Studying the Engineering Student Experience: Design of a Longitudinal Study

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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
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• Project website
http://www.engr.washington.edu/caee/