

CAEE is a higher education Center for Learning and Teaching funded by the Directorate for Education and Human Resources and the Directorate for Engineering. Begun in January 2003, supplemental funding from NSF is supporting research activities into 2009.

- **STUDENTS:** Providing significant **insight into the learning of engineering across diverse student populations** and environments through **longitudinal, cross-sectional, and targeted studies**; portfolio tools created to assist engineering **graduate students prepare for careers in teaching**.
- **FACULTY:** Enhancing the effectiveness of strategies to **help engineering educators improve their teaching**.
- **RESEARCHERS:** Fostering a **diverse cadre of leaders and change-agents in engineering education** who can conduct high impact research.

NUGGETS from CAEE Research

ENGINEERING STUDENTS

Student Retention is Not the Problem for Engineering

When compared to other college students, engineering students in general are:

- more likely to stick with their major
- equally engaged with their studies
- also similar in factors ranging from grades and gains in general education to course-related interactions with faculty and time spent on homework

APS results provide compelling evidence that engineering students do stick with their major and that lack of retention is not the primary cause of the low numbers of graduating engineers.

Many Graduates Don't Seek Employment in Engineering

- Today's college graduates think more about their "first job" than about a "career" as a lifetime choice. Many students expect to have multiple jobs in different fields over the course of their working life.
- Students who complete a major in engineering are not necessarily committed to careers in engineering.
- Undergraduates' thoughts about career options can be swayed by a single experience such as an internship, interactions with faculty, or advice from a mentor.
- Institutional differences can contribute strongly to the varying levels of commitment to engineering careers.
- Student decisions about their post-graduate plans often take place without the direct influence of engineering faculty and staff, who could conceivably provide valuable insights and guidance.

Recognizing the fluidity of student commitment to engineering, and building more guidance into programs, could ensure that our most qualified, talented students will use their skills in engineering-related careers.

Women May See a "Bigger Picture" than Men in Engineering Design Problems

- First-year women engineering students tended to choose a greater number of context-oriented items ("the bigger picture") than men did in selecting from a list of factors important in design.
- These women were more likely than men to associate *seeking information* and less likely to associate *building* and *prototyping* with engineering design.
- Students' fourth-year responses to the same question appear similar to those from the first year: women were more likely than men to choose *goal setting* and less likely to select *building*.

Women in engineering can often provide a different and broader perspective on the approaches to, and details of, a design.

ENGINEERING FACULTY

- Faculty **narratives about their process of committing to a decision** were often emotional and various rationales were behind their decision making.
- Faculty **often felt bound by to a specific action by constraints** or other issues and sometimes knowingly accepted **unsatisfactory decisions based on tradeoffs** and issues beyond their control.
- Faculty would sometimes try to achieve a **satisfactory decision at their own personal cost**.

ENGINEERING EDUCATION RESEARCHERS

- Substantial **commitment to a community of practice** in the domain of engineering education.
- Participants developed **identity within multiple frameworks**: "interdisciplinary," "teacher," "agent of service," "educational researcher," and "engineering researcher."

Study Details

Engineering Students. Academic Pathways Study (APS): *Longitudinal Cohort* - 160 undergraduates on 4 campuses studied 2003-2007, with multiple research methods; *Broader Core Sample* - 800+ students on 4 campuses surveyed Spring 2007; *Broader National Sample/APPLE Survey* - 4200+ students from 21 US universities of varying characteristics surveyed Spring 2008

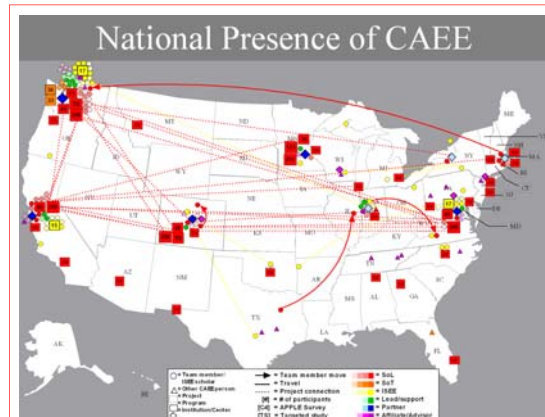
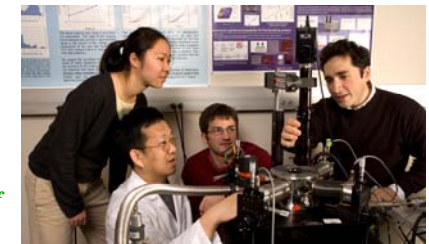
Engineering Faculty. Studies of Engineering Educator Decisions (SEED): Interviews with 31 engineering faculty in 9 of 10 departments; 9 women/22 men

Engineering Education Researchers. Institute for Scholarship on Engineering Education (ISEE): Interviews with 13 ISEE Scholars; analyzed in terms of community of practice and identity

Leadership Team: Cindy Atman (PI), Reed Stevens, Jennifer Turns, Phil Bell, University of Washington; Lorraine Fleming, Howard University; Larry Leifer, Sheri Sheppard, Stanford University; Ron Miller, Barbara Olds, Colorado School of Mines; Karl Smith, University of Minnesota/Purdue University; Ruth Streveler, Robin Adams, Purdue University

National Affiliates: NACME (National Action Council for Minorities in Engineering), WEPAN (Women in Engineering ProActive Network),

CASEE (Center for the Advancement of Scholarship on Engineering Education), CIRTL (Center for the Integration of Research, Teaching, and Learning)



The People of CAEE

- 43 faculty members and staff, 23 graduate students, and 32 undergraduate students from across the country have participated in CAEE research since 2003.
- 47 ISEE Scholars, representing 23 academic institutions, were part of three year-long Institutes for Scholarship on Engineering Education, 2004-2007.
- 150 graduate students and postdoctoral fellows participated in 7 offerings of the Engineering Teaching Portfolio Program with a goal to better prepare them for engineering teaching careers.