Supporting Engaged Pedagogy

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November 30, 2010

1

Linking Insights from How People Learn to the Process of Planning Undergraduate Learning Spaces

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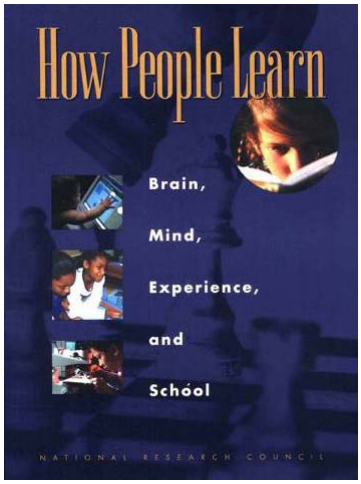
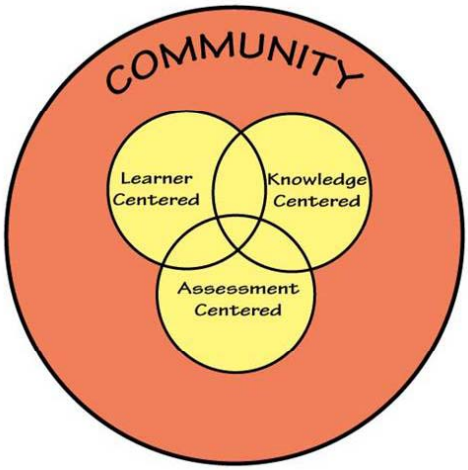
Concordia University – St. Paul – October 22, 2010

2

How People Learn (HPL)





Bransford, Brown & Cocking. 1999. *How people learn.* National Academy Press.
http://www.nap.edu/openbook.php?record_id=6160

3

Pedagogies of Engagement

Pedagogies of Engagement: Classroom-Based Practices

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ABSTRACT

Educators, researchers, and policy makers have advocated student involvement for some time as an essential aspect of meaningful learning. In the past twenty years engineering educators have implemented several means of better engaging their undergraduate students, including active and cooperative learning, learning communities, service learning, cooperative education, inquiry and problem-based learning, and team projects. This paper focuses on classroom-based pedagogies of engagement, particularly cooperative and problem-based learning. It includes a brief history, theoretical roots, research support, summary of practices, and suggestions for redesigning engineering classes and programs to include more student engagement. The paper also lays out the research ahead for advancing pedagogies aimed at more fully enhancing students' involvement in their learning.

Keywords: cooperative learning, problem-based learning, student engagement

I. INTRODUCTION TO THE PEDAGOGIES OF ENGAGEMENT

Russ Edgerton introduced the term "pedagogies of engagement" in his 2001 *Education White Paper* [1], in which he reflected on the projects on higher education funded by the Pew Charitable Trusts. He wrote:

> "Throughout the whole enterprise, the core issue, in my view, is the mode of teaching and learning that is practiced. 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."

Prior to Edgerton's paper, the widely distributed and influential publication called *The Seven Principles for Good Practice in Undergraduate Education* [2] stressed pedagogies of engagement in concept. Three of the principles speak directly to pedagogies of engagement, namely, that good practice encourage student-faculty contact, cooperation among students, and active learning.

More recently, the project titled The National Survey of Student Engagement (NSSE) [3] deepens our understanding of how students perceive classroom based learning, in all its forms, as an indicator for the bigger issue of student engagement in their college education. The NSSE project conceives that student engagement is not just a single course in a student's academic career, but rather a pattern of his or her involvement in a variety of activities. As such, NSSE findings are a valuable assessment tool for colleges and universities to track how successful their academic practices are in engaging their student bodies. The NSSE project is grounded in the proposition that student engagement, the frequency with which students participate in activities that represent effective educational practice, is a meaningful proxy for collegiate quality and, therefore, by extension, quality of education. The annual survey of freshmen and seniors asks students how often they have, for example, participated in projects that required integrating ideas or information from various sources, used e-mail to communicate with an instructor, asked questions in class or contributed to class discussions, received prompt feedback from faculty on their academic performance, participated in community-based projects, or tutored or taught other students. Student responses are organized around five benchmarks:

1. *Level of academic challenge*: Schools encourage achievement by setting high expectations and emphasizing importance of student effort.
2. *Active and collaborative learning*: Students learn more when intensely involved in educational process and are encouraged to apply their knowledge in many situations.
3. *Student-faculty interaction*: Students able to learn from experts and faculty serve as role models and mentors.
4. *Enriching educational experiences*: Learning opportunities inside and outside classroom (diversity, technology, collaboration, internships, community service, capstone courses) enhance learning.
5. *Supportive campus environment*: Students are motivated and satisfied at schools that actively promote learning and stimulate social interaction.

Astin's [4] large-scale correlational study of what matters in college (involving 27,064 students at 309 baccalaureate-granting institutions) found that two environmental factors were by far the most predictive of positive change in college students' academic development, personal development, and satisfaction. These two factors—interaction among students and interaction between faculty and

"Throughout the whole enterprise, the core issue, in my view, is the mode of teaching and learning that is practiced. 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 (2001), Reflecting on higher education projects funded by the Pew Memorial Trust

5

http://www.ce.umn.edu/~smith/docs/Smith-Pedagogies_of_Engagement.pdf

Student Engagement Research Evidence

- Perhaps the strongest conclusion that can be made is the least surprising. Simply put, the greater the student's involvement or engagement in academic work or in the academic experience of college, the greater his or her level of knowledge acquisition and general cognitive development …(Pascarella and Terenzini, 2005).
- Active and collaborative instruction coupled with various means to encourage student engagement invariably lead to better student learning outcomes irrespective of academic discipline (Kuh et al., 2005, 2007).

See Smith, et.al, 2005 and Fairweather, 2008, Linking Evidence and Promising Practices in Science, Technology, Engineering, and Mathematics (STEM) Undergraduate Education - http://www7.nationalacademies.org/bose/Fairweather_CommissionedPaper.pdf

6

Reflection and Dialogue

- Individually reflect on Supporting Engaged Pedagogy. Write for about 1 minute
  - Key features?
  - Challenges?
- Discuss with your neighbor for about 3 minutes
  - Select Story, Comment, Question, etc. that you would like to present to the whole group if you are randomly selected

7

National Survey of Student Engagement (NSSE)

1. **Level of academic challenge**: Challenging intellectual and creative work is central to student learning and collegiate quality.
2. **Active and collaborative learning**: Students learn more when they are intensively involved in their education and are asked to think about and apply what they are learning in different settings.
3. **Student-faculty interaction**: Students learn firsthand how experts think about and solve practical problems by interacting with faculty members inside and outside the classroom.
4. **Enriching educational experiences**: Complementary learning opportunities inside and outside the classroom augment the academic program.
5. **Supportive campus environment**: Students perform better and are more satisfied at colleges that are committed to their success and cultivate positive working and social relations among different groups on campus.

8

http://nsse.iub.edu/pdf/nsse_benchmarks.pdf

Seven Principles for Good Practice in Undergraduate Education

- Good practice in undergraduate education:
  - Encourages student-faculty contact
  - Encourages cooperation among students
  - Encourages active learning
  - Gives prompt feedback
  - Emphasizes time on task
  - Communicates high expectations
  - Respects diverse talents and ways of learning

Chickering & Gamson, June, 1987
http://learningcommons.evergreen.edu/pdf/fall1987.pdf

9

Active and Cooperative Learning

EDUCATION

Farewell, Lecture?

A physics professor describes his evolution from lecturing to dynamically engaging students during class and improving how they learn.

Eric Mazur

Discussions of education are generally predicated on the assumption that we know what education is. I hope to convince you otherwise by recounting some of my own experiences. When I started teaching introductory physics to undergraduates at Harvard University, I never asked myself how I would educate my students. I did what my teachers had done—I lectured. I thought that was how one learns. Look around anywhere in the world and you'll find lecture halls filled with students and, at the front, an instructor. This approach to education has not changed since before the Renaissance and the birth of scientific inquiry. Early in my career I received the first hints that something was wrong with teaching in this manner, but I had ignored it. Sometimes it's hard to face reality.

When I started teaching, I prepared lecture notes and then taught from them. Because my lectures deviated from the textbook, I provided students with copies of these lecture notes. The infuriating result was that on my end-of-semester evaluations—which were quite good otherwise—a number of students complained that I was "lecturing straight from (his) lecture notes." What was I supposed to do? Develop a set of lecture notes different from the ones I handed out? I decided to ignore the students' complaints.

Click here. Students continually discuss concepts among themselves and with the instructor during class. Discussions are spurred by multiple-choice conceptual questions that students answer using a clicker device. See supporting online text for examples of such "clicker questions."

A few years later, I discovered that the students were right. My lecturing was ineffective, despite the high evaluations. Early on in the physics curriculum—in week 2 of a typical introductory physics course—the Laws of Newton are presented. Every student in such a course can recite Newton's third law of motion, which states that the force of object A on object B in an interaction between two objects is equal in magnitude to the force of B on A—it sometimes is known as "action is reaction." One day, when the course had progressed to more complicated material, I decided to test my students' understanding of this concept not by doing traditional problems, but by asking them a set of basic conceptual questions (*1*, *2*). One of the questions, for example, requires students to compare the forces that a heavy truck and a light car exert on one another when they collide. I expected that the students would have no trouble tackling such questions, but much to my surprise, hardly a minute after the test began, one student asked, "How should I answer these questions? According to what you taught me or according to the way I usually think about these things?" To my dismay, students had great difficulty with the conceptual questions. That was when it began to dawn on me that something was amiss.

In hindsight, the reason for my students' poor performance is simple. The traditional approach to teaching reduces education to a transfer of information. Before the industrial revolution, when books were not yet mass commodities, the lecture method was the only way to transfer information from one generation to the next. However, education is so

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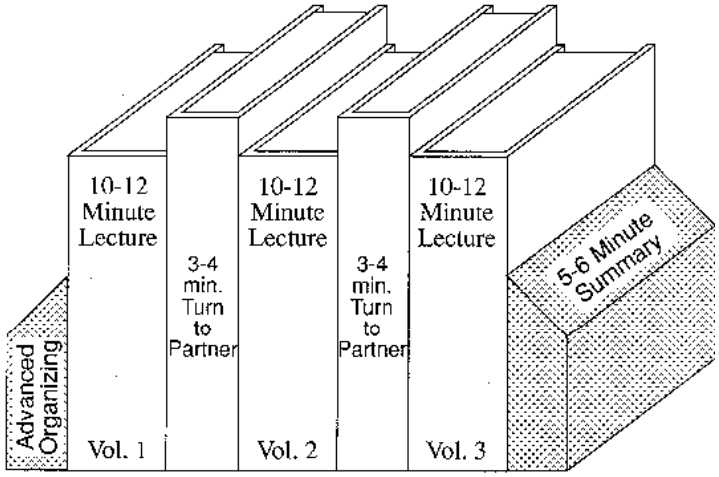
January 2, 2009—Science, Vol. 323 – www.sciencemag.org

10

Calls for evidence-based promising practices

Book Ends on a Class Session



11

More Professors Give Out Hand-Held Devices to Monitor Students and Engage Them

EVANSTON, Ill. — If any of the 70 undergraduates in Prof. Bill White's "Organizational Behavior" course here at Northwestern University are late for class, or not paying attention, he will know without having to scan the lecture hall.

Their "clickers" will tell him.

Every student in Mr. White's class has been assigned a palm-size, wireless device that looks like a TV remote but has a far less entertaining purpose. With their clickers in hand, the students in Mr. White's class automatically clock in as "present" as they walk into class.

They then use the numbered buttons on the devices to answer multiple-choice quizzes that count for nearly 20 percent of their grade, and that always begin precisely one minute into class. Later, with a click, they can signal to their teacher without raising a hand that they are confused by the day's lesson.

But the greatest impact of such devices — which more than a half-million students are using this fall on several thousand college campuses — may be cultural: they have

November 15, 2010 – NY Times

How Clickers Work
By JACQUES STEINBERG
Published: November 15, 2010 At Northwestern University and on hundreds of other campuses, professors are arming students with hand-held clickers that look like a TV remote cross-bred with a calculator. Here is how they work:

1. Each clicker has a unique frequency that is assigned to a particular student.
2. Using a numbered keypad, students signal their responses to multiple-choice questions, which are tabulated wirelessly by the professor's computer.
3. Polling software then collates the data and gives the professor the ability to create various graphs and reports instantly as well as to store the data for grading and other purposes.

http://www.nytimes.com/2010/11/16/education/16clickers.html?ref=education

12

Problem-Based Cooperative Learning

At M.I.T., Large Lectures Are Going the Way of the Blackboard

Jodi Hilton for The New York Times

The Massachusetts Institute of Technology has changed the way it offers some introductory classes. Prof. Gabriella Sciolla at a class on electricity and magnetism.

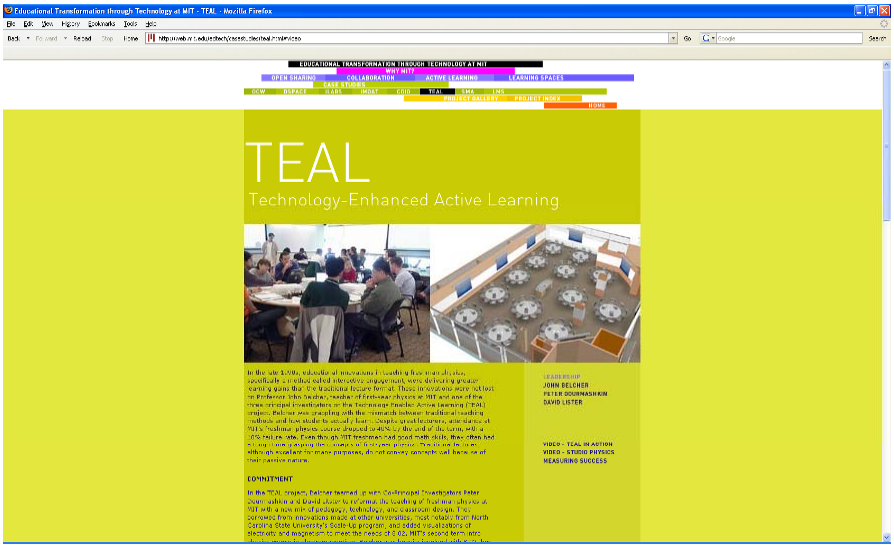
By SARA RIMER
Published: January 12, 2009

COMMENTS (60)
E-MAIL
PRINT
SINGLE PAGE

CAMBRIDGE, Mass. — For as long as anyone can remember, introductory physics at the Massachusetts Institute of Technology was taught in a vast windowless amphitheater known by its number,

January 13, 2009—New York Times – http://www.nytimes.com/2009/01/13/us/13physics.html?em

13



http://web.mit.edu/edtech/casestudies/teal.html#video

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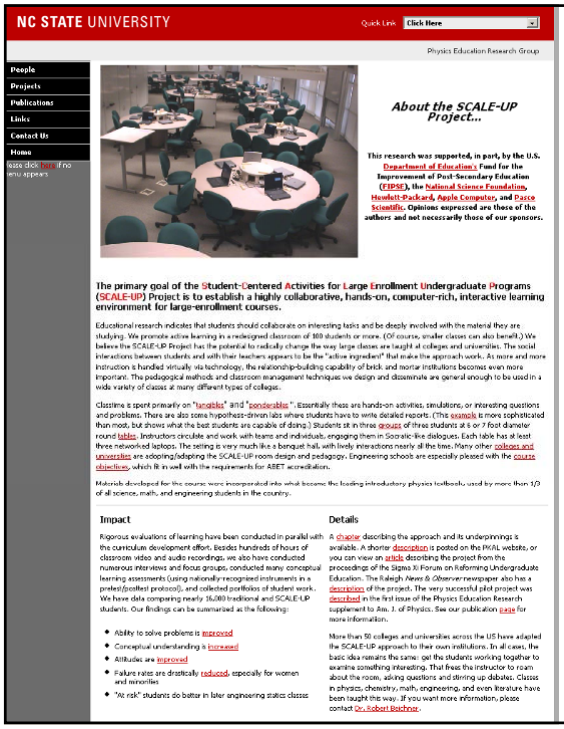

http://www.ncsu.edu/PER/scaleup.html

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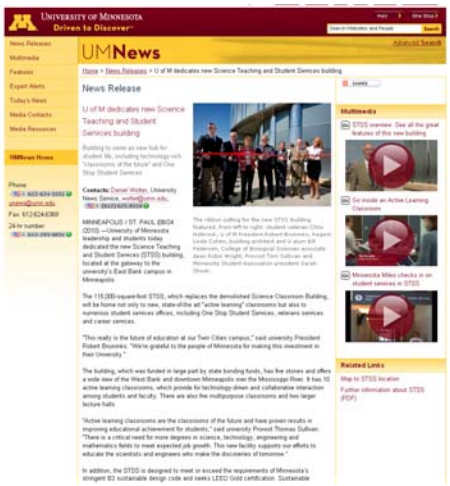


http://www1.umn.edu/news/news-releases/2010/UR_CONTENT_248261.html

http://mediamill.cla.umn.edu/mediamill/embed/78755

16

Challenges to Implementing Engaged Pedagogy

- Learning Spaces
- Time
  - Class time
  - Semester
- Faculty Resistance
  - Amount of material to be covered
  - "Students don't know, they will be sharing ignorance"
- Student Resistance
  - "You're the expert, tell me"
- **Model of Teaching/Teacher Mental Image of Teaching**
- **Teacher-Centered Paradigm**

17

Teacher Mental Images About Teaching - Axelrod (1973)

Mental Image	**Motto**	**Characteristics**	**Disciplines**
Content	I teach what I know	Pour it in, Lecture	Science, Math
Instructor	I teach what I am	Modeling, Demonstration	Many
Student – Cognitive Development	I train minds	Active Learning, Discussion	English, Humanities
Student – Development of Whole Person	I work with students as people	Motivation, Self-esteem	Basic Skills Teachers

Axelrod, J. *The University Teacher as Artist.* San Francisco: Jossey-Bass, 1973.

18

Lila M. Smith

19

Pedago-pathologies

Amnesia

Fantasia

Inertia

Lee Shulman – MSU Med School – PBL Approach (late 60s – early 70s), President Emeritus of the Carnegie Foundation for the Advancement of College Teaching

Shulman, Lee S. 1999. Taking learning seriously. *Change, 31* (4), 11-17.

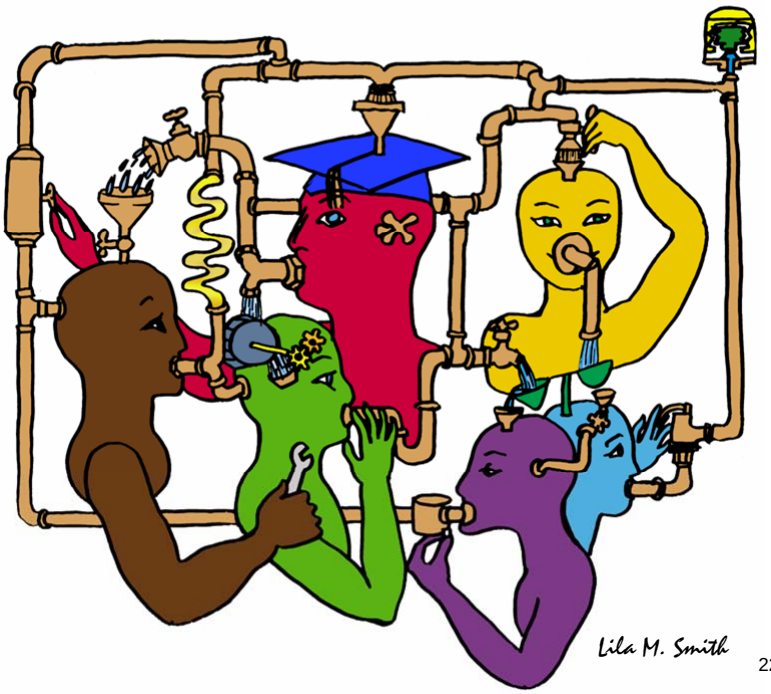
20

What do we do about these pathologies?

- **Activity** – Engage learners in meaningful and purposeful activities
- **Reflection** – Provide opportunities
- **Collaboration** – Design interaction
- **Passion** – Connect with things learners care about

Shulman, Lee S. 1999. Taking learning seriously. Change, 31 (4), 11-17.

21



22

Comparison of Old and New Paradigm of Teaching (Johnson, Johnson & Smith, 1991)

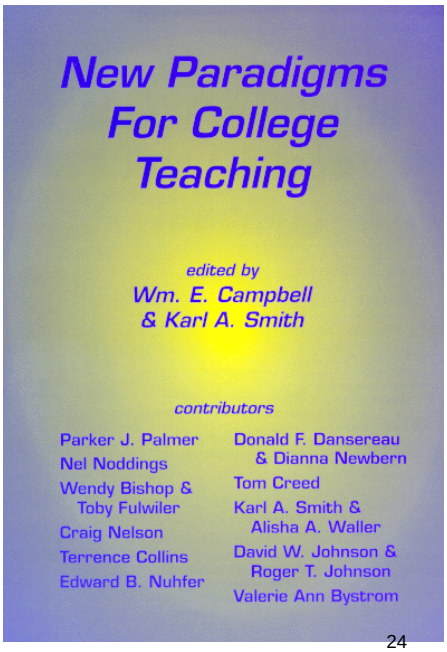
	Old Paradigm	New Paradigm
Knowledge	Transferred from Faculty to Students	Jointly Constructed by Students and Faculty
Students	Passive Vessel to be Filled by Faculty's Knowledge	Active Constructor, Discoverer, Transformer of Knowledge
Faculty Purpose	Classify and Sort Students	Develop Students' Competencies and Talents
Relationships	Impersonal Relationship Among Students and Between Faculty and Students	Personal Transaction Among Students and Between Faculty and Students
Context	Competitive/Individualistic	Cooperative Learning in Classroom and Cooperative Teams Among Faculty
Teaching Assumption	Any Expert can Teach	Teaching is Complex and Requires Considerable Training

Johnson, D.W., Johnson, R.T., and Smith, K.A. *Active Learning: Cooperation in the College Classroom* (1st ed.). Edina, MN: Interaction Book Company, 1991.

23

Robert Barr & John Tagg. From teaching to learning: A new paradigm for undergraduate education. *Change, 27*(6), 1995.

Wm. Campbell & Karl Smith. *New Paradigms for College Teaching*. Interaction Books, 1997.



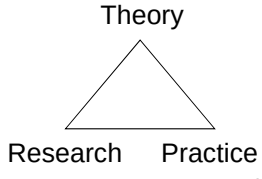
24

	Old Paradigm	New Paradigm
Knowledge	Transferred from Faculty to Students	Jointly Constructed by Students and Faculty
Students	Passive Vessel to be Filled by Faculty's Knowledge	Active Constructor, Discoverer, Transformer of Knowledge
Mode of Learning	Memorizing	Relating
Faculty Purpose	Classify and Sort Students	Develop Students' Competencies and Talents
Student Goals	Complete Requirements, Achieve Certification within a Discipline	Grow, Focus on Continual Lifelong Learning within a Broader System
Relationships	Impersonal Relationship Among Students and Between Faculty and Students	Personal Transaction Among Students and Between Faculty and Students
Context	Competitive/Individualistic	Cooperative Learning in Classroom and Cooperative Teams Among Faculty
Climate	Conformity/Cultural Uniformity	Diversity and Personal Esteem/ Cultural Diversity and Commonality
Power	Faculty Holds and Exercises Power, Authority, and Control	Students are Empowered; Power is Shared Among Students and Between Students and Faculty
Assessment	Norm-Referenced (i.e., Graded "On the Curve"); Typically Multiple Choice Items; Student rating of instruction at end of course	Criterion-Referenced; Typically Performances and Portfolios; Continual Assessment of Instruction
Ways of Knowing	Logico-Scientific	Narrative
Technology Use	Drill and Practice; Textbook Substitute; Chalk and Talk Substitute	Problem Solving, Communication, Collaboration, Information Access, Expression
Teaching Assumption	Any Expert can Teach	Teaching is Complex and Requires Considerable Training

25

Cooperative Learning

- Theory – Social Interdependence – Lewin – Deutsch – Johnson & Johnson
- Research – Randomized Design Field Experiments
- Practice – Formal Teams/Professor's Role



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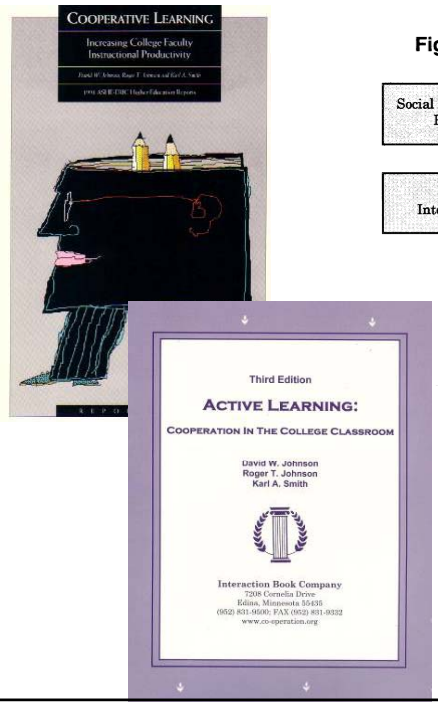
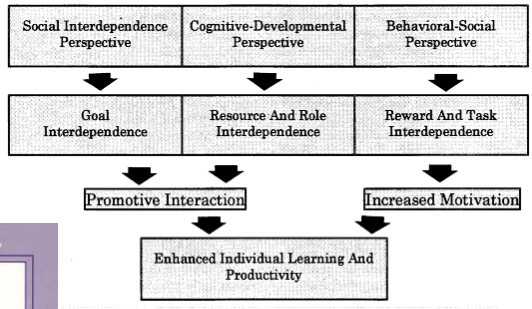


Figure A.1 A General Theoretical Framework



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

27

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

http://www.ce.umn.edu/~smith/docs/Smith-CL%20Handout%2008.pdf

28

Cooperative Learning Research Support

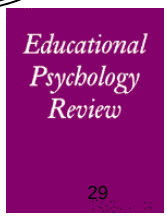
Johnson, D.W., Johnson, R.T., & Smith, K.A. 1998. Cooperative learning returns to college: What evidence is there that it works? *Change*, *30* (4), 26-35.

- 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

29

The American College Teacher:

National Norms for 2007-2008

Methods Used in "All" or "Most"	All – 2005	All – 2008	Assistant - 2008
Cooperative Learning	48	59	66
Group Projects	33	36	61
Grading on a curve	19	17	14
Term/research papers	35	44	47

http://www.heri.ucla.edu/index.php

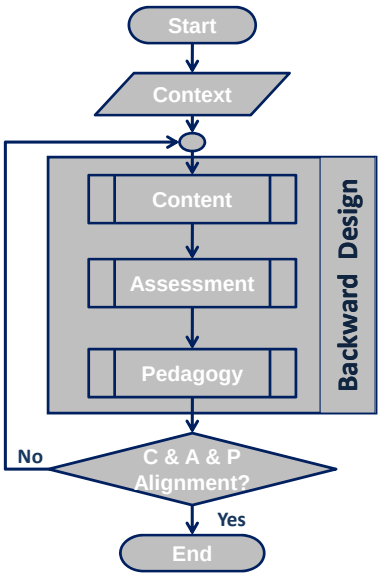
30

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]

31

Content-Assessment-Pedagogy (CAP) Design Process Flowchart



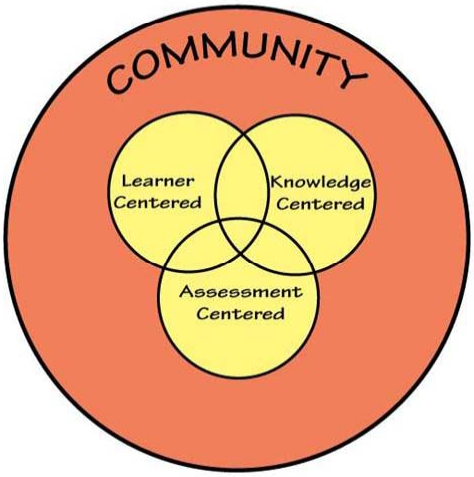
Integrated Course Design (Fink, 2003)

Initial Design Phase

1. Situational Factors
2. Learning Goals
3. Feedback and Assessment
4. Teaching/Learning Activities
5. Integration

32

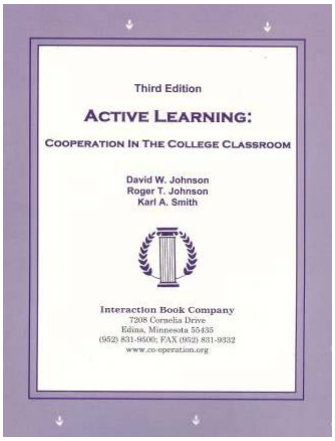
Designing Learning Environments Based on HPL (How People Learn)



33

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)

34

Creative Performance From Students (& Faculty) Requires Maintaining a Creative Tension Between

Challenge and Security

Pelz, Donald, and Andrews, Frank. 1966. Scientists in Organizations: Productive Climates for Research and Development. Ann Arbor: Institute for Social Research, University of Michigan.

Pelz, Donald. 1976. Environments for creative performance within universities. In Samuel Messick (Ed.), Individuality in learning, pp. 229-247. San Francisco: Jossey-Bass

Edmonson, A.C. 2008. The competitive advantage of learning. Harvard Business Review 86 (7/8): 60-67.

35

The Greater the Social Support, The Greater the Academic Challenge

- Must Balance:
  - **Challenge**: An academic demand that may be beyond the student's capacity to achieve
  - **Social Support**: Significant others helping students mobilize her or his resources to advance on the challenges

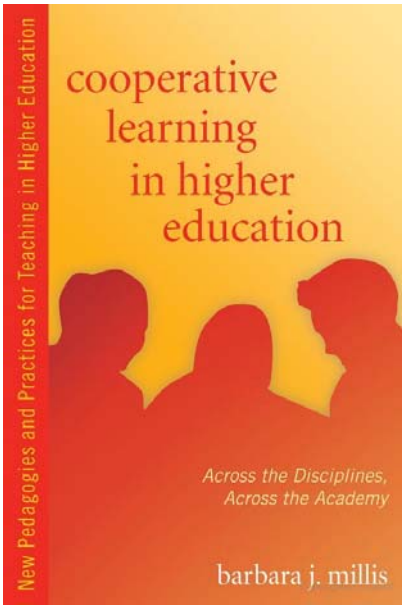
36

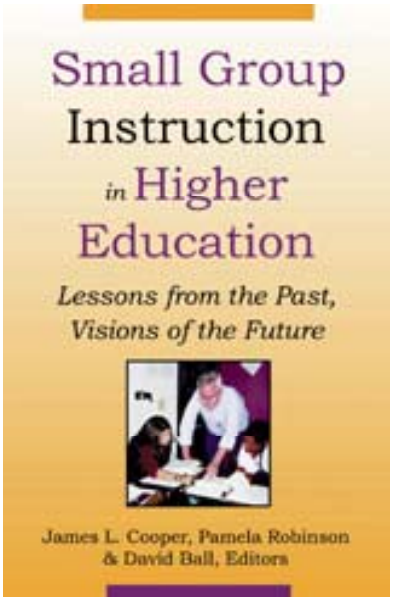
Social Support

- Two types of social support:
  - **Academic Support**: Classmates and faculty provide assistance and help students succeed academically.
  - **Personal Support**: Classmates and faculty care about and are personally committed to the well-being of each student.

Johnson, David W., Johnson, Roger T. and Smith, Karl A. 2006. *Active learning: Cooperation in the college classroom*, 3rd Ed. Edina, MN: Interaction Book.

37





38

Good teaching comes from the identity and integrity of the teacher.

Good teachers possess a capacity for connectedness.

Parker J. Palmer in *The courage to teach: Exploring the inner landscape of a teacher's* life. Jossey-Bass, 1998.

39

Session Summary – Minute Paper

- What was the most useful or meaningful thing you learned during this session?
- What question(s) remain uppermost in your mind as we end this session?
- What was the "muddiest" point in this session?
- Give an example or application
- Explain in your own words . . .

Angelo, T.A. & Cross, K.P. 1993. Classroom assessment techniques: A handbook for college teachers. San Francisco: Jossey Bass.

40

Session Summary
(Minute Paper)

Reflect on the session:

1. Most interesting, valuable, useful thing you learned.
2. Things that helped you learn.
3. Question, comments, suggestions.

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

41

Resources

- Cooperative Learning
  - Instructional Format explanation and exercises to model format and to engage participants – www.ce.umn.edu/~smith
  - Smith (2010) Social nature of learning: From small groups to learning communities. New Directions for Teaching and Learning, 2010, 123, 11-22 [NDTL-123-2-Smith-Social_Basis_of_Learning-.pdf]
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42