A Joint Venture: Universities, Students and Other Stakeholders Achieving High Quality Doctoral Education

The American Association for the Advancement of Science
The 3rd Annual AGEP Evaluation Capacity Building Meeting on Designing an Evaluation Framework for Retaining Students in STEM PhD Programs
San Juan, Puerto Rico
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by
Catherine M. Millett, Ph.D.
Policy Evaluation & Research, ETS

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Doctoral Facts
The National Picture

• Approximately 1.2% of the U.S. adult population age 25 and over has a doctoral degree.

• The United States awarded approximately 43,354 doctoral degrees in 2005.
  – Of the 1,999 engineering Ph.D.s awarded to US citizens in 2005
    • 73 (3.6%) were awarded to Hispanics (Puerto Rican, Mexican, Other Hispanic)
    • 85 (4.2%) to Black, Non-Hispanics

• Fall 2001 full-time instructional faculty (617,868),
  – Black, Non-Hispanic – 31,681 (5%)
  – Hispanic – 18,514 (3%)
  – American Indian/Alaskan Native – 2775 (<1)
Survey of Doctoral Student Finances, Experiences and Achievements

Three Stage Sampling Plan

- Stage 1 - selected 21 diverse doctoral granting universities
- Stage 2 - selected 11 fields of study
- Stage 3 - selected a stratified sample of 13,160 doctoral students who completed at least one year of study and who were taking at least 6 credit hours in the fall term 1996
  - 9,036 students completed surveys (70% response rate)

Source: Nettles & Millett, Survey of Doctoral Student Finances, Experiences and Achievements
Participating Institutions

- Clark Atlanta University
- City University of New York
- Columbia University
- Harvard University
- Howard University
- Indiana University
- New York University
- Ohio State University
- Princeton University
- Rutgers University
- Stanford University
- Teachers College

- Temple University
- University of California at Berkeley
- University of California at Los Angeles
- University of Maryland
- University of Michigan
- University of North Carolina - Chapel Hill
- University of Texas
- University of Wisconsin
- Vanderbilt University

Source: Nettles & Millett, Survey of Doctoral Student Finances, Experiences and Achievements
5 Fields of Study

- Science & Math - biology, chemistry, physics, math
- Social Sciences - economics, political science, psychology, sociology
- Humanities - English, history
- Education
- Engineering - chemical, electrical, mechanical

Source: Nettles & Millett, Survey of Doctoral Student Finances, Experiences and Achievements
Survey of Doctoral Student Finances, Experiences & Achievements (28 page survey)

- Application & enrollment
- Current doctoral program experience
- Attendance patterns
- Financing doctoral education
- Future plans
- Undergraduate experiences
- Background

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
Research Questions about Doctoral Students

1. What are the quality of performance, experiences, and professional training and development?
2. How do indebtedness and financial assistance relate to the success?
3. How do academic and personal background relate to support, experiences, achievements? And
4. How do graduate institutions ensure Student success?
Doctoral Student Experience Conceptual Model

Background Characteristics
- Gender
- Race
- Parent SES
- Married/domestic partner
- Household Income
- Have kids under 18
- Age

Outcomes
- Funding
- Mentoring
- Research Productivity
- Degree Completion

Doctoral Program Experiences
- Private graduate school
- Had a fellowship
- Served as research assistant
- Served as teaching assistant
- Have a mentor
- Always full-time
- Time in program (years)
- Expect 1st job - faculty/postdoc

Admissions Criteria
- GRE Scores (V,Q,A)
- Selectivity of Undergrad C/U
Funding
Our Working Definitions

• Fellowships:
  – monies and/or tuition and fee waivers given to students with no expectation of repayment or of services to be rendered.

• Research Assistantships
  – monies (tuition/fees and/or a stipend) given to students with the expectation of research services to be rendered.

• Teaching Assistantships
  – monies (tuition/fees and/or a stipend) given to students with the expectation of teaching services to be rendered.
Receiving a Research Assistantship During Doctoral Varies by Field of Study

- African American & Hispanic students ever having a research assistantship is significantly different from Whites overall.
- African American students differ from White students in all field except Humanities.
- Within field, Hispanic students did not differ from White students.

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
What Predicts Being a Research Assistant?

- African American students were less likely to be RAs in engineering and science/math.
- In engineering & science/math, having a fellowship was a negative predictor of being an RA.
- Being a TA was a positive predictor of being an RA in all fields except engineering.

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**Negative signs** = less likely to have been an RA. **Positive signs** = more likely to have been an RA.

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
Being a Research Assistant Can Influence Other Doctoral Experiences

Influences *
- Acquiring debt during program
- Ever receiving a fellowship
- Ever being a teaching assistant
- Social interaction with peers
- Academic interactions with faculty
- Interactions with faculty advisor
- Presenting a paper at a conference
- Publishing an article
- Overall research productivity
- Stopping out of a doctoral program
- Rate of progress in program
- Degree completion

* Note: Influences may not be in all fields

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
Mentoring

“Mentors, unlike advisors, cannot be assigned to specific students. Advisors may be mentors, but many advisor-advisee relationships never evolve to the mentor-protégé relationship”

(Willie, Grady & Hope, 1991, p. 72)
Faculty Advisor (B-6)

- A faculty or research advisor is a person assigned by your department/program to act in an official capacity in such ways as discussing and approving your coursework, or signing registration forms. Please note that your faculty or research advisor may not be your mentor. Do you have a faculty member who serves as your advisor?

  _____ 1. Yes

  _____ 2. No  (If ‘NO,’ **GO TO B-9**)

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
Mentor Question (B-9)

- Many doctoral students have someone on the faculty to whom they turn for advice, to review a paper, or for general support and encouragement. This person may be thought of as a mentor. If you have more than one mentor, please comment on the one with whom you work most closely. Do you have a faculty member who serves as your mentor?

1. Yes
2. No (If ‘NO,’ GO TO B-13)

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
Nearly 70% of Doctoral Students Have a Mentor

- African American students having a faculty mentor is significantly different from White students overall and in Science & Math.
- Hispanic students do not differ from White students in the overall or within fields.

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
What admission characteristics predict having a mentor?

- In engineering, race/ethnicity, parental socio-economic status and performance on the Verbal section of the GRE influence the odds of having a mentor.
- In science/mathematics, race/ethnicity, parental socio-economic status, performance on the Verbal section of the GRE and the type of graduate school influence the odds of having a mentor.

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Negative signs = less likely to have been had a faculty mentor.
Positive signs = more likely to have had a faculty mentor.

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
Having a Mentor Can Influence Other Doctoral Experiences

Have a Faculty Mentor

Influences *
- Student-faculty social interactions
- Academic interaction with faculty
- Interactions with faculty advisor
- Presenting a paper at a conference
- Publishing an article
- Overall research productivity
- Rate of progress in program
- Degree completion
- Time to Degree

No Influences
- Satisfaction with doctoral program
- Stopping out of doctoral program

* Note: Influences may not be in all fields

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
What is the Research Productivity of Today’s Doctoral Students?

Individual Measures: (joint or sole authored)

• Presented a paper
• Published a chapter
• Published a refereed article
• Published a book

Composite Measure:

• Some research productivity
Doctoral Students Reports of Achieving An Individual Measure at Least Once

- Created a composite measure that captures whether a student achieved at least one of the individual measures once.

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**Individual Measures**
- Presented a paper: 37%
- Published a Refereed Journal Article: 30%
- Published a Chapter in an Edited Volume: 9%
- Published a Book: 2%

**Composite Measure**
- Some Research Productivity: 51%

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
Doctoral Students are Publishing Refereed Journal Articles (sole or joint authored)

- African American & Hispanic students rates of publishing an article are significantly different from Whites in the total.
- Within fields, African American students differ from White students in education, science & math, and the social sciences.
- Within fields, Hispanic students do not differ from White students.

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
## Being a Research Assistant and Mentoring Positively Influence Article Publication

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Negative signs = less likely to have written a refereed journal article.

Positive signs = more likely to written a refereed journal article.

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
Research Productivity Can Influence Other Doctoral Experiences

- Rate of progress in program
- Degree completion

No Influences
- Time to Degree

* Note: Influences may not be in all fields

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
Pursuit of Ph.D.

- Persistence/Retention
- Progression and
- Completion
A Snapshot in Time: Doctoral Degree Completion by 2001 for Students Beyond the First Year

- African American & Hispanic students degree completion rates are significantly different from White students in the total.
- Hispanic students differ from White students in engineering.
- Afri. Amer. students differ from White students in engineering, science & math, & soc sci.

Source: Survey of Doctoral Student Finances, Experiences and Achievements.
Completing a Doctoral Degree by 2001

- Research productivity is a positive contributor in every field.
- Being married/partner positively influences completion in engineering and science/math.
- Hispanic and African American students differ from White students in engineering.

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Negative signs = less likely to have completed their doctoral degrees.
Positive signs = more likely to have completed their doctoral degrees.

Source: Nettles & Millett, Survey of Doctoral Student Finances, Experiences and Achievements.
What did we learn? Difficult Challenges Controlling for Background, Preparation and Other Program Experiences

Differences Exist:

- **Hispanic Student and White Student Differences:**
  - Hispanic students in education were less likely to be RAs compared to White students.
  - Hispanic students in social sciences were less likely to write refereed journal articles compared to White students.
  - Hispanic students in **engineering** and the social sciences were less likely to have completed their degrees by 2001 compared to White students.

- **African American Student and White Student Differences:**
  - African American students in education, **engineering**, and sciences and mathematics were less likely to be RAs compared to White students.
  - African American students in science and mathematics were less likely to have a mentor compared to White students.
  - African American students in education, sciences and mathematics, and social sciences were less likely to write refereed journal articles compared to White students.
  - African American students in **engineering** were less likely to have completed their doctoral degrees by 2001 compared to White students.
Questions for AAAS/NSF/AGEP and the Nation

- What experiences should all engineering graduate students have?
- What broad skill sets should graduates have and be able to use?
- How well do we understand what entering graduate students expect from their graduate programs?
- How can we exploit the differences they bring to improve their graduate experience?
A Doctoral Student’s World

- Current Graduate Students
- Employers
- Grad School Admin
- Media
- Grad School Faculty
- Business
- State Government
- Local Government
- Federal Government
- friends/peers
- children
- parents
- grandparents

Student
The Holy Trinity
What is the role today?
What should the balance be?

Research
Teaching
Service
Academic & Intellectual Challenges

• Faculty Advisor Issues:
  – Unexpected faculty departures
    • Sabbatical
    • Junior faculty member who is not tenured
    • Death of mentor
  – Conflicts with mentor (holding up dissertation, intellectual property).

• Academic Issues
  – Difficulty in making the transition to independent scholar
  – Loss of confidence
  – Lose interest in dissertation topic
  – Change academic interests and current program does not meet their needs.
The Influence of Life on One’s Graduate Career

- Family Issues:
  - Birth of a child
  - Death of a family member
  - Personal health

- Career opportunities:
  - Work at jobs
  - Fellowships
  - Travel

- Needed a break from school
"Being a graduate student is like becoming all of the Seven Dwarves.

In the beginning you're Dopey and Bashful.

In the middle, you are usually sick (Sneezy), tired (Sleepy), and irritable (Grumpy).

But at the end, they call you Doc, and then you're Happy."

– Ronald T. Azuma
Policy Evaluation & Research Center

cmillett@ets.org