CENTER
for the
ADVANCEMENT of ENGINEERING EDUCATION

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This presentation focuses on…

- Who we are
- What we did (or are doing)
- What we learned
- Insights for your study

CAEE Overview

- Funded by National Science Foundation
  - Two Directorates: *Engineering; Education and Human Resources*
- Five year grant
  - January 2003 – December 2007
- National study of 4 universities

(extending to 16 more soon)

Academic Pathways Study (APS)

- Multi-year **longitudinal study** of undergraduate engineering students
- **First three years** (really 4) of engineering study
- **Descriptive study**…not intervention

  …a "what is" study
- From **students' perspective**…Key!!

Implications for your Retention Study

- Pathways
  - Engineering curriculum to graduate school
  - Graduate school to the professorate
- Beyond the numbers to the reasons

APS Team

4 Diverse Institutions

Colorado School of Mines
Howard University
Stanford University
University of Washington

Differences

- **Private, public, MSI, research**
- **Size, demographics, cultures**
- **Admission processes & criteria**

Discipline Diversity

engineers*
social scientists
physical scientists
biological scientists
humanists

** Advantage/disadvantage of having researchers embedded in the community*

Different…

…Ways of communicating;
… Approaches to research;
…Perspectives.

APS Vision

Better understanding of …

- **How engineering students navigate their education and become engineers**
- **How learning and experiences vary across**
  - **gender**
  - **ethnicity**
  - **race**
  - **institution**

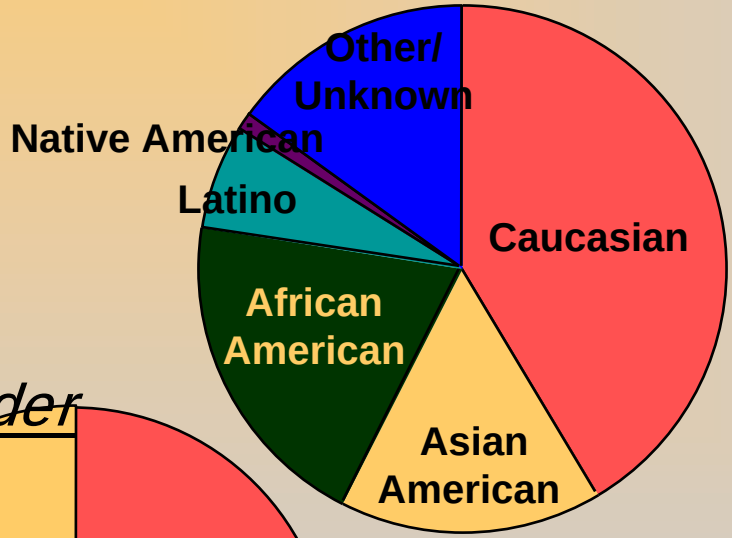
APS Goal

*Transform our findings and insights into **actionable practice** and **policy** items.*

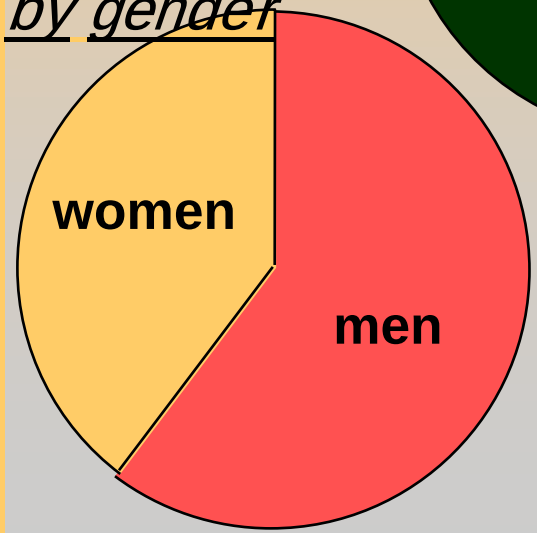
APS Participants

N=160 (40 per school)

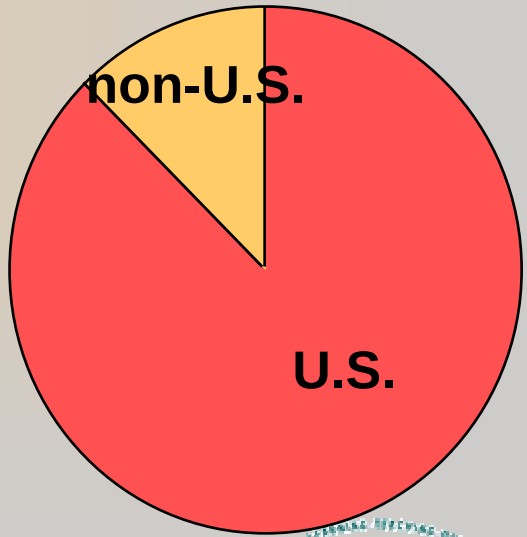
by race & ethnicity



by gender



by citizenship



RESEARCH QUESTIONS

SKILLS

How do students' skills and knowledge develop and change over time?

IDENTITY

How do students come to identify themselves as engineers?

EDUCATION

What elements of a student's education contribute to changes observed in S & I development?

Mixed Method Approach

- Allows for **triangulation** of results
- Combines both **quantitative and qualitative** methods
  (surveys, interviews, observations, records)
- Richer data set

APS Methods

Structured Interviews

- Annually; 1 hour
- Tied to questions in the surveys
- Fixed script that is read by interviewer
- Transcribed, coded, cleaned, analyzed

Unstructured Interviews

- Annually; 2 hours
- No set script; spontaneous conversation
- Rich, in-depth data that describes the culture of engineering education through the eyes of students

APS Methods

SURVEYS

- Twice per year
- Based on other engineering surveys
- National survey to be extended to 16 other institutions

PERFORMANCE TASKS

- Annually
- How students perform on an “Engineering Thinking & Doing” task
- E.g., Flood control, playground, traffic light

APS Methods (cont'd)

Ethnographic Observations

- Observed in class & out-of-class activities
- 30 hours/academic year
- Field notes

Other Data

- **Academic transcript analysis**
- **Exit Interview** provides rich data on those who left

Assessment of Research Questions by Methodology

	Surveys	Structured Interviews	Ethnography	Engineering Thinking & Doing
Skills	✓	✓ ✓	✓	✓ ✓ ✓
Identity	✓ ✓	✓ ✓	✓ ✓ ✓	✓
Education	✓ ✓ ✓	✓ ✓	✓ ✓	✓

Lesson Learned

Mixed Methods—Advantages/ Disadvantages

- Participant/Sample selection
- Timelines
- Skill sets (stats, interview, etc.)

Lesson Learned (cont'd)

Multiple Campus Issues

- IRB
- Roles & responsibilities
- Consistency in Methodology
- Recruitment Challenges
- Data management & access

Considerations for your Retention Study

You have

- **Pressing need** for data/information
- Limited **resources**
- Limited **time**

Retention Study Design Skeleton

- Research Questions

  "What **factors** (academic, social, cultural) lead to the **successful completion** of a STEM PhD? …to **pursuing an academic career**?"

  "Is there a difference among **institutions, genders, citizenships, majors, cultural groups**, etc?"

Retention Study Design **Skeleton** *(cont'd)*

- Participants
  - Cohort mix of URMs and non-URMs
  - Verge of graduation
  - Variety of Institutions
- Methodology
  - Surveys
  - Interviews
  - Academic Record Review

Retention Study Design **Skeleton** *(cont'd)*

Interview/Survey Questions (sample)

- What were the **most challenging aspects** of your graduate education?
- What aspects would you **change**? Why? How?
- What is your level of **enjoyment** of the experience?
- What **support services** (e.g. AGEP programs) did you partake in? How were they helpful?

WE WELCOME YOUR COMMENTS & QUESTIONS