Designing Innovative Higher Education Programs: Insights from Research and Practice

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Learning Impact Through Teaching Innovation

HKUST – Teaching and Learning Symposium

December 11, 2007

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 [Nuclear Engineering Professor; Dean, Provost and President of the University of Michigan]

Guiding Questions

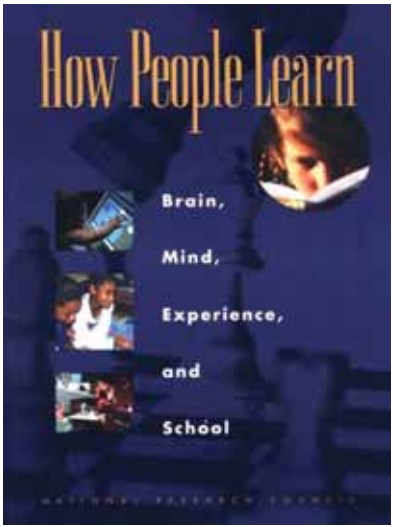
- What are we preparing students for?
- How will we know if we succeeded?
- What do we do to prepare them?
- What models and resources are available to assist?

Resources

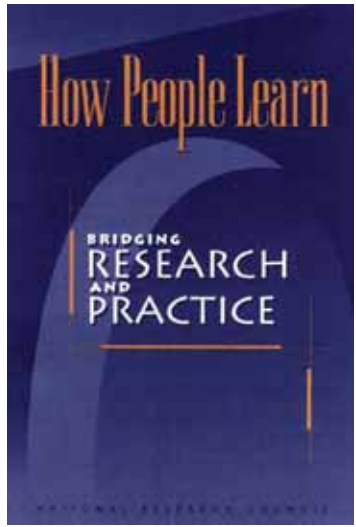
http://books.nap.edu/openbook.php?record_id=10239&page=159

http://www.skillscommission.org/commissioned.htm

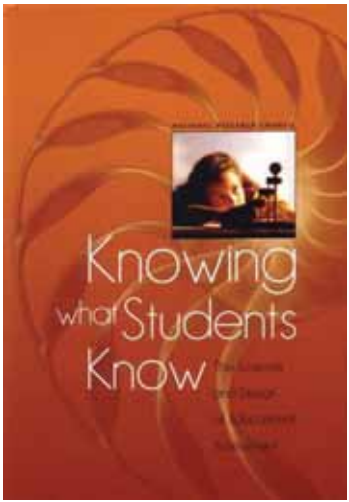
- Bransford, Vye and Bateman – Creating High Quality Learning Environments
- Pellegrino – Rethinking and Redesigning Curriculum, Instruction and Assessment



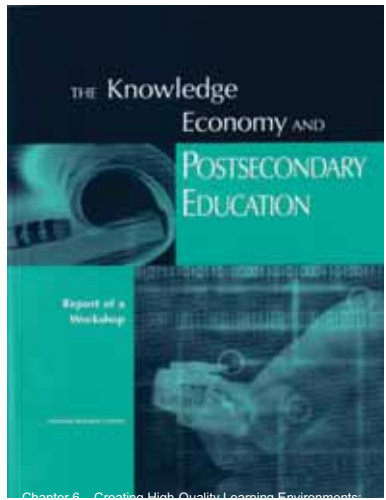
www.nap.edu/html/how**people**1/



www.nap.edu/books/0309070368/html/



www.nap.edu/books/0309072727/html/



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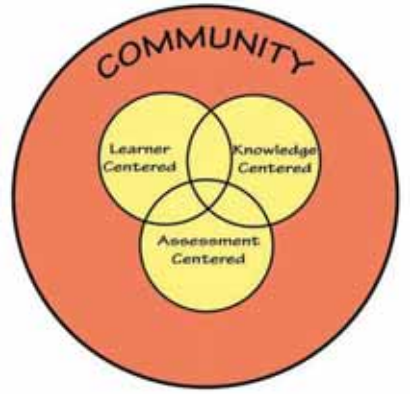
Designing Learning Environments Based on HPL (How People Learn)



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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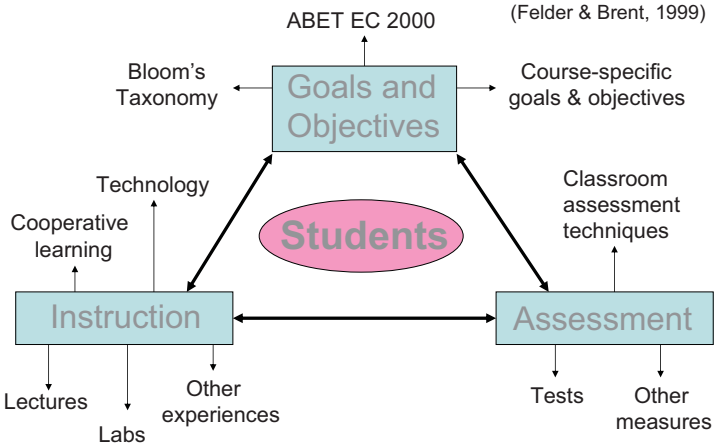
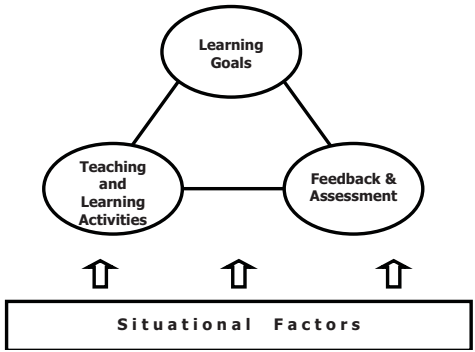
Effective Course Design



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.

Guiding Questions

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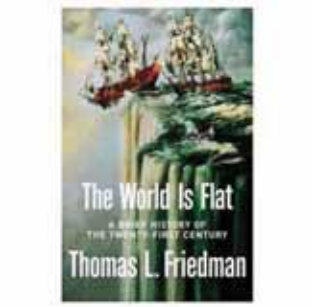
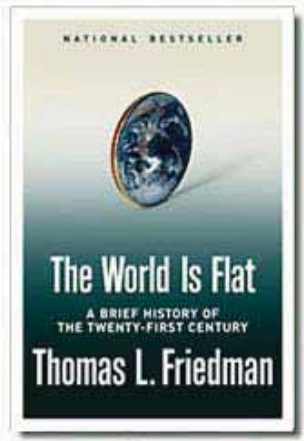
Preparing Students for an Interdependent World:
Role of Cooperation and Social Interdependence Theory

Apollo 8 – 12/29/68

The World is Flat



"Clearly, it is now possible for more people than ever to collaborate and compete in real-time, with more people, on more kinds of work, from more corners of the planet, and on a more equal footing, than at any previous time in the history of the world"



Platform for Collaboration
(1st Three Flatteners):
1. 11/9/89
2. 8/9/95
3. Work Flow Software

NYTimes MAGAZINE April 3, 2005
It's a Flat World, After All
By THOMAS L. FRIEDMAN

Video – Think Global Series:
http://minnesota.publicradio.org/radio/features/2005/05/collaboration/

mitworld.**mit**.edu/video/266/

Age of Interdependence

Tom Boyle of British Telecom calls this the age of interdependence; he speaks of the importance of people's NQ, or network quotient – their capacity to form connections with one another, which, Boyle argues is now more important than IQ, the measure of individual intelligence.

Cohen, Don & Prusak, Laurence. 2001. In good company: How social capital makes organizations work. Cambridge, MA: Harvard Business School Press.

Sunday
JANUARY 13, 2002

Opinion

A17
Editorials, A18

A selection of voices from the community, nation and world

Living in an interdependent world

Former President Bill Clinton addresses the question: Is the age of interdependence going to be good or bad for humanity? He thinks it will turn out to be good — but he cautions that the West must help those who are being left behind.

The great question of this new century is whether the age of interdependence is going to be good or bad for humanity. The answer depends upon whether we in the wealthy nations spread the benefits and reduce the burdens of the modern world, on whether the poor nations enact the changes necessary to make progress possible, and on whether we all can develop a level of consciousness high enough to understand our obligations and responsibilities to each other.

By William Jefferson Clinton

NEW YORK — The great question of this new century is whether the age of interdependence is going to be good or bad for humanity. The answer

Fourth, from a political point of view, you might have said the dominant factor of the 21st-century world will be the explosion of democracy and diversity.

For the first time in the history of

Interdependent World

- Essential knowledge, skills, habits of mind, … for an interdependent world?
  - Reflect individually and list essential skills ~ 30”
  - Turn to the person next to you ~ 2’
    - Introduce yourself
    - Share lists

UMN - Undergraduate Student Learning Outcomes

- At the time of receiving a bachelor's degree, it is the University's goal that its students:
  - Can identify, define, and solve problems.
  - Can locate and critically evaluate information.
  - Have mastered a body of knowledge and a mode of inquiry.
  - Understand diverse philosophies and cultures within and across societies.
  - Can communicate effectively.
  - Understand the role of creativity, innovation, discovery, and expression across disciplines.
  - Have acquired skills for effective citizenship and life-long learning.

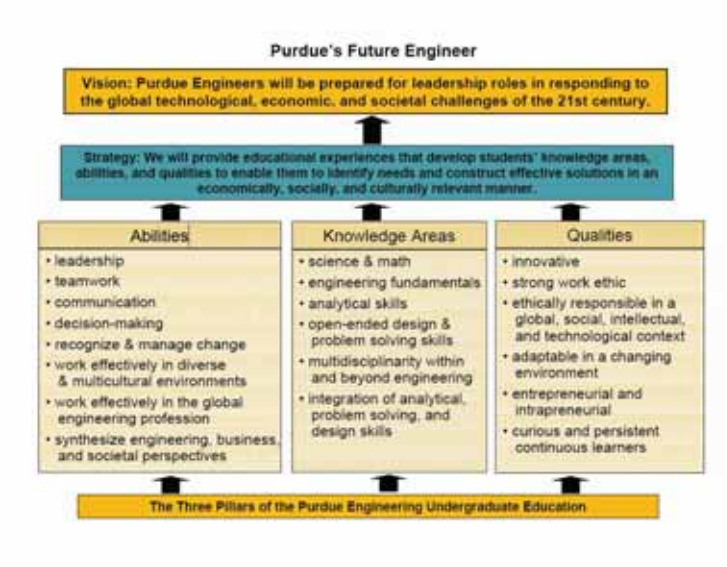
http://academic.umn.edu/provost/teaching/cesl.html

HKUST Graduate Attributes (ABC LIVE)

- Academic excellence
- Broad-based education
- Competencies and capacity building
- Leadership and teamwork
- International outlook
- Vision and an orientation to the future
- Ethical standards and compassion

Successful Attributes for the Engineer of 2020

- Possess strong analytical skills
- Exhibit practical ingenuity; posses creativity
- Good communication skills with multiple stakeholders
- Business and management skills; Leadership abilities
- High ethical standards and a strong sense of professionalism
- Dynamic/agile/resilient/flexible
- Lifelong learners



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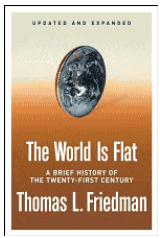
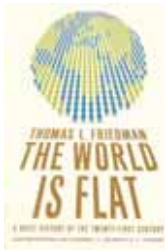
Design Thinking

Discipline Thinking



Tom Friedman
Horizontalize
Ourselves

CQ+PQ>IQ



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

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Time, April 2005

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

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?

Guiding Questions

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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).

Evaluating the quality of learning: The SOLO taxonomy (Biggs & Collis, 1982)

Facets of understanding (Wiggins & McTighe, 1998)

Taxonomy of significant learning (Fink, 2003)

A taxonomic trek: From student learning to faculty scholarship (Shulman, 2002)

The Cognitive Process 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						
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						
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						
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						

The Knowledge Dimension

The Cognitive Process 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

The Knowledge Dimension

Imbrie and Brophy, 2007

Guiding Questions

- What are we preparing students for?
- How will we know if we succeeded?
- **What do we do to prepare them?**
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In my entire life as a student, I remember only twice being given the opportunity to come up with my own ideas, a fact I consider typical and terrible. I would like to start this paper by telling how I came to realize that schooling could be different from what I had experienced.

Eleanor Duckworth, Twenty-four, forty-two, and I love you: Keeping it complex, *Harvard Educational Review*, *61* (1991), 1-24.

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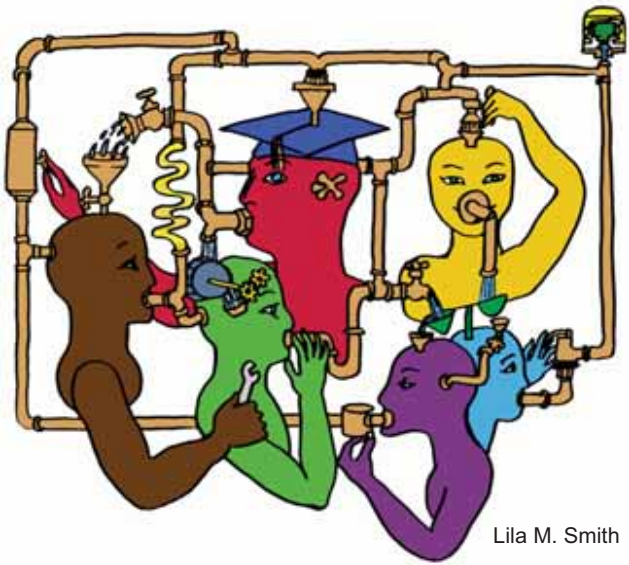
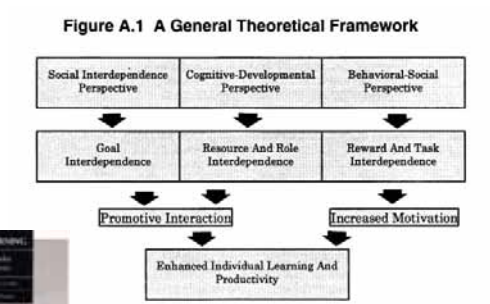
Lila M. Smith



Lila M. Smith

Pedagogies of Engagement



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

Cooperative Learning Research Support

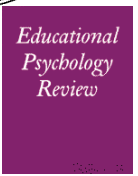
Johnson, D.W., Johnson, R.T., & Smith, K.A. 1998. Cooperative learning returns to college: What evidence is there that it works? *Change*, *30* (4), 26-35.

- Over 300 Experimental Studies
- First study conducted in 1924
- High Generalizability
- Multiple Outcomes

Outcomes

1. Achievement and retention
2. Critical thinking and higher-level reasoning
3. Differentiated views of others
4. Accurate understanding of others' perspectives
5. Liking for classmates and teacher
6. Liking for subject areas
7. Teamwork skills

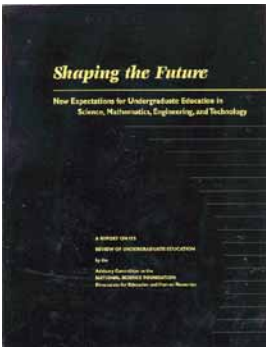
January 2005



March 2007

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.

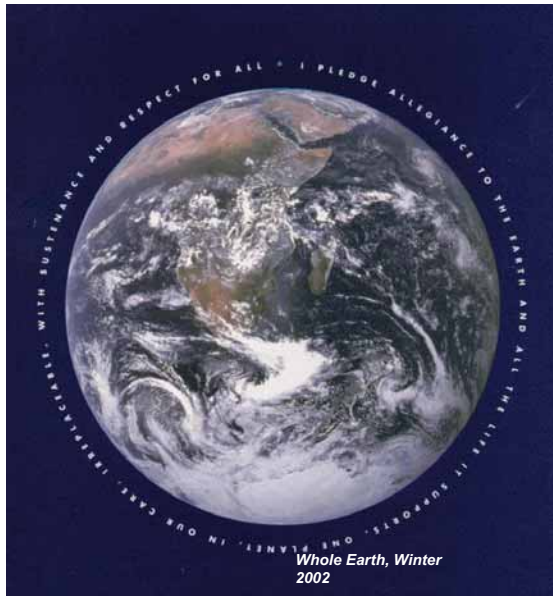


Recommend that SME&T faculty: Believe and affirm that every student can learn, and model good practices that increase learning; starting with the student=s experience, but have high expectations within a supportive climate; and build inquiry, a sense of wonder and the excitement of discovery, plus communication and teamwork, critical thinking, and life-long learning skills into learning experiences.

Lynn & Salzman – The Real Global Technology Challenge & Collaborative Advantage

Collaborative Advantage: New Horizons for a Flat World – *Issues in Science & Technology*
*www.nsf.gov/attachments/105652/public/**Collaborative-Advantage**-1205.pdf*

Change Magazine – HKUST Libary



Whole Earth, Winter 2002