Design and Implementation of Pedagogies of Engagement:
Cooperative Learning and Problem-Based Learning

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Post-Conference Workshop
RCEE 2007 Johor

December 6, 2007

Workshop Layout

- Overview
- Guiding Questions & Participant Survey
- *How People Learn* Framework
- PBL Example – PrBL –Design Project
- Backward Design Approach
  - Course, Class Session, and Learning Module Design: From Objectives and Evidence to Instruction
- Groups in CL & PBL
  - PBL groups in action
- Tools for using groups in PBL
- Video Preview – Facilitators & Groups in PBL
- Wrap-up

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Design and Implementation of Pedagogies of Engagement

- Design Framework – *How People Learn*
- Design & Backward Design Process (Felder & Brent, Dee Fink and Wiggins & McTighe)
- Pedagogies of Engagement - Instructional Format explanation (or exercise to engage workshop participants)
  - Smith web site – www.ce.umn.edu/~smith
  - University of Delaware PBL web site – www.udel.edu/pbl
- Design of Challenge-Based (PBL) exercises
  - Creating High Quality Learning Environments (Bransford, Vye & Bateman) -- http://www.nap.edu/openbook/0309082927/html/
  - Cooperative Learning (Johnson, Johnson & Smith)
- Course, Class Session, and Learning Module Design: From Objectives and Evidence to Instruction

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Guiding Questions for the Workshop

- How do you design and implement CL & PBL?
- What are some of the guiding principles underlying the design of CL & PBL?
- Questions based on Backward Design Model:
  - What is worthy and requiring of student's understanding?
  - What is evidence of understanding?
  - What learning experiences and teaching promote understanding, interest, and excellence?

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Knowledge Probe

- CL/PBL Knowledge Probe
- Example from MOT 8221
- What would you like to know about the students in your courses?

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Survey of Participants

- Familiar with cooperative learning (CL) or problem based learning (PBL) literature?
- Experienced CL or PBL as a learner?
- CL/PBL Workshop(s)?
  - University of Minnesota Johnson & Johnson CL
  - McMaster University
  - University of Delaware
  - Other Workshops/conferences?
- Teach / Taught using PBL or CL?

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Participant Information
MOT 8221, Project and Knowledge Management, Spring 2007

Name______________________________

Current Title and Job Description: (Please append a recent resume)

Work Experience (describe briefly): (use additional space if necessary).

Previous Coursework/Experience in Project Management, Knowledge Management, Leadership, Engineering Systems, Industrial Engineering/Operations Research (IE/OR), Management Science, and Quality Management (Six Sigma/TQM):
For the following areas, please rank your level of understanding according to the following scale:

1 = Little or no coursework/self study/experience in this area.
2 = (Between 1 & 3).
3 = Moderate coursework/self study/experience in this area
4 = (Between 3 & 5).
5 = A great deal of coursework/self study/experience in this area.

Project Management	1	2	3	4	5
PMI-PMBOK	1	2	3	4	5
Knowledge Management	1	2	3	4	5
Leadership	1	2	3	4	5
Engineering Systems	1	2	3	4	5
IE/OR	1	2	3	4	5
Modeling/Simulation	1	2	3	4	5
Complex Adaptive Systems	1	2	3	4	5
Mgmt Science	1	2	3	4	5
Six Sigma/ TQM	1	2	3	4	5

Computing Experience:
For each of the following, rate your proficiency and list any computer software:

1 = Never have used it.
2 = Know a little about it.
3 = Have used it some.
4 = Am very comfortable using it.

	Rating				Specific Packages
Spreadsheet	1	2	3	4	
Project Management	1	2	3	4	
Statistical	1	2	3	4	
Modeling/simulation	1	2	3	4	
Data base	1	2	3	4	
Programming language	1	2	3	4	
Knowledge Map/Expert System	1	2	3	4	

Expectations from the course (use additional space if necessary):

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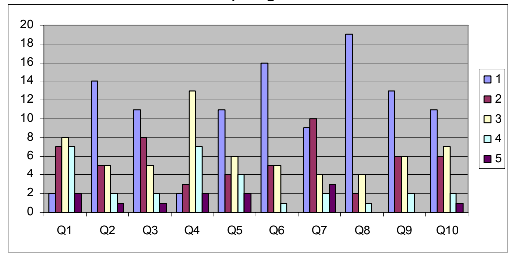
MOT 8221 – Spring 2007 – 27/30



PM	Q1	IE/OR	Q6
PMI-PMBOK	Q2	Mod/Sim	Q7
KM	Q3	CAS	Q8
Leadership	Q4	MgmtSci	Q9
EngSys	Q5	6 Sigma	Q10

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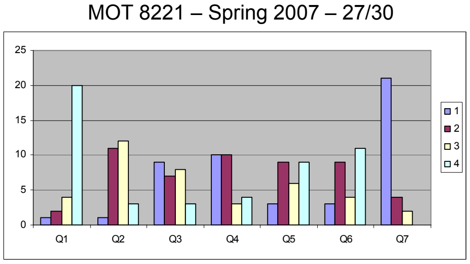
MOT 8221 – Spring 2007 – 27/30



Spread	Q1	DB	Q5
PM	Q2	Prog	Q6
Stat	Q3	KM/ES	Q7
Mod/Sim	Q4		

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How People Learn References

National Research Council Reports:

1. How People Learn: Brain, Mind, Experience, and School (1999).
2. How People Learn: Bridging Research and Practice (2000).
3. Knowing What Students Know: The Science and Design of Educational Assessment (2001).
4. The Knowledge Economy and Postsecondary Education (2002). Chapter 6 – Creating High-Quality Learning Environments: Guidelines from Research on How People Learn

NCEE Report

1. Rethinking and redesigning curriculum, instruction and assessment: What contemporary research and theory suggests. (2006). http://www.skillscommission.org/commissioned.htm

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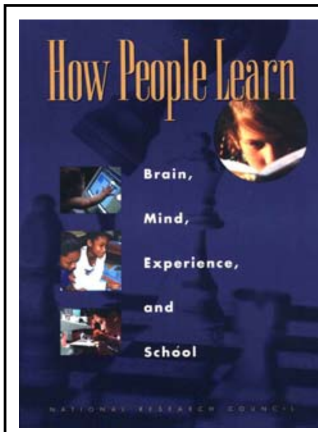

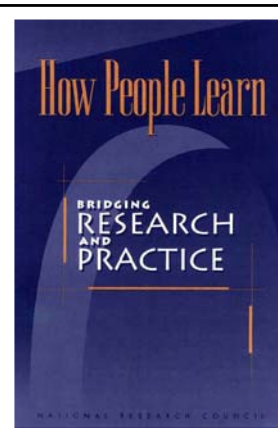

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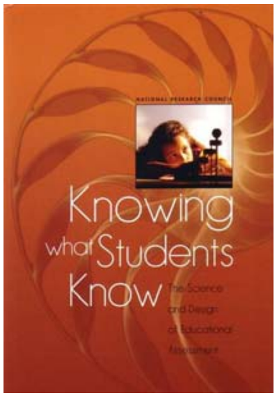

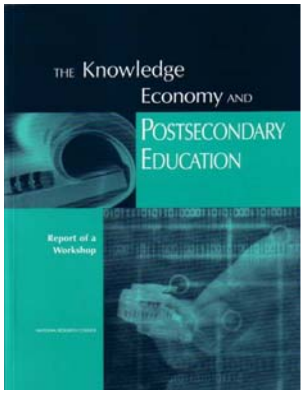

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Designing Learning Environments Based on HPL (How People Learn)

Some Important Principles About Learning and Understanding

The first important principle about how people learn is that students come to the classroom with preconceptions about how the world works which include beliefs and prior knowledge acquired through various experiences.

The second important principle about how people learn is that to develop competence in an area of inquiry, students must: (a) have a deep foundation of factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organize knowledge in ways that facilitate retrieval and application.

A third critical idea about how people learn is that a "metacognitive" approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them.

Jim Pellegrino – Rethinking and redesigning curriculum, instruction and assessment: What contemporary research and theory suggests

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Shaping the Future: New Expectations for Undergraduate Education in Science, Mathematics, Engineering and Technology – **National Science Foundation, 1996**

Goal – All students have access to supportive, excellent undergraduate education in science, mathematics, engineering, and technology, and all students learn these subjects by direct experience with the methods and processes of inquiry.

Recommend that SME&T faculty: Believe and affirm that every student can learn, and model good practices that increase learning; starting with the student's experience, but have high expectations within a supportive climate; and build inquiry, a sense of wonder and the excitement of discovery, plus communication and teamwork, critical thinking, and life-long learning skills into learning experiences.

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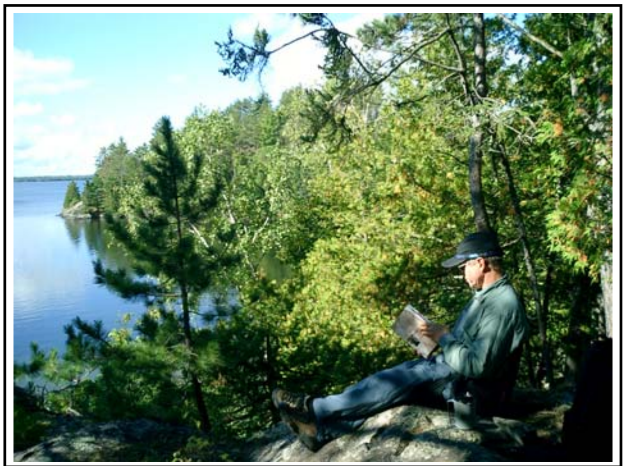

Engineering

The engineering method is design under constraints – Wm. Wulf, President, National Academy of Engineering

The engineering method is the use of heuristics to cause the best change in a poorly understood situation within the available resources – Billy Koen, *Discussion of the Method*

A scientist discovers that which exists. An engineer creates that which never was -- Theodore von Kármán (1881-1963)

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Engineering = Design

Design in a major sense is the essence of engineering; it begins with the identification of a need and ends with a product or system in the hands of a user. It is primarily concerned with synthesis rather than the analysis which is central to engineering science. Design, above all else, distinguishes engineering from science (Hancock, 1986, National Science Foundation Workshop).

Design defines engineering. It's an engineer's job to create new things to improve society. It's the University's obligation to give students fundamental education in design (William Durfee, ME, U of Minnesota, *Minnesota Technolog*, Nov/Dec 1994).

Engineering Design

Engineering design is a systematic, intelligent process in which designers generate, evaluate, and specify concepts for devices, systems, or processes whose form and function achieve clients' objectives or users' needs while satisfying a specified set of constraints.

Engineering Design Thinking, Teaching, and Learning -- http://www.asee.org/about/publications/jee/upload/2005jee_sample.htm

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Skills often associated with good designers – the ability to:

- tolerate ambiguity that shows up in viewing design as inquiry or as an iterative loop of divergent-convergent thinking;
- maintain sight of the big picture by including systems thinking and systems design;
- handle uncertainty;
- make decisions;
- think as part of a team in a social process; and
- think and communicate in the several languages of design.

Engineering Design Thinking, Teaching, and Learning -- http://www.asee.org/about/publications/jee/upload/2005jee_sample.htm

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http://www.businessweek.com/magazine/content/04_20/b3883001_mz001.htm

Time, April 2005

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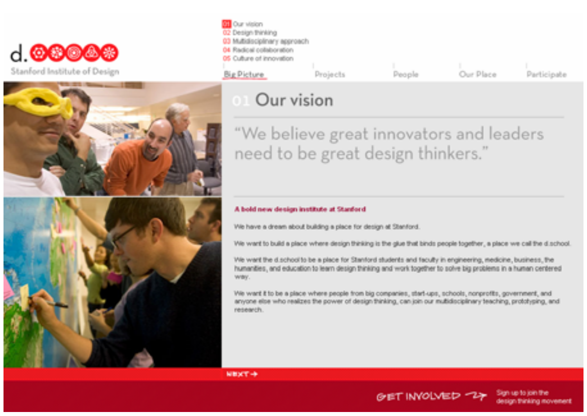

http://www.stanford.edu/group/dschool/big_picture/our_vision.html

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Ideo's five-point model for strategizing by design:

Hit the Streets

Recruit T-Shaped People

Build to Think

The Prototype Tells a Story

Design Is Never Done

Design Thinking

Discipline Thinking

Tom Friedman Horizontalize Ourselves

AAC&U *College Learning For the New Global Century*

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Project-Based Cooperative Learning

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Tower Design

Cooperative Learning is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both *positive interdependence* (all members must cooperate to complete the task) and *individual and group accountability* (each member is accountable for the complete final outcome).

Key Concepts

•Positive Interdependence
•Individual and Group Accountability
•Face-to-Face Promotive Interaction
•Teamwork Skills
•Group Processing

Formal Cooperative Learning – Types of Tasks

1. Jigsaw – Learning new conceptual/procedural material
2. Peer Composition or Editing
3. Reading Comprehension/Interpretation
4. **Problem Solving, Project, or Presentation**
5. Review/Correct Homework
6. Constructive Academic Controversy
7. Group Tests

Challenged-Based Learning

- Problem-based learning
- Case-based learning
- Project-based learning
- Learning by design
- Inquiry learning
- Anchored instruction

John Bransford, Nancy Vye and Helen Bateman. Creating High-Quality Learning Environments: Guidelines from Research on How People Learn

Professor's Role in
Formal Cooperative Learning

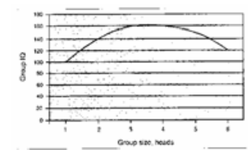
1. Specifying Objectives
2. Making Decisions
3. Explaining Task, Positive Interdependence, and Individual Accountability
4. Monitoring and Intervening to Teach Skills
5. Evaluating Students' Achievement and Group Effectiveness

Decisions,Decisions

Group size?
Group selection?
Group member roles?
How long to leave groups together?
Arranging the room?
Providing materials?
Time allocation?

Formal Cooperative Learning Task Groups

Perkins, David. 2003. *King Arthur's Round Table: How collaborative conversations create smart organizations.* NY: Wiley.



Problem Based Cooperative Learning Format

TASK: Solve the problem(s) or Complete the project.

INDIVIDUAL: Estimate answer. Note strategy.

COOPERATIVE: One set of answers from the group, strive for agreement, make sure everyone is able to explain the strategies used to solve each problem.

EXPECTED CRITERIA FOR SUCCESS: Everyone must be able to explain the strategies used to solve each problem.

EVALUATION: Best answer within available resources or constraints.

INDIVIDUAL ACCOUNTABILITY: One member from your group may be randomly chosen to explain (a) the answer and (b) how to solve each problem.

EXPECTED BEHAVIORS: Active participating, checking, encouraging, and elaborating by all members.

INTERGROUP COOPERATION: Whenever it is helpful, check procedures, answers, and strategies with another group.

Engineering Design Project

The engineering method is design under constraints – Wm. Wulf, President, National Academy of Engineering

The engineering method is the use of heuristics to cause the best change in a poorly understood situation within the available resources – Billy Koen, Mechanical Engineering Professor, UT-Austin, author *Discussion of the Method*

Project Based Learning (PrBL) - Example - Design

- Experience PrBL:
  - – Participate in the design task
  - – Metacognitive Reflection
    - Attend to what the group is doing.
    - Pay attention to what the instructor is doing.

Team Member Roles

- Task Recorder
- Process Recorder
- Materials Manager

Design objective
Design and build a tower that can support a concentrated load (text book) at a height of least 25 cm. The tower is built from index cards and office tape.

Design rules
Materials are 100 index cards and one roll of office tape
Cards can be folded but not torn
No piece of tape can be longer than 2 inches
Tower cannot be taped to the floor, ceiling, or any other object
Tower must be in one piece, and easily transported in one hand
Time to design and build: 20 minutes
Height is measured from the ground to the lowest corner of the book placed on top
Tower must support book for at least 10 seconds before the measurement is made
Room must be cleaned up before measurements are made.

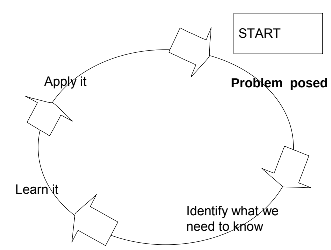
Group Processing
Plus/Delta Format

Plus (+) Things That Group Did Well	Delta (Δ) Things Group Could Improve

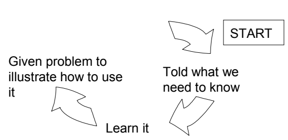
Teamwork & Project Management Heuristics--Examples

- Identify the weak link and Allocate resources to the weak link
- Freeze the design--at some stage in the project (when about 75% of the time or resources are used up) the design must be frozen
- Discuss the process and ask meta-level questions, e.g., What are we doing? Why are we doing it? How does it help?

Problem-Based Learning



Subject-Based Learning



Normative Professional Curriculum:

1. Teach the relevant basic science,

2. Teach the relevant applied science, and

3. Allow for a practicum to connect the science to actual practice.

Problem-Based Learning (PBL)

Problem-based learning is the learning that results from the process of working toward the understanding or resolution of a problem. The problem is encountered first in the learning process – Barrows and Tamlyn, 1980

Core Features of PBL

•Learning is student-centered
•Learning occurs in small student groups
•Teachers are facilitators or guides
•Problems are the organizing focus and stimulus for learning
•Problems are the vehicle for the development of clinical problem-solving skills
•New information is acquired through self-directed learning

Cooperative Learning is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both *positive interdependence* (all members must cooperate to complete the task) and *individual and group accountability* (each member is accountable for the complete final outcome).

Key Concepts

- Positive Interdependence
- Individual and Group Accountability
- Face-to-Face Promotive Interaction
- Teamwork Skills
- Group Processing

Modeling

Modeling in its broadest sense is the cost-effective use of something in place of something else for some cognitive purpose (Rothenberg, 1989). A model represents reality for the given purpose; the model is an abstraction of reality in the sense that it cannot represent all aspects of reality.

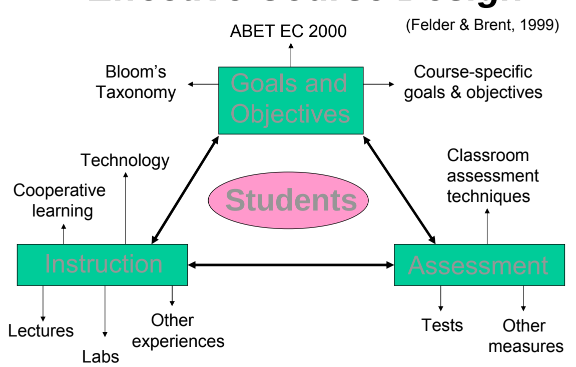
Any model is characterized by three essential attributes: (1) *Reference*: It is *of* something (its "*referent*"); (2) *Purpose*: It has an intended cognitive *purpose* with respect to its referent; (3) *Cost-effectiveness:* It is more *cost-effective* to use the model for this purpose than to use the referent itself.

Rothenberg, J. 1989. The nature of modeling. In L.E. Widman, K.A. Laparo & N.R. Nielson, Eds., *Artificial intelligence, simulation and modeling*. New York: Wiley

Modeling Heuristics
Ravindran, Phillips, and Solberg (1987):

1. Do not build a complicated model when a simple one will suffice.
2. Beware of molding the problem to fit the technique.
3. The deduction phase of modeling must be conducted rigorously.
4. Models should be validated prior to implementation.
5. A model should never be taken too literally.
6. A model should neither be pressed to do, nor criticized for failing to do, that for which it was never intended.
7. Beware of overselling a model.
8. Some of the primary benefits of modeling are associated with the process of developing the model.
9. A model cannot be any better than the information that goes into it.
10. Models cannot replace decision makers.

Effective Course Design



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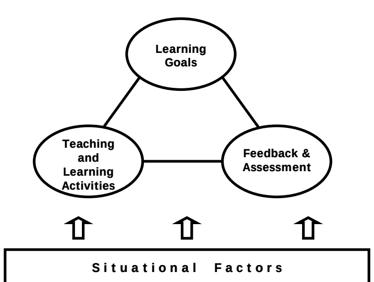
Model 1

The Key Components Of INTEGRATED COURSE DESIGN



A Self-Directed Guide to Designing Courses for Significant Learning
L. Dee Fink. 2003. *Creating significant learning experiences*. Jossey-Bass.

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Backward Design
Wiggins & McTighe

Stage 1. Identify Desired Results

Stage 2. Determine Acceptable Evidence

Stage 3. Plan Learning Experiences and Instruction

Wiggins, Grant and McTighe, Jay. 1998. *Understanding by Design*. Alexandria, VA: ASCD

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Worksheet 1

Worksheet for Designing a Course/Class Session/Learning Module

	Ways of Assessing	Actual Teaching-Learning	Helpful Resources:
Learning Goals for Course/Session/Learning Module:	This Kind of Learning:	Activities:	(e.g., people, things)
1.			
2.			
3.			
4.			
5.			
6.			

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Purdue's Engineer of 2020 Program Outcomes

Vision: Purdue Engineers will be prepared for leadership roles in responding to the global technological, economic, and societal challenges of the 21st century.

Strategy: We will provide educational experiences that develop students' technical strength, leadership, innovation, flexibility, and creativity to enable them to identify needs and construct effective solutions in an economically, socially, and culturally relevant manner.

Abilities	Knowledge Areas	Traits
• leadership • teamwork • communication • decision-making • recognize & manage change • work effectively in diverse & multicultural environments • work effectively in the global engineering profession • synthesize engineering, business, and societal perspectives	• science & math • engineering fundamentals • analytical skills • open-ended design & problem solving skills • multidisciplinarity within and beyond engineering • integration of analytical, problem solving, and design skills	• innovative • strong work ethic • globally, socially, ethically, intellectually, and technologically responsible • adaptable in a changing environment • entrepreneurial and intrapreneurial • curious and persistent lifelong learners

The Purdue 2020 Curricula Pillars

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Backward Design

Stage 1. Identify Desired Results

Filter 1. To what extent does the idea, topic, or process represent a big idea or having enduring value beyond the classroom?

Filter 2. To what extent does the idea, topic, or process reside at the heart of the discipline?

Filter 3. To what extent does the idea, topic, or process require uncoverage?

Filter 4. To what extent does the idea, topic, or process offer potential for engaging students?

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Nairobi, Kenya

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Backward Design Approach:

- Desired Results (Outcomes, Objectives, Learning Goals)
  - 5 minute university
- **Evidence (Assessment)**
  - Learning Taxonomies
- Plan Instruction
  - Cooperative Learning Planning Format & Forms

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Backward Design

Stage 2. Determine Acceptable Evidence

Types of Assessment

Quiz and Test Items:
Simple, content-focused test items

Academic Prompts:
Open-ended questions or problems that require the student to think critically

Performance Tasks or Projects:
Complex challenges that mirror the issues or problems faced by graduates, they are authentic

Understanding Understanding

Stage 1. Identify Desired Results
Focus Question: What does it mean to "understand"?

Stage 2. Determine Acceptable Evidence
Focus Questions: "How will we know if students have achieved the desired results and met the standards? What will we accept as evidence of student understanding and proficiency (Wiggins & McTighe)

Understanding Misunderstanding

A Private Universe – 21 minute video available from www.learner.org

Also see *Minds of our own* (Annenberg/CPB Math and Science Collection – www.learner.org)
1. Can we believe our eyes?
2. Lessons from thin air
3. Under construction

Teaching Teaching & Understanding Understanding -
http://www.daimi.au.dk/~brabrand/short-film/index-gv.html

Taxonomies

Bloom's taxonomy of educational objectives: Cognitive Domain (Bloom & Krathwohl, 1956)

A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives (Anderson & Krathwohl, 2001).

Facets of understanding (Wiggins & McTighe, 1998)

Taxonomy of significant learning (Dee Fink, 2003)

The Six Major Levels of Bloom's Taxonomy of the Cognitive Domain (with representative behaviors and sample objectives)

Knowledge. Remembering information *Define, identify, label, state, list, match*
- Identify the standard peripheral components of a computer
- Write the equation for the Ideal Gas Law

Comprehension. Explaining the meaning of information *Describe, generalize, paraphrase, summarize, estimate*
- In one sentence explain the main idea of a written passage
- Describe in prose what is shown in graph form

Application. Using abstractions in concrete situations *Determine, chart, implement, prepare, solve, use, develop*
- Using principles of operant conditioning, train a rate to press a bar
- Derive a kinetic model from experimental data

Analysis. Breaking down a whole into component parts *Points out, differentiate, distinguish, discriminate, compare*
- Identify supporting evidence to support the interpretation of a literary passage
- Analyze an oscillator circuit and determine the frequency of oscillation

Synthesis. Putting parts together to form a new and integrated whole *Create, design, plan, organize, generate, write*
- Write a logically organized essay in favor of euthanasia
- Develop an individualized nutrition program for a diabetic patient

Evaluation. Making judgments about the merits of ideas, materials, or phenomena *Appraise, critique, judge, weigh, evaluate, select*
- Assess the appropriateness of an author's conclusions based on the evidence given
- Select the best proposal for a proposed water treatment plant

3.1 The Taxonomy Table

The Knowledge Dimension	The Cognitive Process Dimension 1. Remember	2. Understand	3. Apply	4. Analyze	5. Evaluate	6. Create
A. Factual knowledge						
B. Conceptual knowledge						
C. Procedural knowledge						
D. Meta-cognitive knowledge						

(Anderson & Krathwohl, 2001).

A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives (Anderson & Krathwohl, 2001).

- The Knowledge Dimension
  - Factual Knowledge
  - Conceptual Knowledge
  - Procedural Knowledge
  - Metacognitive Knowledge

Cognitive Process Dimension

- Remember
  - Recognizing
  - Recalling
- Understand
  - Interpreting
  - Exemplifying
  - Summarizing
  - Inferring
  - Comparing
  - Explaining

Cognitive Process Dimension-2

- Apply
  - Executing
  - Implementing
- Analyze
  - Differentiating
  - Organizing
  - Attributing
- Evaluate
  - Checking
  - Critiquing
- Create
  - Generating
  - Planning
  - Producing

The Cognitive Process Dimension →

The Knowledge Dimension ↓

	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual Knowledge – The basic elements that students must know to be acquainted with a discipline or solve problems in it. a. Knowledge of terminology b. Knowledge of specific details and elements	Recall	Restate	Employ	Distinguish	Select	Arrange
Conceptual Knowledge – The interrelationships among the basic elements within a larger structure that enable them to function together. a. Knowledge of classifications and categories b. Knowledge of principles and generalizations c. Knowledge of theories, models, and structures	Define	Describe	Translate	Compare	Defend	Combine
Procedural Knowledge – How to do something; methods of inquiry, and criteria for using skills, algorithms, techniques, and methods. a. Knowledge of subject-specific skills and algorithms b. Knowledge of subject-specific techniques and methods c. Knowledge of criteria for determining when to use appropriate procedures	Relate	Identify	Demonstrate	Contrast	Interpret	Construct
Metacognitive Knowledge – Knowledge of cognition in general as well as awareness and knowledge of one's own cognition. a. Strategic knowledge b. Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge c. Self-knowledge	Review	Express	Examine	Deduce	Discriminate	Propose

Imbrie and Brophy, 2007

Facets of Understanding
Wiggins & McTighe, 1998, page 44

When we truly understand,we

*Can **explain***
*Can **interpret***
Can ***apply***
Have ***perspective***
Can ***empathize***
Have ***self-knowledge***

SIX FACETS OF UNDERSTANDING

Six Facets	Description	Example
Explanation	To ensure students understand why an answer or approach is the right one. Students explain or justify their responses or justify their course of action.	Students develop an illustrated brochure to explain the principles and practices of a particular type of technology (i.e., transportation, construction, medical, information).
Interpretation	To ensure students avoid the pitfall of looking for the "right answer" and demand answers that are principled....students are able to encompass as many salient facts and points of view as possible.	Students develop a 'biography' of the development of a particular type of technology.
Application	To ensure students' key performances are conscious and explicit reflection, self-assessment, and self-adjustment, with reasoning made evident. Authentic assessment requires a real or simulated audience, purpose, setting, and options for personalizing the work, realistic constraints, and "background noise."	Students analyze a design of a product, taking it apart in order to determine how it works. Students design, develop, test, and revise a solution to a local issue, such as a new roadway system, a water treatment system, or long-term storage of various materials.
Perspective	To ensure students know the importance or significance of an idea and to grasp its importance or unimportance. Encourage students to step back and ask, "What of it?" "Of what value is this knowledge?" "How important is this idea?" "What does this idea enable us to do that is important?"	Students investigate about a technological artifact from the perspective of different regions and countries.
Empathy	To ensure students develop the ability to see the world from different viewpoints in order to understand the diversity of thought and feeling in the world.	Students imagine they are politicians debating the value of nuclear power. They write their thoughts and feelings explaining why they agree or disagree with the use of nuclear power.
Self-Knowledge	To ensure students are deeply aware of the boundaries of their own and others' understanding; able to recognize their own prejudices and projections; has integrity – able and willing to act on what one understands.	Students reflect on their own progress of understanding about one of the standards in Standards for Technological Literacy: Content for the Study of Technology. They evaluate the extent to which they have improved, what task or assignment was the most challenging and why, and which project or product of work they are most proud of and why.

Source: Wiggins, G., & McTighe, J. (1998). Understanding by Design, p. 85-97. Alexandria, VA: Association for Supervision

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Dee Fink – Creating Significant Learning Experiences

A TAXONOMY OF SIGNIFICANT LEARNING

1. Foundational Knowledge
- "Understand and remember" learning
  - For example: facts, terms, formulae, concepts, principles, etc.

2. Application
- Thinking: critical, creative, practical (problem-solving, decision-making)
- Other skills
  - For example: communication, technology, foreign language
- Managing complex projects

3. Integration
- Making "connections" (i.e., finding similarities or interactions) . . .
  - Among: ideas, subjects, people

4. Human Dimensions
- Learning about and changing one's SELF
- Understanding and interacting with OTHERS

5. Caring
- Identifying/changing one's feelings, interests, values

6. Learning How to Learn
- Becoming a better student
- Learning how to ask and answer questions
- Becoming a self-directed learner

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Backward Design

Stage 3. Plan Learning Experiences & Instruction

- What enabling knowledge (facts, concepts, and principles) and skills (procedures) will students need to perform effectively and achieve desired results?
- What activities will equip students with the needed knowledge and skills?
- What will need to be taught and coached, and how should it be taught, in light of performance goals?
- What materials and resources are best suited to accomplish these goals?
- Is the overall design coherent and effective?

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Challenged-Based Learning

- Problem-based learning
- Case-based learning
- Project-based learning
- Learning by design
- Inquiry learning
- Anchored instruction

John Bransford, Nancy Vye and Helen Bateman. Creating High-Quality Learning Environments: Guidelines from Research on How People Learn

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Problem-Based Learning (PBL)
-- Small Group Self-Directed Problem Based Learning --

Problem-based learning is the learning that results from the process of working toward the understanding or resolution of a problem. The problem is encountered first in the learning process. (Barrows and Tamblyn, 1980)

Core Features of PBL
- Learning is student-centered
- Learning occurs in small student groups
- Teachers are facilitators or guides
- Problems are the organizing focus and stimulus for learning
- Problems are the vehicle for the development of clinical problem-solving skills
- New information is acquired through self-directed learning

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Problem Based Cooperative Learning Format

TASK: Solve the problem(s) or Complete the project.

INDIVIDUAL: Estimate answer. Note strategy.

COOPERATIVE: One set of answers from the group, strive for agreement, make sure everyone is able to explain the strategies used to solve each problem.

EXPECTED CRITERIA FOR SUCCESS: Everyone must be able to explain the strategies used to solve each problem.

EVALUATION: Best answer within available resources or constraints.

INDIVIDUAL ACCOUNTABILITY: One member from your group may be randomly chosen to explain (a) the answer and (b) how to solve each problem.

EXPECTED BEHAVIORS: Active participating, checking, encouraging, and elaborating by all members.

INTERGROUP COOPERATION: Whenever it is helpful, check procedures, answers, and strategies with another group.

Cooperative Lesson Planning Form

Grade Level: ________ Subject Area: ________________ Date:________

Lesson: ____

Objectives

Academic: ____

Teamwork Skills: ____

Preinstructional Decisions

Group Size: ________ Method Of Assigning Students: ________________

Roles: ____

Room Arrangement: ____

Materials: ____

◊ One Copy Per Group ◊ One Copy Per Person
◊ Jigsaw ◊ Tournament
◊ Other: ________________

Explain Task And Cooperative Goal Structure

1. Task: ____
2. Criteria For Success: ____
3. Positive Interdependence: ____
4. Individual Accountability: ____
5. Intergroup Cooperation: ____
6. Expected Behaviors: ____

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Monitoring And Intervening

1. Observation Procedure: _____ Formal _____ Informal
2. Observation By: _____ Teacher _____ Students _____ Visitors
3. Intervening For Task Assistance: ______________________________
4. Intervening For Teamwork Assistance: ______________________________
5. Other: ______________________________

Evaluating And Processing

1. Assessment Of Members' Individual Learning: ______________________________
2. Assessment Of Group Productivity: ______________________________
3. Small Group Processing: ______________________________
4. Whole Class Processing: ______________________________
5. Charts And Graphs Used: ______________________________
6. Positive Feedback To Each Student: ______________________________
7. Goal Setting For Improvement: ______________________________
8. Celebration: ______________________________
9. Other: ______________________________

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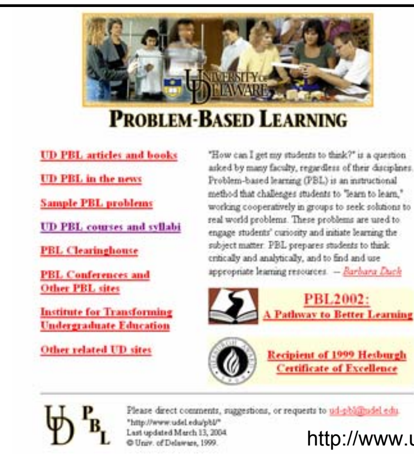

http://www.udel.edu/pbl/

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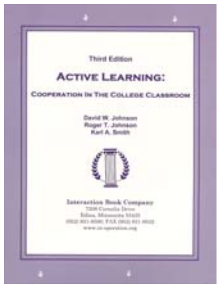
Cooperative Learning:
Key Concepts
•Positive Interdependence
•Individual and Group Accountability
•Face-to-Face Promotive Interaction
•Teamwork Skills
•Group Processing

Active Learning: Cooperation in the College Classroom

- **Informal** Cooperative Learning Groups
- **Formal** Cooperative Learning Groups
- Cooperative **Base** Groups



See Cooperative Learning Handout (CL College-804.doc)

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Pedagogies of Engagement: Classroom-Based Practices

http://www.asee.org/about/publications/jee/upload/2005jee_sample.htm

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Pedagogies of Engagement: Classroom-Based Practices

"Learning 'about' things does not enable students to acquire the abilities and understanding they will need for the twenty-first century. We need new **pedagogies of engagement** that will turn out the kinds of resourceful, engaged workers and citizens that America now requires."

Russ Edgerton (reflecting on higher education projects funded by the Pew Memorial Trust)

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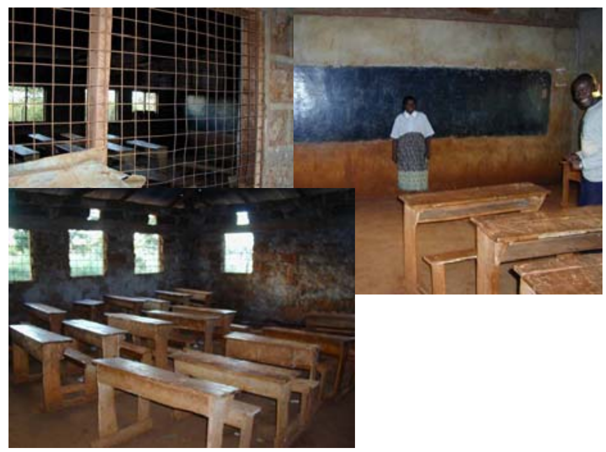

PBL Groups in Action

(Allen & White, 2002 – www.udel.edu/pbl)

Water Striders

Video trios – watch to answer:

- What's happening with/in this group?
- How does the tutor try to deal with what's happening?
- What would you do if faced with the same situation as the tutor?

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Thinking about Groups in PBL

- What differences did you notice between the "water sliders" vignette and your PrBL Design Experience?

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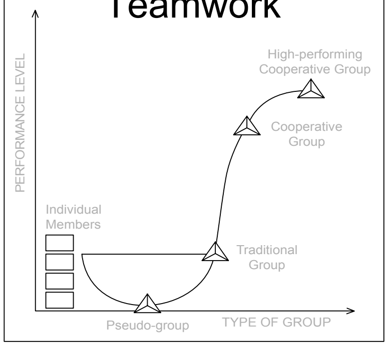
Teamwork



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Teams

A team is a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable.

- SMALL NUMBER
- COMPLEMENTARY SKILLS
- COMMON PURPOSE & PERFORMANCE GOALS
- COMMON APPROACH
- MUTUAL ACCOUNTABILITY

--Katzenbach & Smith (1993)
The Wisdom of Teams

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Groups & Cooperative Learning (CL)

Cooperative Learning is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both ***positive interdependence*** (all members must cooperate to complete the task) and ***individual and group accountability*** (each member is accountable for the complete final outcome).

Key Concepts

- Positive Interdependence
- Individual and Group Accountability
- Face-to-Face Promotive Interaction
- Teamwork Skills
- Group Processing

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EXPECTED BEHAVIORS: Active participating, checking, encouraging, and elaborating by all members.

INTERGROUP COOPERATION: Whenever it is helpful, check procedures, answers, and strategies with another group.

Successful Teams / Groups

Instructor gives advanced thought to team formation, activities & assessment.

Key Interpersonal Skills & Performance of Group/Team Members (Stein & Hurd, 2000)

- Active Listening & Clarifying
- Supporting & Building
- Differing & Confronting

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Tools for PBL and CL

- 5 Key Elements of Cooperative Learning
- Group Formation
- Group Norms/Guidelines
- Group Contract Form
- Group/Team Charters
- Others…
- References

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Problem-Based Learning:
A Reasonable Adventure (Knous, 2000)

Video viewing groups (1 person per question):

- What is the group doing?
- What is the instructor/tutor doing?
- What aspects of pbl are evident in the way the group functions?
- What aspects of pbl are evident in the video?

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CL & PBL Group Facilitation

- Faculty (Course Instructor, others)
- Teaching Assistants (Graduate)
- Undergraduate Teaching Assistants / Peer Facilitators

- Training
- Incentives / Compensation

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Groups in CL & PBL – Your Thoughts

- What are the implications of what you've experienced today?
- How can you apply this material?
- What do you still need to know to use groups effectively in cooperative learning and problem-based learning?

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It could well be that faculty members of the twenty-first century college or university will find it necessary to set aside their roles as teachers and instead become designers of learning experiences, processes, and environments.
James Duderstadt, 1999

We never educate directly, but indirectly by means of the environment. Whether we permit chance environments to do the work, or whether we design environments for the purpose makes a great difference.
John Dewey, 1906

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Session Summary
(Minute Paper)

Reflect on the session:

1. What were the most important points for you?
2. What is one thing you would be willing to try?
3. What questions do you have?

4. Pace: Too slow 1 . . . . 5 Too fast
5. Relevance: Little 1 . . . 5 Lots
6. Format: Ugh 1 . . . 5 Ah

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