Pedagogies of Engagement:
Preparing Students for an Interdependent World

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Case Study Teaching in Science

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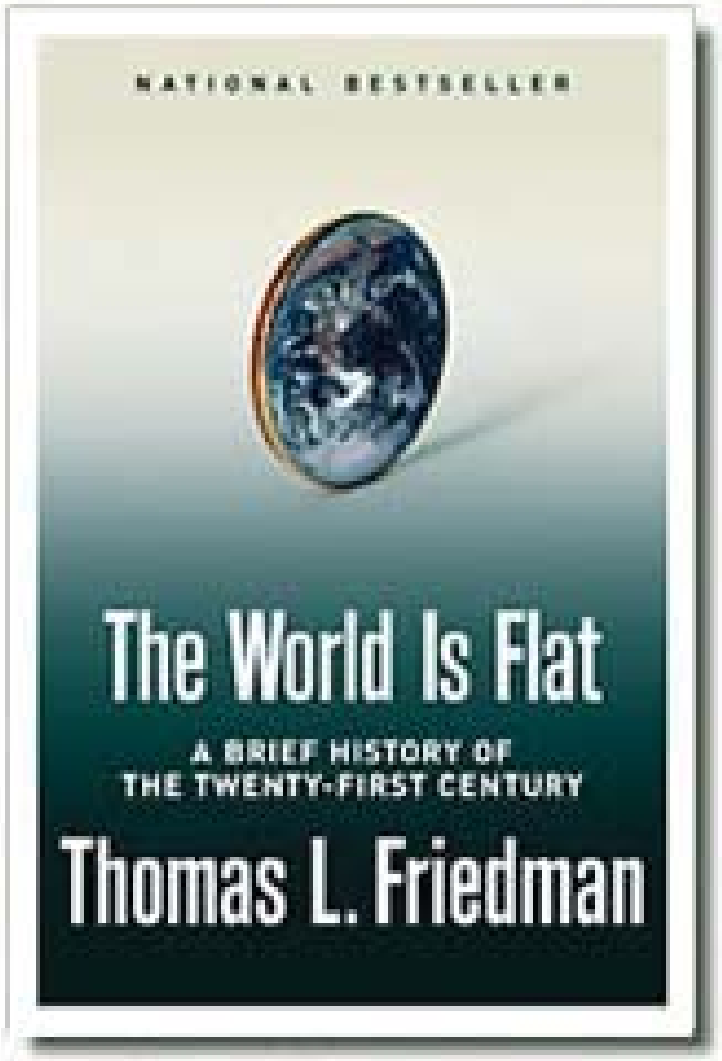
Age of Interdependence

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.



Platform for Collaboration
(1st Three Flatteners):

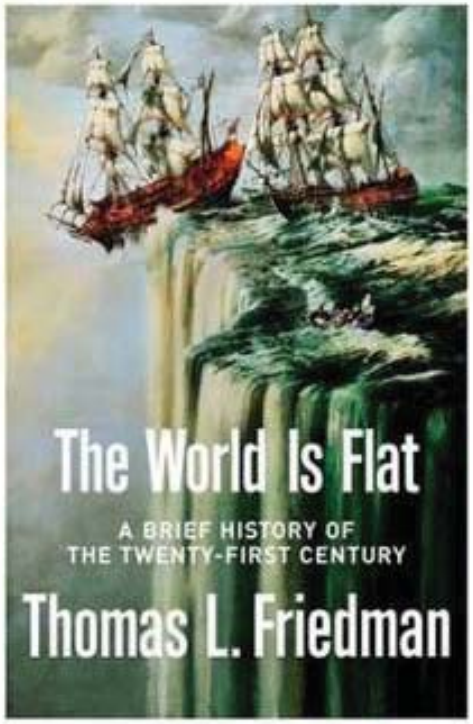
1. 11/9/89
2. 8/9/95
3. Work Flow Software

Horizontalize

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/

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"

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.

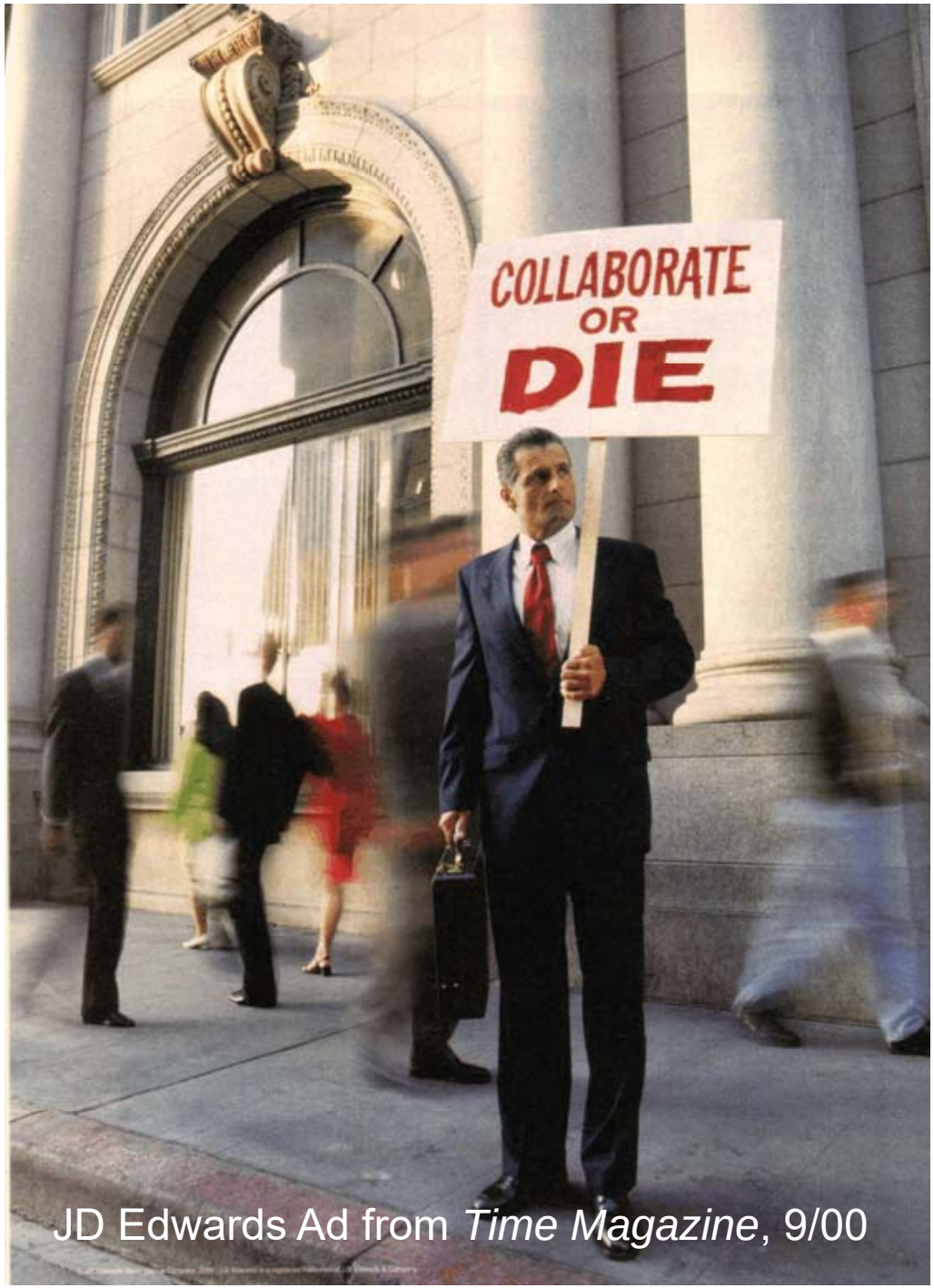
The great question of this new century is whether the age of interdependence is going to be good or bad for humanity. The answer depends upon whether we in the wealthy nations spread the benefits and reduce the burdens of the modern world, on whether the poor nations enact the changes necessary to make 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



JD Edwards Ad from *Time Magazine*, 9/00

Collaboration

Collaboration is a purposive relationship. At the heart of collaboration is a desire or need to

- solve a problem,
- create, or
- discover something

Within a set of constraints, including expertise, time, money, competition, and conventional wisdom (p. 36)

Michael Schrage. 1991. Shared minds: The new technologies of collaboration.

Preparing Students for an Interdependent World

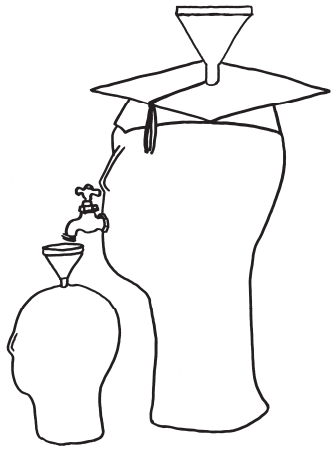
- Please reflect on how best to prepare students for an interdependent world – jot down some of your ideas
- Turn to the person next to you
  - Introduce yourself
  - Share thoughts on preparing students

Pedagogies of Engagement

Lila M. Smith

Pedago-pathologies

Amnesia



Fantasia

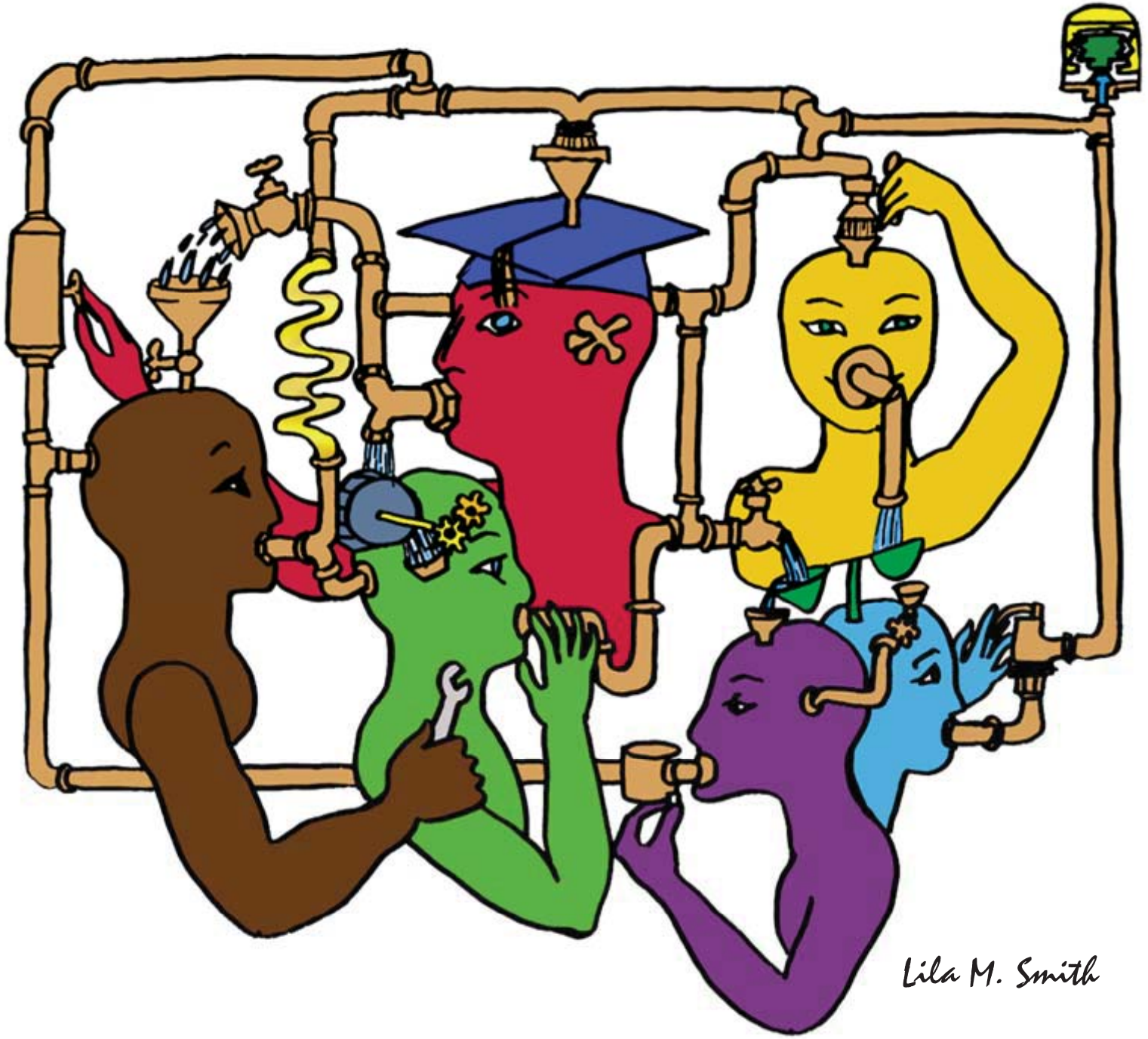
Inertia

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

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

What do we do about these pathologies?
– Lee Shulman
Activity
Reflection
Collaboration
Passion
Combined with generative content and the creation of powerful learning communities

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


Lila M. Smith

Formulate-Share-Listen-Create (Think-Pair-Share)

- Individually read the quote “To teach is to engage students in learning. . .”
- Underline/Highlight words and/or phrases that stand out for you
- Turn to the person next to you and talk about words and/or phrases that stood out

To teach is to engage students in learning; thus teaching consists of getting students involved in the active construction of knowledge. . .The aim of teaching is not only to transmit information, but also to transform students from passive recipients of other people's knowledge into active constructors of their own and others' knowledge. . .Teaching is fundamentally about creating the pedagogical, social, and ethical conditions under which students agree to take charge of their own learning, individually and collectively

Education for judgment: The artistry of discussion leadership. Edited by C. Roland Christensen, David A. Garvin, and Ann Sweet. Cambridge, MA: Harvard Business School, 1991.

Foundations for Pedagogies of Engagement

1. Learning is a social activity (John Dewey)
2. Innovative learning requires ambiguity (Stuart Pugh)
3. All learning requires un-learning (John Seely Brown)
4. Learning is situated (Jean Lave)

Foundations - John Dewey

John Dewey's ideal school:

- a "thinking" curriculum aimed at deep understanding
- **cooperative learning within communities of learners**
- interdisciplinary and multidisciplinary curricula
- projects, portfolios, and other "alternative assessments" that challenged students to integrate ideas and demonstrate their capabilities.

Dewey, John. 1915. The school and society, 2nd ed. Chicago: University of Chicago Press.

Cooperative Learning

Kurt Lewin - Social Interdependence Theory (~1935)

1. The essence of a group is the interdependence among members (created by common goals) which results in the group being a "dynamic whole" so that a change in the state of any member of subgroup changes the state of any other member or subgroup

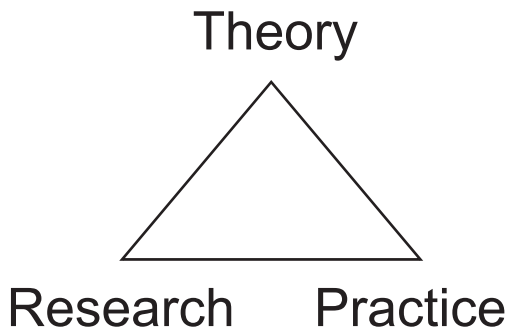
2. An intrinsic state of tension within group members motivates movement toward the accomplishment of the desired common goals.

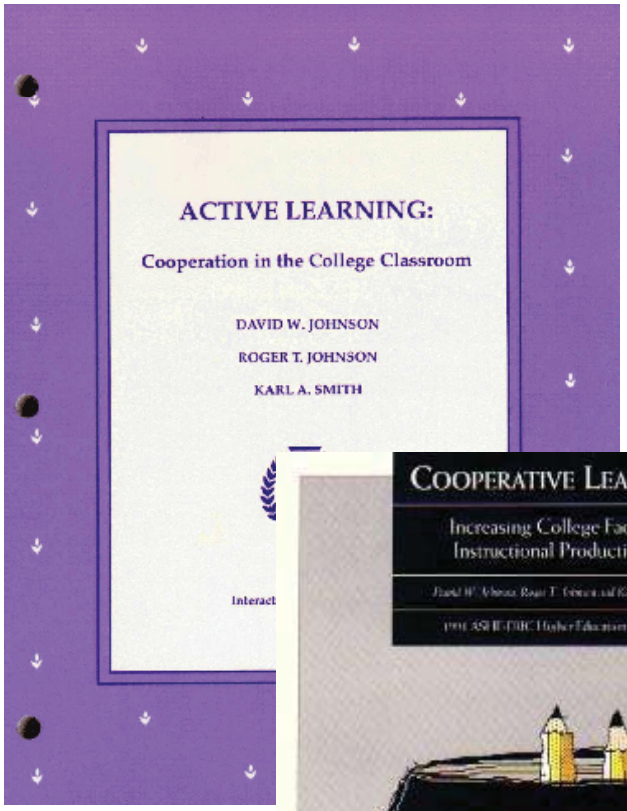
Student – Student Interaction
Lewin's Contributions

- Founded field of social psychology
- Action Research
- Force-Field analysis
- B = f(P,E)
- Social Interdependence Theory
- "There is nothing so practical as a good theory"

Cooperative Learning

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





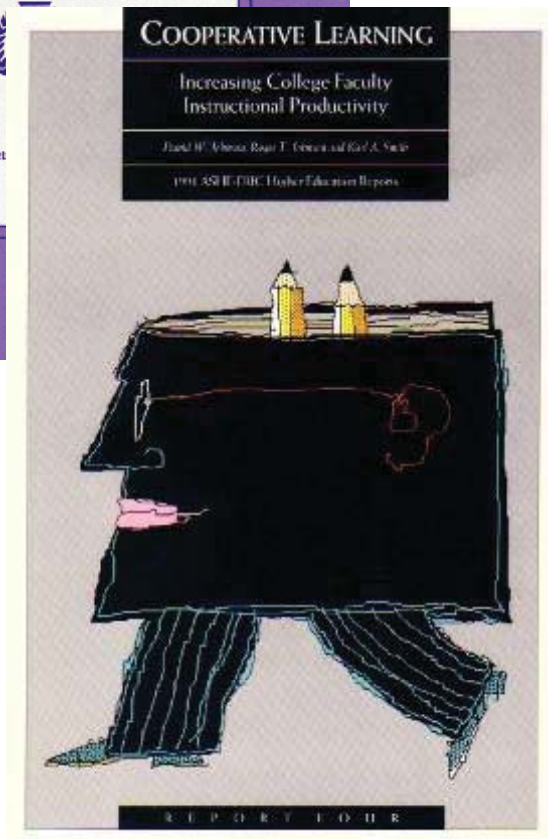
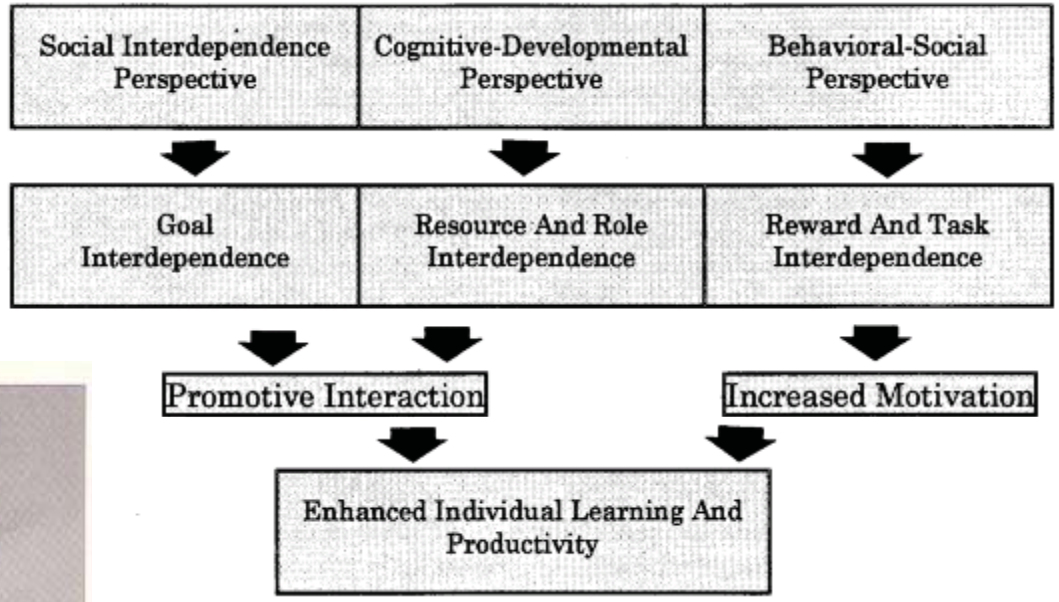


Figure A.1 A General Theoretical Framework

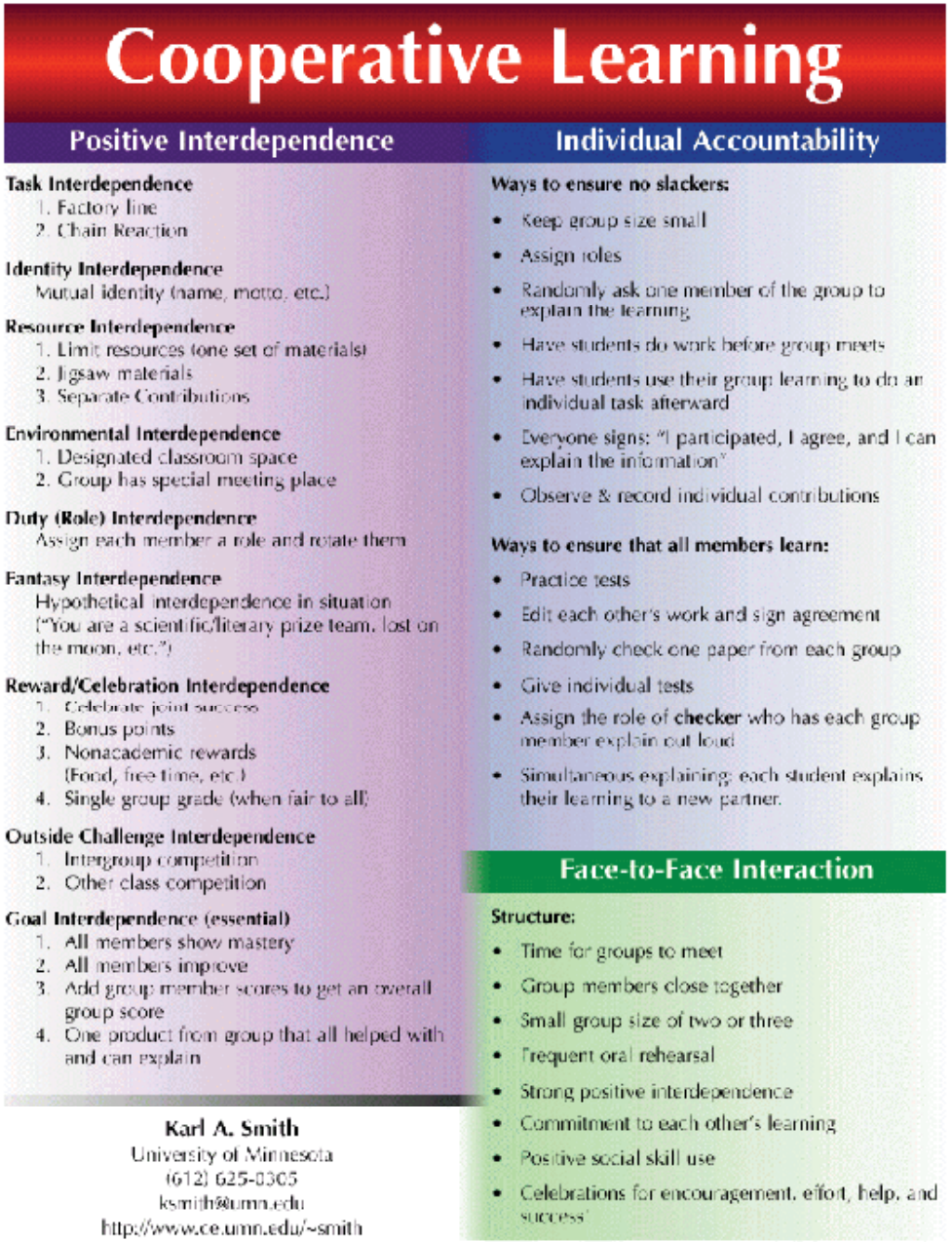


Cooperative Learning

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

Cooperative Learning:
Key Concepts

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



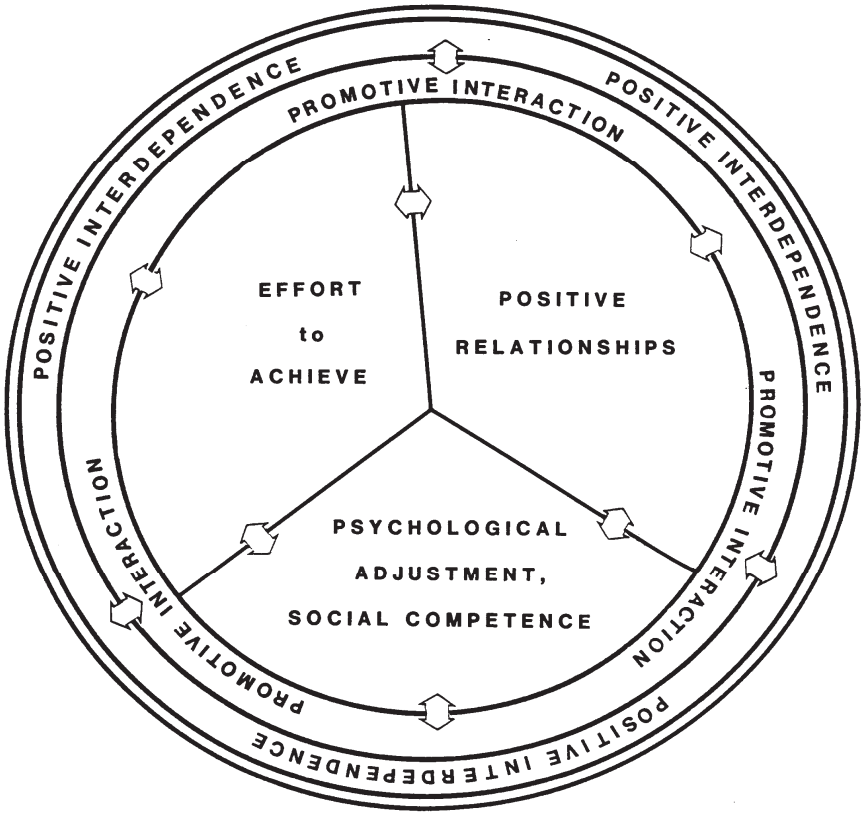
Cooperative Learning Research Support

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

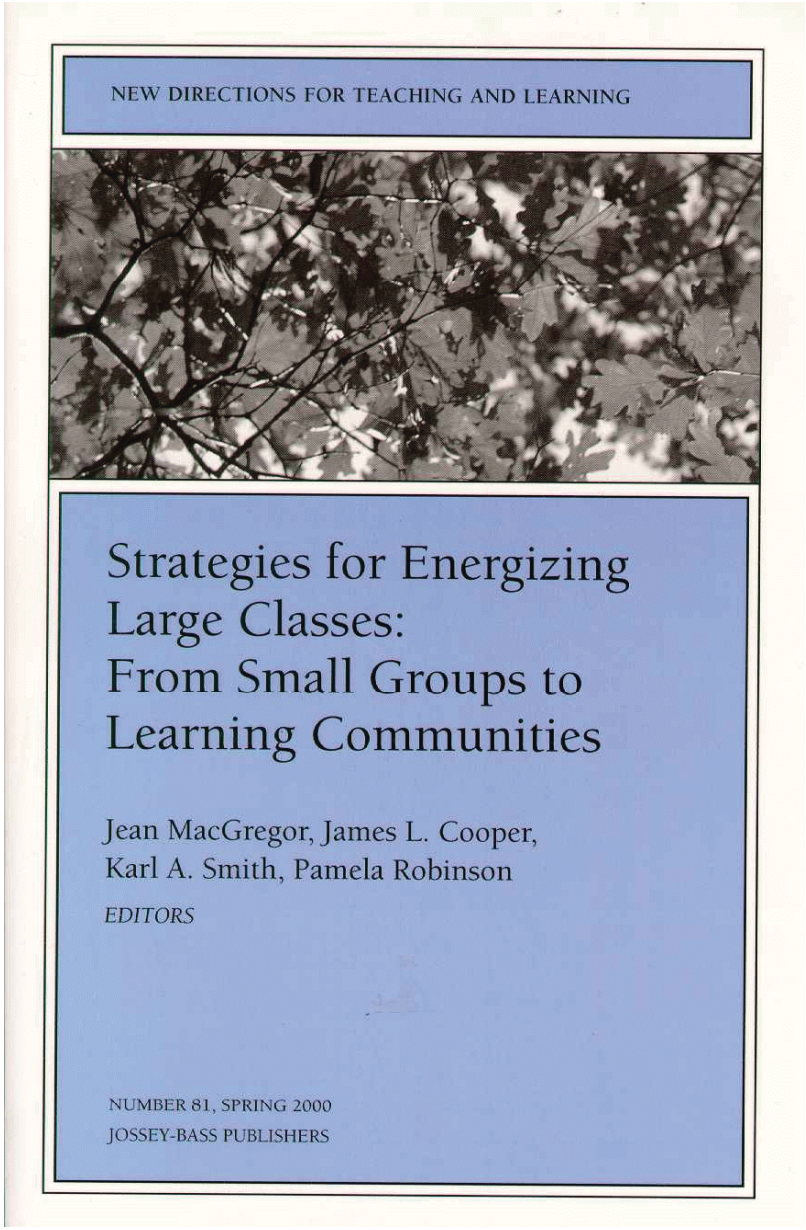


Small-Group Learning: Meta-analysis

Springer, L., Stanne, M. E., & Donovan, S. 1999. Effects of small-group learning on undergraduates in science, mathematics, engineering, and technology: A meta-analysis. Review of Educational Research, 69(1), 21-52.

Small-group (predominantly cooperative) learning in postsecondary science, mathematics, engineering, and technology (SMET). 383 reports from 1980 or later, 39 of which met the rigorous inclusion criteria for meta-analysis.

The main effect of small-group learning on achievement, persistence, and attitudes among undergraduates in SMET was significant and positive. Mean effect sizes for achievement, persistence, and attitudes were 0.51, 0.46, and 0.55, respectively.



Strategies for Energizing Large Classes: From Small Groups to Learning Communities:

Jean MacGregor,
James Cooper,
Karl Smith,
Pamela Robinson

New Directions for Teaching and Learning,
No. *81*, 2000.
Jossey- Bass

Pedagogies of Engagement: Classroom-Based Practices

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

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 encourages 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 element in 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:

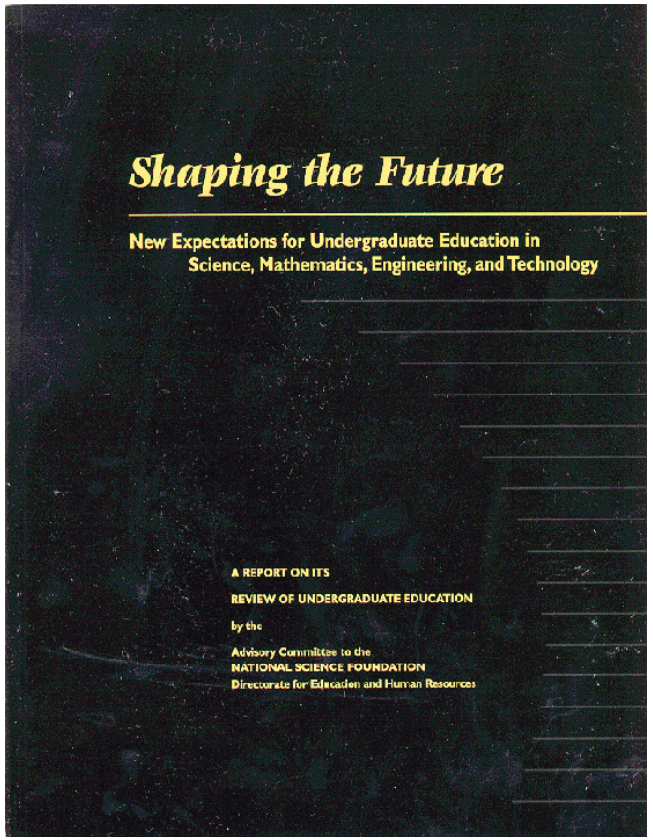
1. *Level of academic challenge:* Schools encourage achievement by setting high expectations and emphasizing importance of student effort.
2. *Active and collaborative learning:* Students learn more when intensely involved in educational process and are encouraged to apply their knowledge in many situations.
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, capstones) 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** (reflecting on higher education projects funded by the Pew Memorial Trust)

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

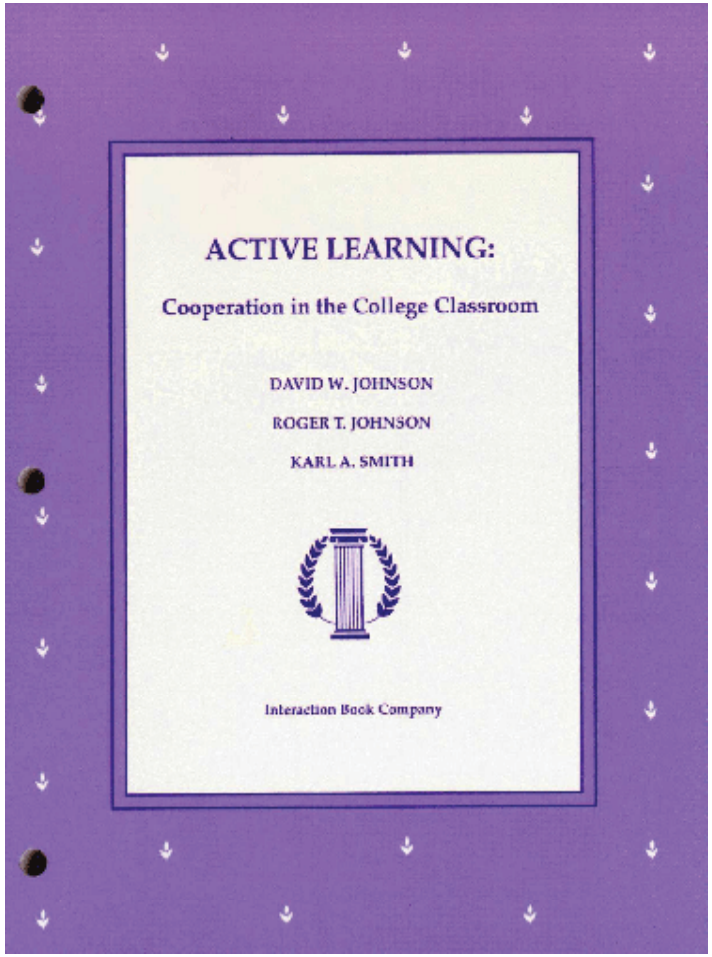
Goal – All students have access to supportive, excellent undergraduate education in science, mathematics, engineering, and technology, and all students learn these subjects by direct experience with the methods and processes of inquiry.



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.

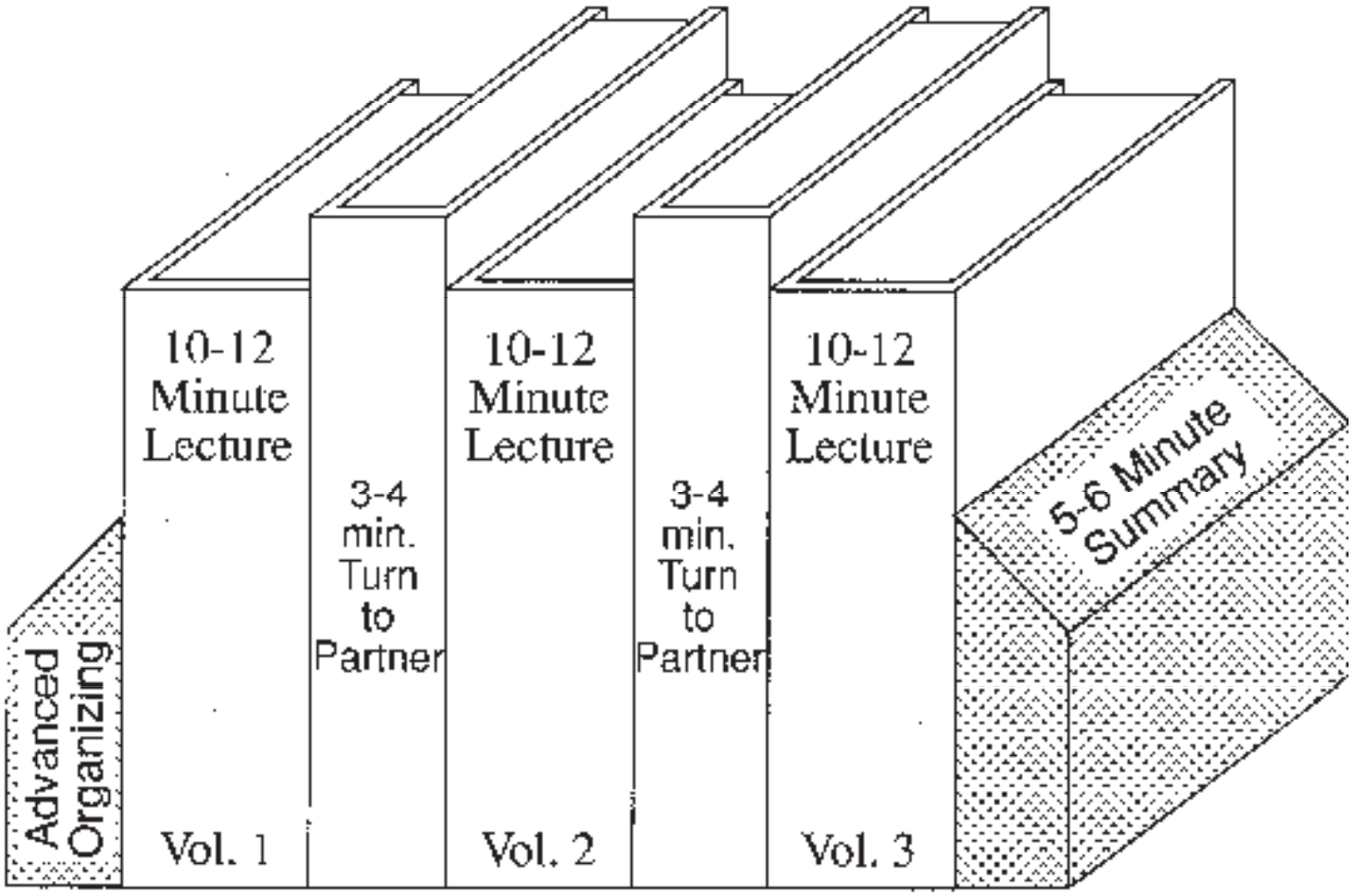
Active Learning: Cooperation in the College Classroom

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



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

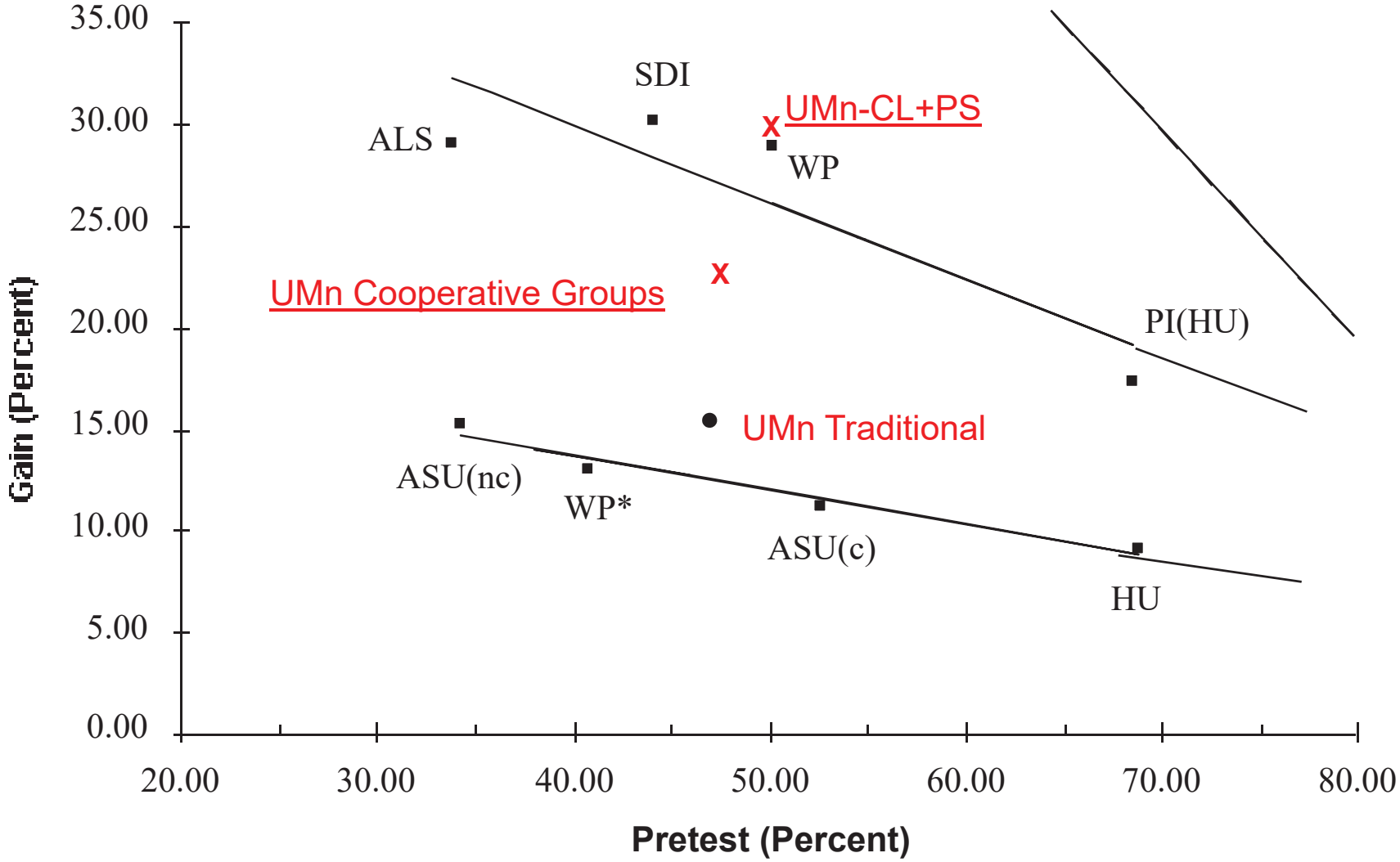
Book Ends on a Class Session

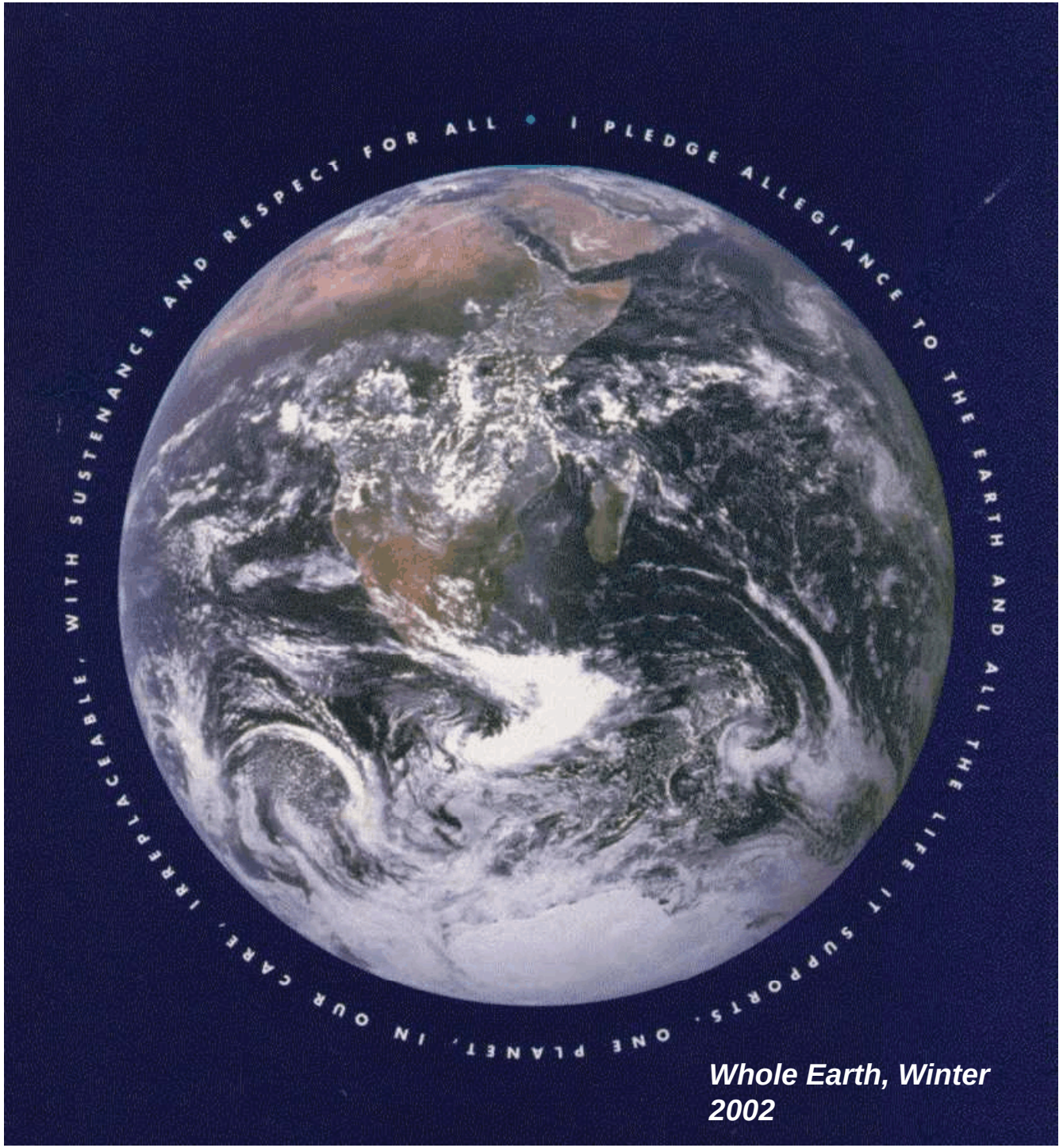


Book Ends on a Class Session

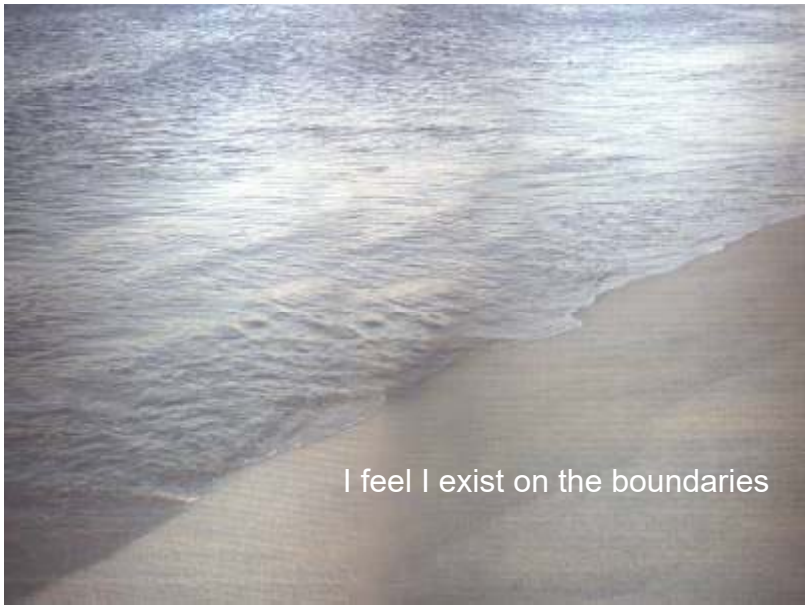
1. Advance Organizer
2. Formulate-Share-Listen-Create (Turn-to-your-neighbor) -- repeated every 10-12 minutes
3. Session Summary (Minute Paper)
    1. What was the most useful or meaningful thing you learned during this session?
    2. What question(s) remain uppermost in your mind as we end this session?
    3. What was the “muddiest” point in this session?

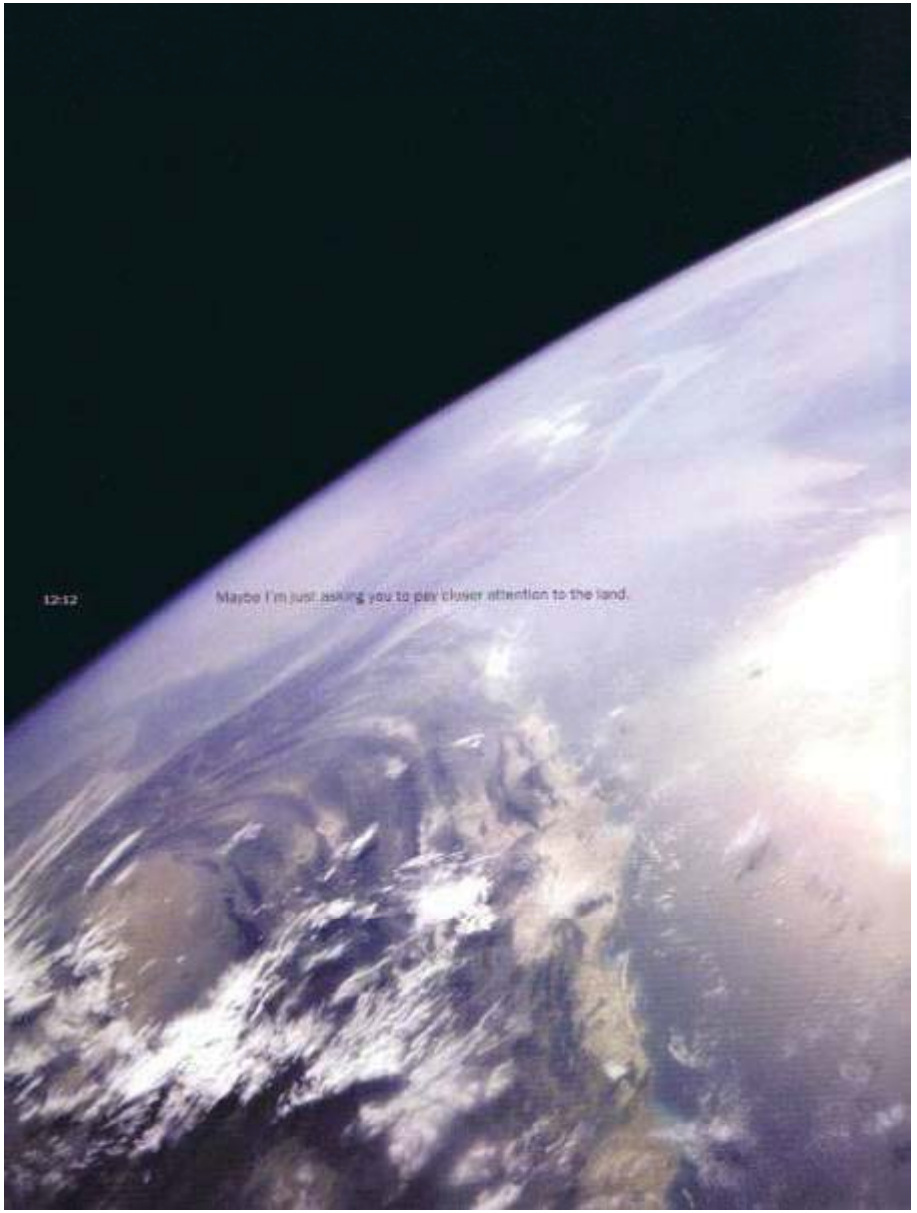
The “Hake” Plot of FCI





Whole Earth, Winter 2002





Maybe I’m just asking you to pay closer attention to the land

Mitakuye Oyasin

"We are all related"

Education is an art of process, participation and making connection.

Albert White Hat, Sr. & Cheryl Medearis
Sinte Gleska University, Rosebud, South Dakota

Formulate-Share-Listen-Create (Think-Pair-Share)

- Please reflect on the session
- List things that are memorable
  - Useful, valuable, provocative, etc.
- List questions that you have and comments you'd like to make
- Turn to the person next to you and compare notes