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

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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”

NYTimes MAGAZINE April 3, 2005
It’s a Flat World, After All
By THOMAS L. FRIEDMAN
Video – Think Global Series:
http://minnesota.publicradio.org/radiofeatures/2005/05/collaboration/

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.

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.

Interdependent World

- Essential knowledge, skills, habits of mind, … for an interdependent world?
  - Reflect individually and list essential skills ~ 1’
  - Turn to the person next to you ~ 2’
    - Introduce yourself
    - Compare lists
    - Develop a joint list
  - Present to whole group (if randomly selected)

The reports...

- **Engineering Research and America’s Future** (NAE, 2005)
- The Engineer of 2020 (NAE, 2004) and Educating the Engineer of 2020 (NAE, 2005)
- Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future (NRC/COSEPUP, 2005)

Successful Attributes for the Engineer of 2020

- Possess strong analytical skills
- Exhibit practical ingenuity; possess 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

Desired Attributes of a Global Engineer*

- A good grasp of these engineering science fundamentals, including:
  - Mechanics and dynamics
  - Mathematics (including statistics)
  - Physical and life sciences
  - Information science/technology
- A good understanding of the design and manufacturing process (i.e., understands engineering and industrial perspective)
- A multidisciplinary, systems perspective, along with a product focus
- A basic understanding of the context in which engineering is practiced, including:
  - Economics and finance
  - The environment and its protection
  - The history of technology and society
- An awareness of the boundaries of one’s knowledge, along with an appreciation for other areas of knowledge and their interrelatedness with one’s own expertise
- An awareness of and strong appreciation for other cultures and their diversity, their distinctiveness, and their inherent value
- A strong commitment to teamwork, including extensive experience with and understanding of team dynamics
- Good communication skills, including written, verbal, graphic, and listening
- High ethical standards (honesty, sense of personal and social responsibility, fairness, etc)
- An ability to think both critically and creatively, in both independent and cooperative modes
- Flexibility: the ability and willingness to adapt to rapid and major change
- Curiosity and the accompanying drive to learn continuously throughout one’s career
- An ability to impart knowledge to others

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

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

How to help students develop the knowledge, skills and habits of mind needed for effective participation?

Opportunities for the Participants in the RCEE 2007
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.


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


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 for Pedagogies of Engagement
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.


Cooperative Learning

• Theory – Social Interdepende
  nce – Lewin – Deutsch – Johnson & Johnson
• Research – Randomized Design Field Experiments
• Practice – Formal Teams/Professor’s Role

Cooperative Learning Research Support


• 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

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.
Top Three Main Engineering Work Activities

**Engineering Total**
- Design – 36%
- Computer applications – 31%
- Management – 29%

**Civil/Architectural**
- Management – 45%
- Design – 39%
- Computer applications – 20%


Preparation Students for an Interdependent World

“If we cannot end now our differences, at least we can help make the world safe for diversity.”

President John F. Kennedy, Commencement Address, American University, June 10, 1963.


Safe for Diversity

The required solvent for civilization is respect for differences. The art is to be different together.

Civilization will be built by cooperation and compassion, in a social climate in which people of different groups can deal with each other in ways that respect their cultural differences.