CENTER
for the
ADVANCEMENT of
ENGINEERING EDUCATION

Lorraine N. Fleming, Ph.D.
Co-Principal Investigator
Howard University

Kimarie Engerman, Ph.D.
Senior Research Associate (former)
Howard University
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

- Caucasian
- African American
- Latino
- Native American
- Other/Unknown

by gender

- Men
- Women

by citizenship

- U.S.
- Non-U.S.
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

<table>
<thead>
<tr>
<th>Structured Interviews</th>
<th>Unstructured Interviews</th>
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<tbody>
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<td>• Annually; 1 hour</td>
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- 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

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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
**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

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