

# Studying the Engineering Student Experience: Design of a Longitudinal Study

**Sheri Sheppard, Cynthia Atman, Reed Stevens,  
Lorraine Fleming, Ruth Streveler, Robin Adams,  
Theresa Barker**

**Stanford University/University of Washington/ University of  
Washington/ Howard University/Colorado School of  
Mines/University of Washington/ University of Washington**



NSF Grant # ESI-0227558



# Introduction

- NEED
  - Study how students become engineers and learn critical engineering skills
  - Investigate the student's perspective
- Academic Pathways Study (APS)
  - Research conducted by the Center for Advancement in Education (CAEE)

# Objectives of this work

Provide a comprehensive account of how students become engineers:

- How student engineering knowledge changes over time
- How education varies across populations and institutions (e.g., gender, ethnicity, geographic location)
- Misalignments between student learning and workplace needs

# Research questions

- **SKILLS:**

- How do students' engineering skills and knowledge develop and/or change over time?
- How do engineering students' technology skills compare with those of professionals?
- Difficult concepts
  - What concepts are difficult for students to learn?
  - Why are these concepts difficult?
  - How can we measure students' understanding of these concepts?

# Research questions *(cont.)*

- **IDENTITY**

- How do students come to identify themselves as engineers?
- How does student appreciation, confidence, and commitment to engineering change as they navigate their education?

# Research questions *(cont.)*

- **EDUCATION:**

- What elements of students' engineering educations contribute to changes observed in skill and identity development?
- What do students find difficult and how do they deal with the difficulties they face?

# Research questions *(cont.)*

- **WORKPLACE:**

- What skills do early career engineers need as they enter the workplace?
- Where did they obtain these skills?
- Are there any missing skills?

# APS Methodology

- Focus on engineering students
- Four cohorts
  - Cohort 1 - Longitudinal (freshmen - junior)
  - Cohort 2 – Longitudinal (senior – workplace)
  - Cohort 3 – surveys at 4 campuses
  - Cohort 4 – surveys at other campuses
- Cross-institutional (4 campuses)
- Multiple research methods



# Cross-institutional

- Four campuses:
  - U. of Washington (*large public Research I*)
  - Stanford University (*large private Research I*)
  - Howard University (*HBCU Research I*)
  - Colorado School of Mines (*engineering-only*)

# Multiple research methods

- Surveys
- Formal interviews
- Ethnographic interviews
- Ethnographic observations
- Scoping task

# Participants

- Recruited in their first year
- 160 subjects (40/campus)
  - 32 ethnographic subjects (8/campus)
- Control Group
  - 160 subjects
- Diversity
  - Over sampling of underrepresented groups

# Challenges

- Multi-campus Effort
- Multidisciplinary Team
- Multiple Methodology
  - Ethnographic vs formal interviews

# Where we are now

- First year of data collected (freshmen)
- Data analysis begins this summer
  - 2 day meeting researcher's meeting in August to jointly look at data
- Analysis will be both quantitative and qualitative
- First year results will inform questions and methods for year 2
  - Same 160 students will participate in year 2 of the study

# Acknowledgements

- Center for the Advancement of Engineering Education [NSF ESI-0227558]
- Contributing Team Members: Tori Bailey, Helen Chen, Angela Cole, Kimarie Engerman, Ozgur Eris, Lari Garrison, Ashley Griffin, Marvin Kendall, Heidi Loshbaugh, Kevin O'Connor, Tom Satwicz and Carmen Smith
- Project website  
<http://www.engr.washington.edu/caee/>