Doctor?* The American public television series, NOVA, produced this video about the New Pathways Program -- a problem based learning track -- at Harvard University Medical School. This will be shown at a predetermined time.

Assessment: Talk Back

We need your reactions to this PBL project; these will play an important role in our decisions (i.e., modify, leave as is, drop) about this project. Please let us have your candid reactions to what has occurred. We will take them seriously. Please continue your comments on the back of this sheet if necessary.

Talkback

1. What was the most important thing you learned in today's session?

2. What questions do you have from today's session that remain unanswered?

3. How might this session be changed to make it more useful? (Please be as specific as possible.)

Because Wisdom Cannot be Told Knowledge Review

Section I: Multiple Choice

- 1. The starting point in problem-based learning is:
 - a) disciplinary knowledge
 - b) the student's prior knowledge
 - c) a problem derived from practice
 - d) problem-solving skills
- 2. Which of the following elements distinguishes problem-based learning from traditional case teaching?
 - a) PBL focus on an administrative problem
 - b) PBL uses cooperative learning as an essential element
 - c) PBL engages students in problem analysis
 - d) None of the above
- 3. Which of the following is not a characteristic of PBL?
 - a) student centered learning
 - b) performance-based outcomes
 - c) a problem derived from practice
 - d) emphasis on problem-solving
 - e) all of the above
- 4. The conceptual bases for problem-based learning include:
 - a) knowledge learned in relation to a problem context promotes transfer
 - b) the student's prior knowledge is activated
 - c) information is better understood if students have an opportunity to apply it
 - d) retention is promoted through student elaboration of concepts with peers
 - e) all of the above
- 5. Which of the following is not a motivational factor that supports the use of PBL?
 - a) application of higher order thinking skills
 - b) opportunity for active response
 - c) immediate feedback
 - d) opportunity to apply prior knowledge
 - e) all of the above
- 6. Which of the following functional features distinguishes PBL from case teaching?
 - a) PBL allows for the application of higher order thinking skills
 - b) PBL provides an opportunity for active response
 - c) PBL projects target the affective as well as the cognitive domain
 - d) PBL focuses on a realistic administrative problem
 - e) all of the above

- 7. Which of the following reflects the instructor's role in PBL:
 - a) instructor exercises a high degree of control over the curricular content
 - b) instructor focuses on summative evaluation
 - c) instructors focuses on formative feedback
 - d) instructor ensures that students understand the right answer
 - e) all of the above
- 8. Which of the following is not supported by empirical research on PBL?
 - a) more positive student attitudes towards instruction among students in PBL
 - b) PBL students complete programs faster and at a higher rate
 - c) PBL students adopt a meaning rather than a reproduction orientation
 - d) PBL students outperform traditional students on tests of program knowledge
 - e) all of the above
- 9. In PBL students:
 - a) are responsible for managing their own learning
 - b) are expected to use resources beyond those provided by the instructor
 - c) seek to develop lifelong learning skills
 - d) must apply knowledge towards the development of a realistic learning product
 - e) all of the above
- 10. In PBL the curriculum:
 - a) is student driven
 - b) allows for greater depth of coverage
 - c) allows for greater breadth of coverage
 - d) is instructor centered
 - e) all of the above

Fill In

- 11. List three disadvantages of PBL from the perspective of the instructor:
 - a)
 - b)
 - c)
- 12. List three advantages of PBL from the perspective of the instructor:
 - a)
 - b)
 - c)
- 13. List three disadvantages of PBL from the perspective of the student:
 - a)
 - b)
 - c)

- 14. List three disadvantages of PBL from the perspective of the student:
 - a)
 - b)
 - c)
- 15. If you accepted the balance of empirical evidence in the medical literature as supportive of problem-based learning, what factors with respect to management would you consider as you think about the applicability of the medical research to managerial education?

Because Wisdom Cannot Be Told Project Resources

Resource #1: Problem-Based Learning: What is It?

In providing you with an overview of this instructional approach, we have chosen to organize the discussion around some of the most commonly asked questions.

How does problem-based learning differ from traditional and case methods of instruction?

Step inside three different management classrooms and listen to the instructors as they introduce the topic of personnel selection.

Classroom 1: Traditional instruction

Near the end of the class session, the instructor announces:

That concludes our discussion of employee socialization. At our next meeting we will be discussing the topic of "Personnel Selection." In line with previous class discussions, you should come prepared to discuss the readings listed in your course syllabus. I want you to pay particular attention to the readings about two selection methods -- the interview and the work sample -- and the paper that discusses research on the effectiveness of various selection tools. I would also like for you to think about how this material might be used to design a personnel selection process.

Classroom 2: Case method of instruction

Near the end of the class session, the instructor announces,

Before our next meeting, I want you to read the case, Mr. Jones: A Case of Mistaken Identity. This case describes the selection process that the XYZ corporation used when choosing him for a position and what happened during his first year on the job. Mr. Jones has been working for five months, and it is now clear that he is unsuited for the position. Come to class prepared to discuss the following:

- 1. What are Mr. Jones' principal strengths and weaknesses?
- 2. Why does Mr. Jones seem to be doing so poorly?
- 3. How would you change the company's selection process to increase the odds of choosing someone with the "right stuff"? Be prepared to explain and justify your conclusions.

Classroom 3: Problem-based learning

Your next project will be on the topic of "Personnel Selection."

While the instructor distributes copies of the project's description, he continues his comments: "You will have three class sessions (three hours each) to complete this

project. Ellen has agreed to be the project leader. At the first session she will be assisted by Michael and Gail; he will be the recorder while she will act as the facilitator."

In this project, the team is constituted as a selection committee. You will design a selection process and implement it with three finalists. The three finalists, one novice and two experienced managers, are candidates for a position as marketing manager. You have to decide which candidate will be recommended for the position. To assist you in designing the selection process, I have supplied a number of pertinent readings and guiding questions. If you look at the Learning Objectives in the project description, you will have a sense of what I expect you to learn from this experience.

As with previous projects, I will act as an observer and a resource to the team. You, of course, will decide how you are going to complete your committee's assignment and to accomplish the learning objectives."

What are the characteristics of PBL as an instructional strategy?

Problem-based learning (PBL) is an instructional strategy that has the following characteristics:

- 1. The starting point for learning is a problem (that is, a stimulus for which an individual lacks a ready response).
- 2. The problem is one that students are apt to face currently or in the future as professionals.
- 3. The knowledge that students are expected to acquire during their professional training is organized around problems rather than the disciplines (e.g., psychology, law).
- 4. Being able to use the knowledge appropriately is considered as important as acquiring the knowledge.
- 5. Students, individually and collectively, assume a major responsibility for their own instruction and learning.
- 6. Most of the learning occurs within the context of small groups rather than lectures. (These small groups are referred to as project teams.)

What is the basic unit of instruction in PBL?

A problem-based learning project is the basic unit of instruction in a PBL curriculum. Each PBL project contains the following features:

- \circ Introduction
- o Problem
- o Learning objectives
- \circ Resources
- Product specifications
- Guiding questions

- o Assessment exercises
- o Time constraints

How are project teams organized?

Each project team consists of five to seven students. Each student is assigned one of the following roles: project leader, facilitator, recorder, team member. Students rotate roles from one project to another so that each student will have the opportunity to experience all of these roles.

When sufficient numbers of students are available, the composition of the teams changes from one project to the next. Since the composition of each team, the leader, and the duration of the project may vary across projects, students become exposed to the situational nature of leadership and the risk and uncertainty that are characteristic of managerial work.

What is the role of the student?

Students play an extremely active role in a PBL project. They, not the instructor, shoulder the responsibility for what happens during the life of a project. The leader and other team members are responsible for figuring out how the project objectives will be accomplished, on time, with the available resources.

Team members should not lose sight of the fact that each project has dual objectives. One set relates to the learning objectives--the knowledge and skills participants are expected to acquire during the life of the project. The other set relates to the product objectives--the resolution of the problematic situation that lies at the heart of problembased learning. There is the ever-present danger that team members will become consumed with trying to accomplish the product objectives and will slight the learning objectives in the process. The leader and other team members are responsible for seeing that both objectives of the project are accomplished.

How are students evaluated?

Students are evaluated primarily for the purpose of promoting personal and professional growth. Three sources of evaluation are used to accomplish this purpose--self, peer, and instructor. Formative evaluation is based primarily on the student's performance at team meetings, the student's or team's final product and/or performance, and the student's mastery of the learning objectives. Feedback is oral as well as written, underscores what the student is doing especially well, and highlights some things for the student to think about or consider in relation to his or her performance.

Students also receive a summative evaluation at the end of the quarter in the form of a pass/no credit. Students do not fail (that is, receive no credit) unless they have ample forewarning that this may occur.

What is the role of the instructor?

The role of the instructor in a PBL environment can be defined in terms of what the instructor does not do, as well as what the instructor does. PBL instructors do not act as dispensers of knowledge, they do not conduct recitations, they do not guide the discussion, and they generally do not manage the activities that occur during "class" time. In conventional classrooms, the two-thirds rule has become an iron law; two-thirds of the time someone will be talking and two-thirds of this talking will be done by the instructor. This rule does not apply to PBL classrooms, where the instructor talks substantially less than students. They, not the instructor, are the dominant participants.

PBL instructors engage in quite different activities. They create, select, and sequence the problem-based learning projects. They assign students to project teams and designate who will be the leader, facilitator, and recorder. Instructors assemble the materials and equipment needed by project participants. Once the project is underway, the instructor acts as a process observer, provides suggestions to facilitate the team when it becomes stuck, encourages students to take risks, and provides feedback. When the project is completed, the instructor provides oral and written feedback about the team's product and performance.

Resource #2: PBL: How Effective Is It?

The effectiveness of problem-based learning in preparing professionals for their future roles has been studied most extensively in the context of training future physicians. Here we briefly review the focus, results, and limitations of this research.

Focus

The vast majority of the research on problem-based learning in medical education focuses on a variant of the following question: Do problem-based learning programs produce better outcomes for medical students than traditional programs? The major outcomes of interest in descending order of investigation are (a) student attitudes toward the instructional environment; (b) knowledge of the basic disciplines represented in medical curricula; (c) clinical competence; (d) approaches to studying; (e) career preferences; (f) completion time and rates; and (g) study loads.

A small set of studies focuses on non-student outcomes. These studies center on one of the following issues: instructors' motives for teaching in a problem-based learning program, costs of PBL vs. traditional programs, students' preferences for PBL or traditional programs, and the correspondence between faculty and student perceptions of learning needs in a problem-based program.

Results

Compared with traditional programs in medical education, PBL yields superior or equivalent results on all but one of the outcome measures studied.

Students in the PBL programs express substantially more positive attitudes toward their training than do students in more traditional programs. The former are inclined to praise their training, especially those aspects which are unique to problem-based learning, while the latter are more likely to describe their training as boring, irrelevant, and anxiety provoking.

Besides expressing more positive attitudes toward their training, students in PBL programs also adopt more desirable approaches to studying than their traditional program counterparts. Students in traditional programs are more likely to adopt a reproducing orientation to studying, i.e., use rote learning and seek to reproduce the factual information in the syllabus. PBL students, on the other hand, are more likely to adopt a meaning orientation, i.e., to be intrinsically motivated by the subject matter and to strive to understand the material.

In those countries with relatively high dropout rates among medical school students, there appear to be noticeable differences in the completion times and rates of PBL and traditional students. PBL students in Holland are much more likely to graduate and to graduate in less time than medical students in the more traditional schools.

Upon graduation from medical school, PBL students apparently pursue different careers in the field of medicine than graduates of traditional programs. The most pronounced

tendency is for PBL graduates to choose family medicine and practice more often than traditional program graduates. This tendency was evident in three of the four studies that investigated career preferences of medical graduates.

When we examine how well PBL and traditional programs accomplish the major goals of medical education, we discover that the two types of programs do not yield markedly different results. On tests of medical knowledge students in the traditional programs score higher than students in the PBL programs, but the differences are small. There is some evidence, however, which suggests that students in PBL programs show a steeper growth in medical knowledge throughout their entire period of study than students in more traditional programs.

When the goal of clinical competence is considered, there are no substantial performance differences between PBL students and their counterparts in traditional programs. Although PBL students tend to perform better, the differences are small and non-significant. This pattern holds true for problem solving proficiency and performance of students during the clerkship, residency, and internship phases of their medical training.

In light of the widespread concern about rising medical costs, we were surprised to find only one study that focused on the costs of PBL and traditional programs. Costs were studied exclusively in terms of the time instructors spent on teaching. There were no differences in the amount of time spent on teaching; however, there were substantial differences in how instructors spent their time. In the PBL track, instructors spent 72% of their time in contact with students and 28% in preparation for this contact. The reverse was true in the traditional track where instructors spent 61% of their time in preparation and only 39% in contact with students. Given the apparent indifference toward studying program costs, we searched the literature on Continuing Medical Education (CME). None of the 47 studies of the effectiveness of CME considered the costs of these programs.

Limitations of the Research on PBL

The research that has been conducted on the effectiveness of problem-based learning versus the traditional approach is flawed in several respects. Let us examine the deficiencies of this research in terms of the specification of the research design, the independent variable, and the measurement of dependent variables.

Research Design

Research on problem-based learning generally uses weak research designs. The overwhelming majority of this research employs one type of pre-experimental research design, the static-group comparison. This is a design in which one group that has experienced X, the independent variable (in this instance, PBL), is compared with another group which has not, for the purpose of establishing the effect of X. According to Campbell and Stanley (1963), this particular design has several weaknesses. The most serious weakness is that there is no way of telling conclusively whether the differences in outcomes would have occurred anyway without X because the persons in the two groups were differentially recruited.

Independent Variable

Although researchers claim that they are contrasting problem-based learning with traditional training programs, their claims are suspect. There are virtually no attempts to define what is meant by "traditional." Moreover, when problem-based learning is compared with the traditional approach, PBL often is not the main instructional approach. In those cases where PBL appears to be the main approach and is explicitly defined, it is clear that the PBL programs belong to the same genus but different species.

Measures of the Dependent Variables

The measures of the dependent variables, like the specification of the independent variable, are also suspect. Researchers rarely cite any evidence that attests to the reliability of the measures. In those rare instances where the researcher supplies data about reliability, the coefficients are moderate at best (.26 to less than .80).

When measuring differences in medical knowledge, researchers appear to be testing recall via cued questions (i.e., alternative answers furnished), rather than recall and spontaneous use of knowledge in clinical contexts. Given the rationale for problembased learning in medical education, it seems more appropriate to measure how well students retrieve and correctly use knowledge in clinical contexts without external prompts.

Question #3: PBL: Why Use It?

Our own interest in exploring the potential of PBL for professional education rests on cognitive, motivational, and functional grounds.

Cognitive Grounds

Problem-based learning has been used extensively in the field of medicine to train future physicians. The rationale for using this approach rests in part on four propositions that, in our judgment, apply with equal force to the preparation of administrators.

- 1. Students retain little of what they learn when taught in a traditional lecture format.
- 2. Students often do not appropriately use the knowledge they have learned.
- 3. Since students forget much of what is learned or use their knowledge inappropriately, instructors should create conditions that optimize retrieval and appropriate use of the knowledge in future professional practice.
- 4. PBL creates the three conditions that information theory links to subsequent retrieval and appropriate use of new information: activation of prior knowledge, similarity of contexts in which information is learned and later applied, and opportunity to elaborate on that information.

Prior knowledge is activated, that is, students apply knowledge they already possess in order to understand the new information. This prior knowledge and the kind of cognitive structure in which it is stored determine what is understood from the new experience and what is learned from it. Problems are selected and sequenced to ensure that this activation of prior knowledge occurs.

The context in which information is learned resembles the context in which it will later be applied (referred to as encoding specificity). Research shows that knowledge is much more likely to be remembered or recalled in the context in which it was originally learned. Encoding specificity in problem-based learning is achieved by having students acquire knowledge in a functional context, that is, in a context containing problems that closely resemble the problems they will encounter later in their professional careers.

The advantage of such an approach is that students become much more aware of how the knowledge they are acquiring can be put to use. Adopting a problem-solving mentality, even when it is marginally appropriate, reinforces the notion that the knowledge is useful for achieving particular goals. Students are not being asked to store information away; they see how it works in certain situations which increases the accessibility of the knowledge.

Information is better understood, processed and recalled if students have an opportunity to elaborate on that information. Elaborations provide redundancy in the memory structure which in turn reduces forgetting and abets retrieval. Elaboration occurs in

problem-based learning in various ways, namely, discussing the subject matter with other students, teaching peers what they first learned themselves, exchanging views about how the information applies to the problem they are seeking to solve, and preparing essays about what they have learned while seeking to solve the problem.

Motivational Grounds

According to one major theory of motivation, the effort that people are willing to expend on a task is a product of two factors. One factor is the degree to which they expect to be able to perform the task successfully if they apply themselves and the other factor is the degree to which they value the rewards that successful performance will bring. In line with the tenets of expectancy x value theory, instructors should use motivational strategies that address these factors. Furthermore, instructors should create the preconditions that are essential to the effectiveness of any motivational strategy.

Problem-based learning strives to create the essential preconditions for successfully using motivational strategies in several ways. The instructor creates a supportive learning environment by encouraging students to take risks, by praising students for their risk-taking attempts, and by treating mistakes and "failures" as learning opportunities. The instructor assigns tasks at the appropriate level of difficulty. This precondition is achieved by choosing projects that are neither too easy nor too difficult for the student and by gradually increasing the complexity of each project. The instructor chooses each PBL project with meaningful learning objectives in mind, communicates these objectives to students, and explains in an introduction to the project why these objectives are worth mastering. Finally, the instructor uses a variety of strategies to stimulate student motivation.

To maintain the students' expectation of success in a PBL instructional environment, the instructor underscores how the curriculum has been designed to promote success. Projects have been chosen and sequenced in such a way that students will acquire the basic skills they will need to succeed in this instructional environment. Moreover, each project contains a knowledge base and a set of guiding questions that may prove helpful to students as they attempt to deal with the focal problem. Finally, students are encouraged to draw on other resources to assist them in thinking through the problem. Each successful completion of a PBL project strengthens the expectation that effort leads to success.

To underscore the value of learning activities in a PBL curriculum, instructors may use extrinsic or intrinsic motivation strategies. An extrinsic motivation strategy links task performance to consequences that students value. These consequences may take one of several forms: rewards for good performance, instrumental value in achieving future success, and rewards achieved through competition with others. In a PBL environment, the instrumental value of learning activities is emphasized. Each PBL project contains an explicit rationale that explains why the project was included in the curriculum. The rationale also discusses how the knowledge and skills that are emphasized in the project relate to the future responsibilities of the administrator.

Intrinsic motivation strategies are based on the idea that students will expend effort on tasks and activities they find inherently enjoyable and interesting even when there are no extrinsic incentives. Each PBL project contains six elements that most students, according to Good and Brophy (1991), find enjoyable or intrinsically rewarding.

- 1. *Provides opportunities for active response*. In each PBL project students learn by doing something. They engage in a wide array of activities--leading, recording, discussing, facilitating, making decisions, developing and revising schedules, making oral presentations, holding conferences, and the like.
- 2. *Includes higher-level objectives and divergent questions*. At the heart of each PBL project are a problem to be solved, a situation to be analyzed, knowledge to be applied, alternatives to be evaluated, and consequences to be forecast. All of these tasks involve higher-order intellectual skills. The hallmark of PBL is applying knowledge, not simply recalling it.
- 3. *Includes simulations*. In a PBL instructional environment, the instructor incorporates simulations into most PBL projects. For example, students participate in mock meetings of a board of education and a superintendent's cabinet. Students also role play conferences, handle in basket items, and conduct classroom observations by viewing videotapes of classroom teaching episodes.
- 4. *Provides immediate feedback.* In a PBL environment, instructors position themselves to observe students and how they are using or misusing the knowledge they are attempting to master. When it becomes clear that students do not understand a particular concept or are unable to use it appropriately, the instructor can supply immediate feedback.
- 5. *Provides an opportunity to create finished products*. Most PBL projects conclude with a product (for example, a memo to the superintendent or a classroom observation report), a performance (such as a post observation conference with a teacher or an oral presentation to a board of education), or both. These products challenge students and heighten their level of concern.
- 6. *Provides an opportunity to interact with peers*. Since the basic unit of instruction is a project and students work as members of a project team, students interact extensively with peers. Every student has a role on the project team and participates actively in accomplishing the project's objectives, The person occupying the project facilitator role has the responsibility for ensuring that all team members are actively involved in the team meetings and that no one dominates the discussions.

Functional Grounds

In an earlier paper Bridges (1977) analyzed the "work" of a student and the work of an administrator along four dimensions: the rhythm of the work, the hierarchical nature of the work, the character of work-related communications, and the role of emotions in work. Based on this analysis, he concluded that there is a major lack of connection

between the work of a student and the work of an administrator. Problem-based learning narrows the gap between the "work" of a student and the work of an administrator in several ways; therefore, it is more likely to result in trained capacity rather than trained incapacity.

With respect to the rhythm of the work, the tempo of a student's work in a PBL environment more closely corresponds to the accelerated work pace of the administrator than does the work of a student in a conventional instructional environment. Students work under time pressure to complete a problem-based learning project, and the time available is rarely sufficient. Time deadlines in the PBL environment force students to balance the need to understand (that is, analyze) with the need to act. Since they are judged on the feasibility of their actions, as well as the thoroughness of their analysis, they are less likely to become victims of "analysis paralysis."

The hierarchical nature of the work of a student in a PBL environment also more closely resembles the work of an administrator. In a conventional instructional environment, students occupy subordinate roles. Their work is largely individualistic and competitive; the deficiencies of "fellow employees" enhance rather than diminish their standing in the workplace. The student's work in a PBL environment is strikingly different. Students serve as team leaders, facilitators, and members of a project team. Through these experiences, students come to appreciate the dependency inherent in managerial roles, the necessity of delegating responsibilities to others, and the difficulties and frustrations inherent in trying to obtain results through other adults.

The character of work-related communications contrasts sharply in PBL and conventional instructional environments. In conventional instructional environments students spend most of their time in receiving roles, they rely heavily on the written mode of communication using the impersonal language and the detached style of the academician, and they engage in one-way communications. The character of work-related communications in a PBL environment more closely resembles those of the administrator. PBL students, like administrators, spend roughly equal amounts of time in sending and receiving roles, rely heavily on oral modes of communication, prepare written memos (the dominant form of written communication for administrators), and work in small face-to-face interpersonal settings that are conducive to two-way communication.

The role of emotions in work also is quite different in the two types of instructional environments. In a conventional instructional environment students "work" in a relatively placid emotional climate. Ideas, not feelings, are the currency of the realm. Affective neutrality is the dominant expressive state as it is congruent with the contemplative and scientific character of academic work. In a PBL environment, the emotional tone of the interpersonal environment is more varied and jagged. Students, like the administrators they aspire to be, encounter the emotional problems of working with people. These occasions create opportunities for students to test their competence in interpreting and responding to the feelings of others. When projects go awry, students also acquire insights into how they deal with disappointment, a common, but oft neglected, emotion.