

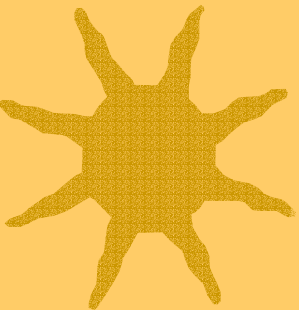
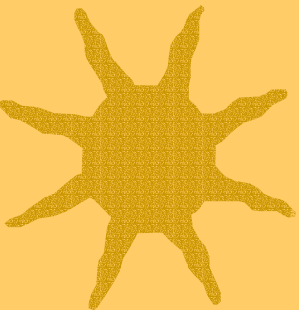
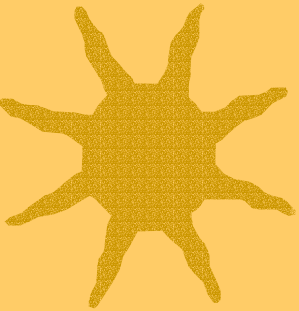
CENTER for the ADVANCEMENT of ENGINEERING EDUCATION

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

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



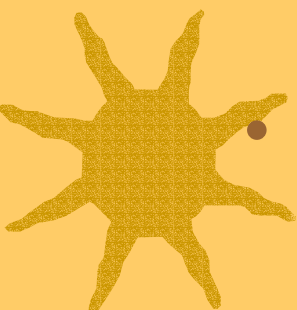
This presentation focuses on...



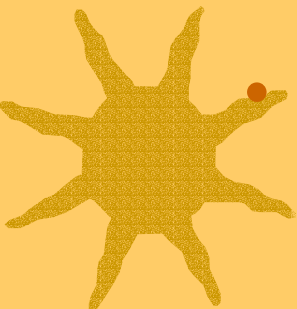
- Who we are
- What we did (or are doing)
- What we learned
- Insights for your study



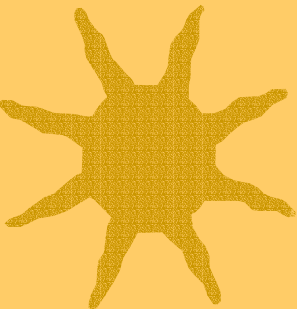
CAEE Overview



- Funded by National Science Foundation
Two Directorates: *Engineering; Education and Human Resources*



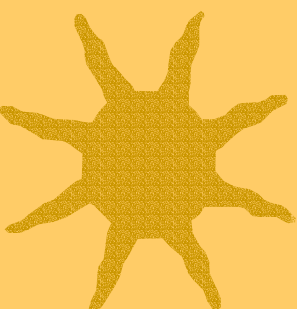
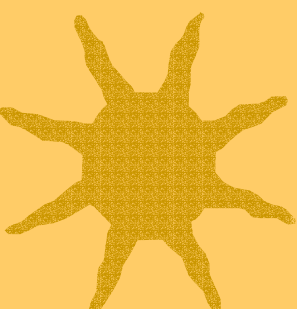
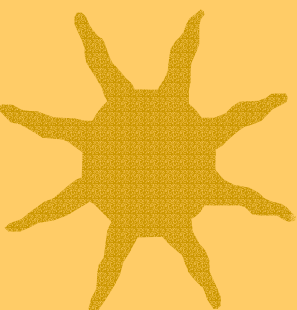
- Five year grant
January 2003 – December 2007



- National study of 4 universities
(extending to 16 more soon)



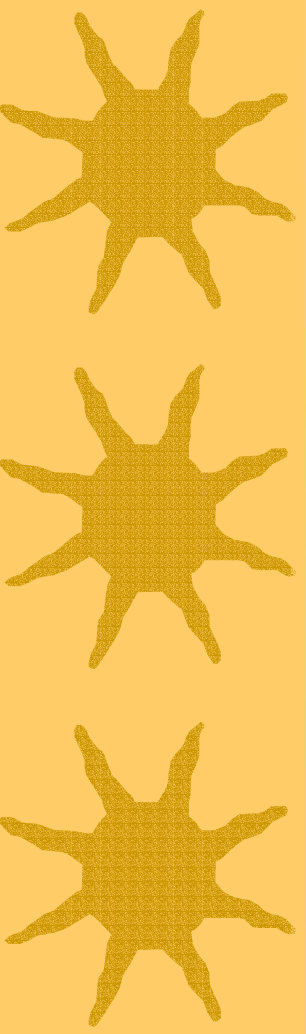
Academic Pathways Study (APS)



- 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

Different...

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

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



APS Vision

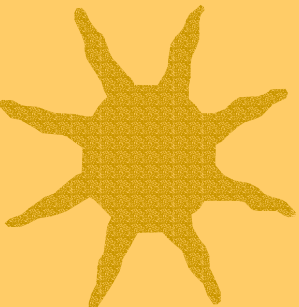
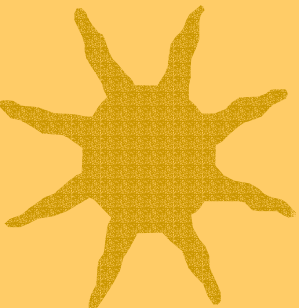
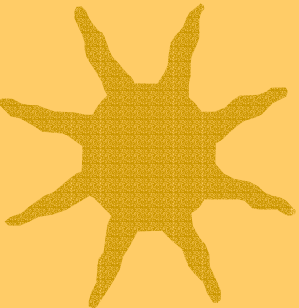
Better understanding of ...

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



APS Goal

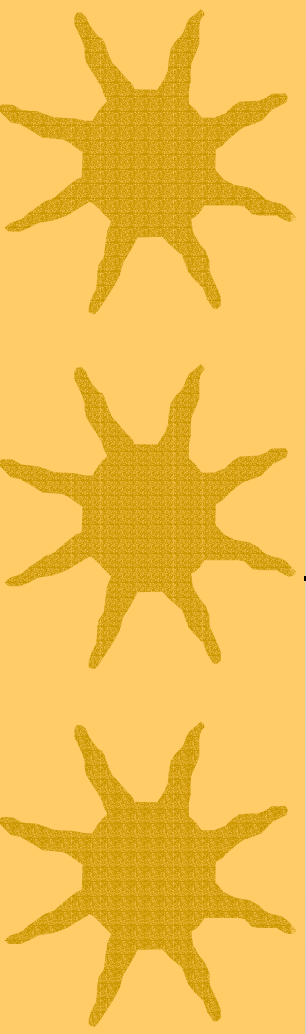
*Transform our
findings and insights
into **actionable
practice and policy
items.***



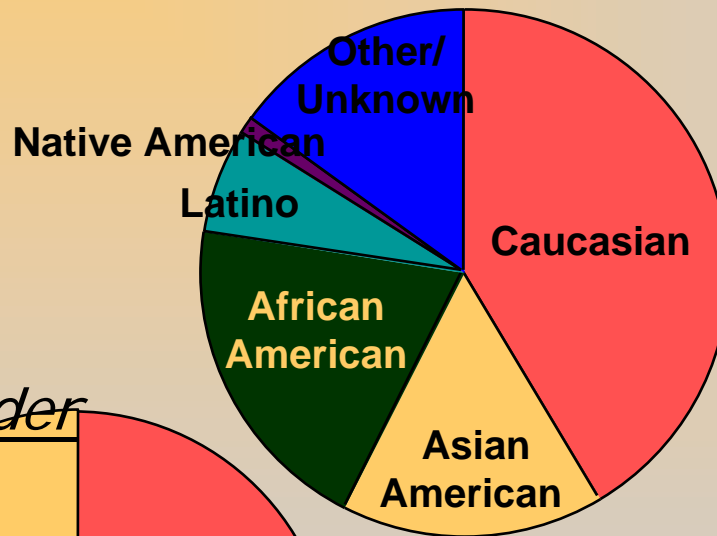


APS Participants

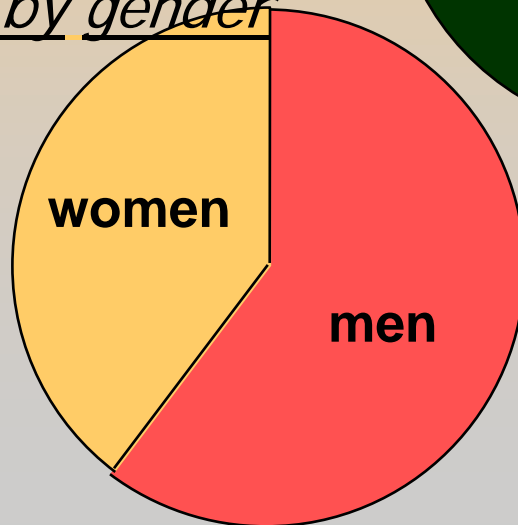
N=160 (40 per school)



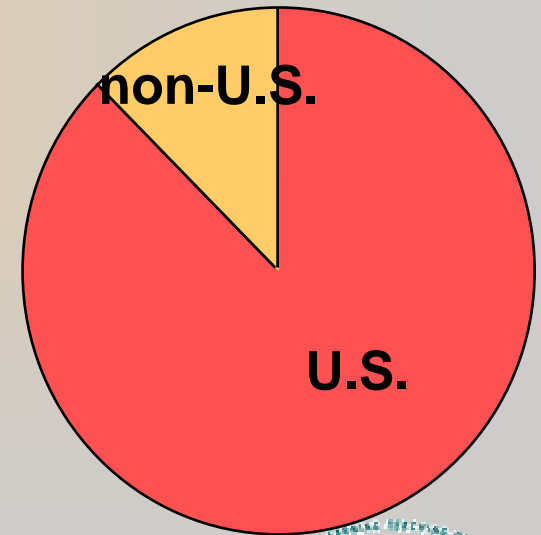
by race & ethnicity



by gender

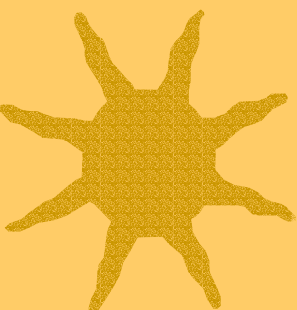


by citizenship



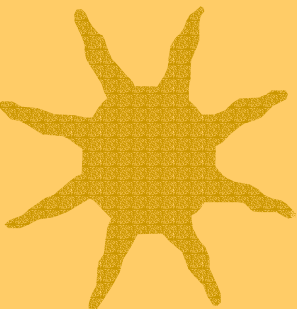


RESEARCH QUESTIONS



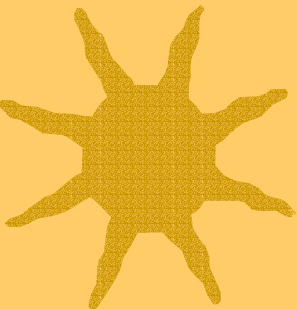
SKILLS

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



IDENTITY

How do students come to identify themselves as engineers?

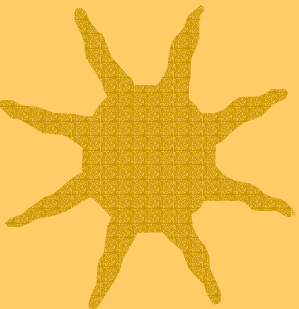
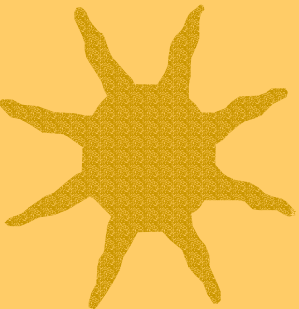
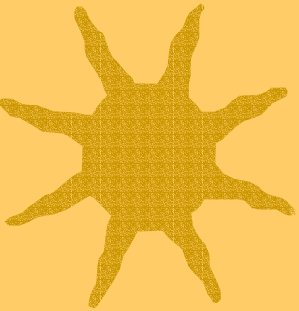


EDUCATION

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



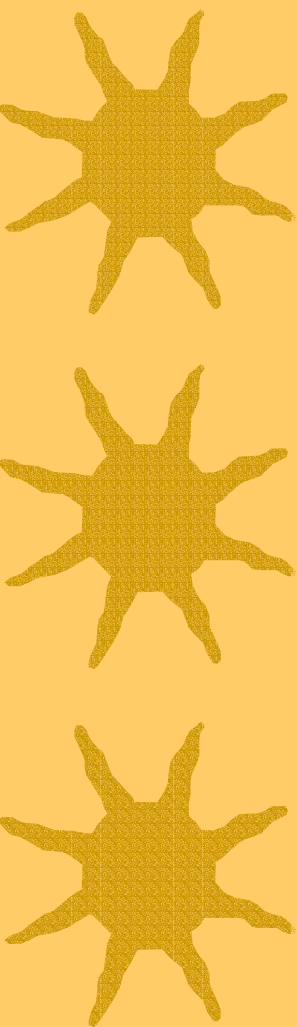
Mixed Method Approach



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



APS Methods



Structured Interviews

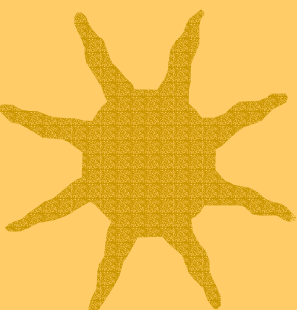
- Annually; 1 hour
- Tied to questions in the surveys
- Fixed script that is read by interviewer
- Transcribed, coded, cleaned, analyzed

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

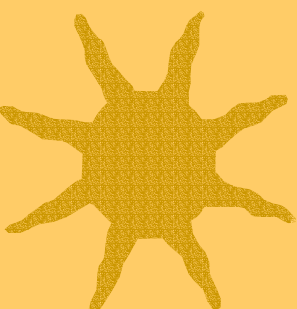
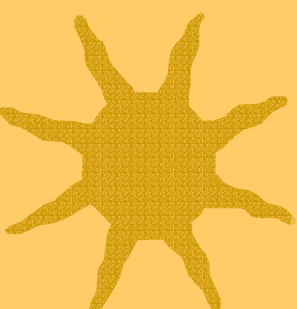


APS Methods



SURVEYS

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

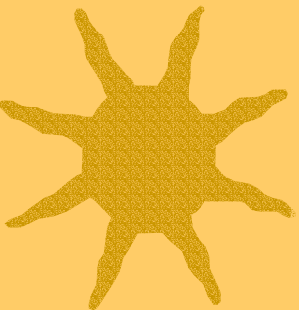


PERFORMANCE TASKS

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

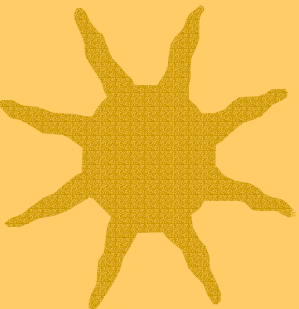
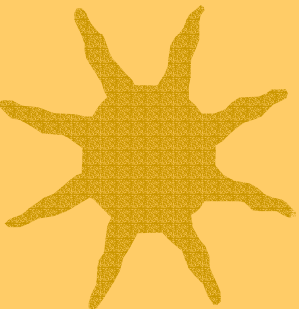


APS Methods (cont'd)



Ethnographic Observations

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

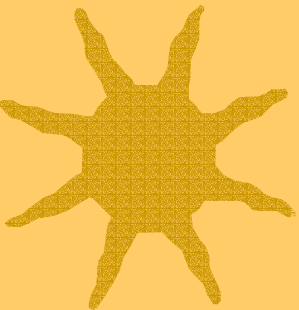
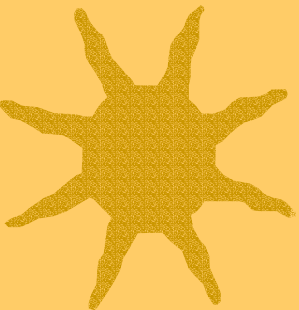
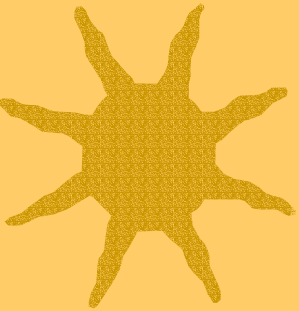


Other Data

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



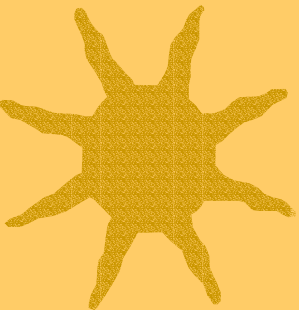
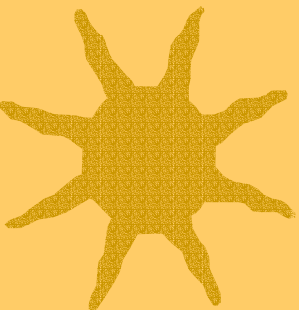
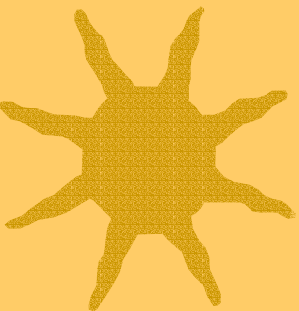
Assessment of Research Questions by Methodology



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



Lesson Learned

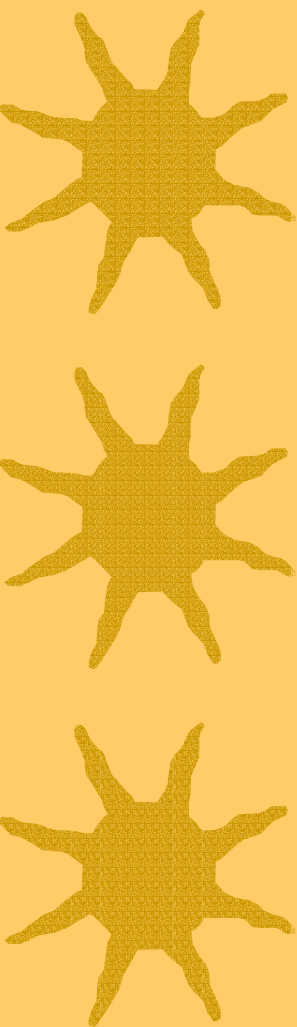


Mixed Methods—Advantages/ Disadvantages

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



Lesson Learned (cont'd)

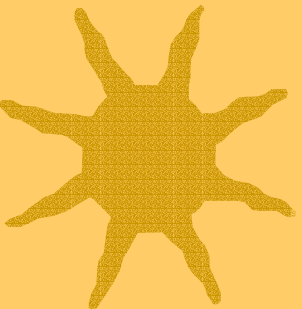
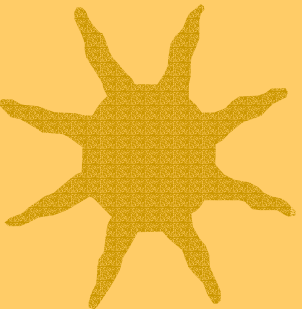
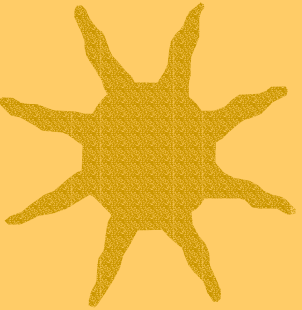


Multiple Campus Issues

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



Considerations for your Retention Study

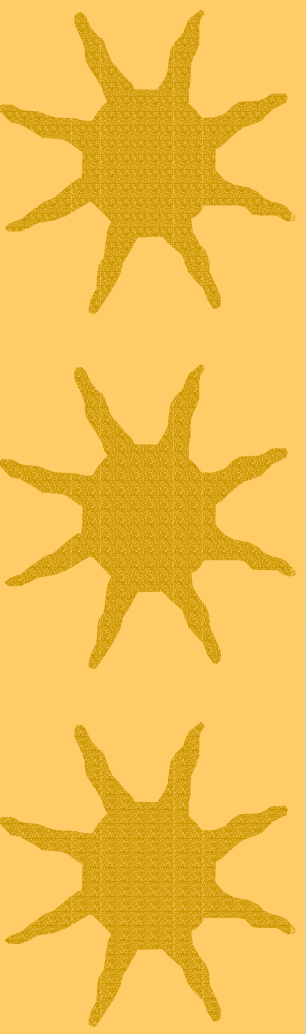


You have

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



Retention Study Design Skeleton



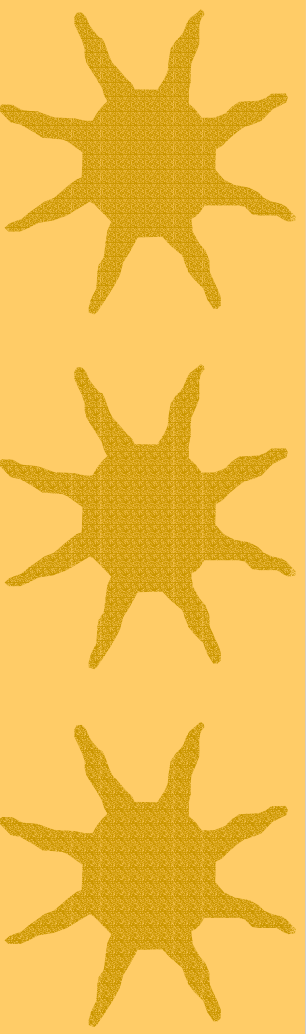
- Research Questions

“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**

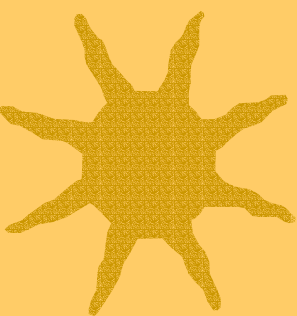
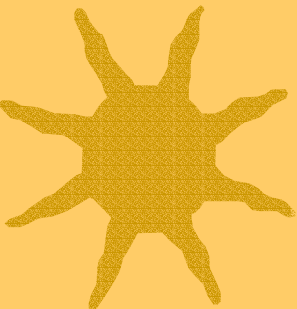
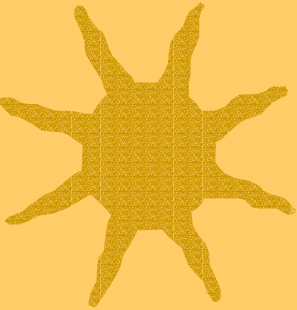
- Cohort mix of URMs and non-URMs
 - Verge of graduation
 - Variety of Institutions

- **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***

