Engineering Design

• What engineers do...
• Design within constraints
• Systematic
• Thoughtful
• People centered

Design Education

• Focused on students
• Knowledge and professional practice
• Social activity... with people, for people
• Ambiguity

See work of Dym, Sheppard
Evolution of First Year Design

- Early – mid 1990’s
- The leap: science & math → engineering
- Acquire facts; organize knowledge
- Connect to existing knowledge
- Multidisciplinary
- Synthesis
- Hopeful outcomes

See work of Froyd and Ohland
Start Early: First Year Design

- Not so common...
- ASEE and CASEE benchmarking
  - 9% (10/113) – generalize to ~35 nationally?
- Early design $\rightarrow$ reflection $\rightarrow$ success
- Self efficacy research enticing for First Year Design
  - Engineering experiences shape confidence
  - Importance of *mastery* experiences

See survey summary by Brannan, research by Stevens and Hutchinson-Green
Learning Happens Between People

- Technical vs social
- Engineering is about people
- Neglectful relationship to people?
- Socio-technical work
- Implications of outsourcing the First Year
- First Year Design

See research of Stevens
Engaging

• Learning requires feedback
• Solving a problem → connections
• Entwinement
  ▫ Learning and engaging
  ▫ Mind and heart
  ▫ Social and technical
• Context for engineering design challenges...
  ▫ Gender differences in patterns of intellectual development
  ▫ Is to engineer in context particularly important for women?
• Design!

See research of Adams, Kilgore
The Fuzzy Stuff - Self Efficacy

• Confidence in one’s ability to perform tasks to **achieve success** in the engineering environment
• Relevance to First Year design education
  ▫ Mastery experiences
  ▫ Working in teams
  ▫ Getting help
• Mastery experiences (again)
• Design!

See research of Hutchinson-Green
Self-efficacy and Persistence

- Increased persistence, achievement and interest
- Gender differences
- Relevance to First Year design
  - Experiencing
  - Confirming mastery

See Fortenberry et al
So...What Might You Ponder or Act Upon?

Jacquelyn Sullivan
College of Engineering & Applied Science
University of Colorado Boulder