THE MASTER’S DEGREE: A CRITICAL TRANSITION IN STEM DOCTORAL EDUCATION

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Overview of Presentation

- Growth in master’s degrees
- Summary of dissertation research
- Implications of findings from research
## STEM Degrees by Race & Gender
### 2001

<table>
<thead>
<tr>
<th></th>
<th>BS</th>
<th>MS</th>
<th>PHD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Women</strong></td>
<td>50.6%</td>
<td>43.8%</td>
<td>36.6%</td>
</tr>
<tr>
<td><strong>African American</strong></td>
<td>8.1%</td>
<td>5.1%</td>
<td>2.7%</td>
</tr>
<tr>
<td><strong>Native American</strong></td>
<td>0.7%</td>
<td>0.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td><strong>Asian American</strong></td>
<td>8.8%</td>
<td>7.3%</td>
<td>6.5%</td>
</tr>
<tr>
<td><strong>Hispanic/Latino</strong></td>
<td>7.0%</td>
<td>3.9%</td>
<td>2.6%</td>
</tr>
<tr>
<td><strong>White/Caucasian</strong></td>
<td>67.7%</td>
<td>49.6%</td>
<td>50.0%</td>
</tr>
<tr>
<td><strong>Non-resident Aliens</strong></td>
<td>3.8%</td>
<td>28.8%</td>
<td>31.2%</td>
</tr>
</tbody>
</table>

Source: National Science Foundation (NSF 04-318 Tables 7& 10; NSF 04-311 Table 3)
Growth in Master’s Education

Increase in Master's Degrees Earned
1990-2000

- All
- African American
- Native American
- Asian American
- Hispanic
- White
Master’s & Doctoral Education

- Little is known about master’s education and pathway to the doctorate

- Questions raised about whether master’s degree is a diversion from or stepping stone to doctoral degree

- Is master’s only institution source of talent loss or untapped reservoir?
Study Methodology

- Survey of Earned Doctorates, 1998-2001
- Science and engineering fields only
- Stratified random sample, 400 from each racial category
- Pathways as institutional transitions between undergraduate, master’s and doctoral degrees
- Chi-square analysis
Research Questions

- What are graduate degree pathways to the doctorate?
- Do pathways differ by race & gender?
- Are women & URM more likely to earn a master’s degree en route to the doctorate?
- What are institutional origins of master’s degrees earned en route to the doctorate?
Doctoral Degree Pathways

- No BS Data Available, 6.0%
- Start Graduate Program at BS Institution, 17.8%
- Start Graduate Education Different Institution, 76.2%
Leave BS Institution to Begin Graduate Program

- No MS, BS ≠ PhD (28.4%)
- BS ≠ MS = PhD (27.2%)
- BS ≠ MS ≠ PhD (19.6%)
- BS ≠ MS ≠ PhD = BS (1.0%)
Begin Graduate Program at BS Institution

- BS = MS ≠ PhD (8.2%)
- BS = MS = PhD (6.2%)
- No MS, BS = PhD (3.5%)
Differences by Race/Ethnicity

Legend:
- BS ≠ MS ≠ PhD
- BS ≠ MS ≠ PhD = BS
- No MS, BS ≠ PhD
- BS = MS ≠ PhD
- BS = MS = PhD
- No MS, BS = PhD
- No BS, MS = PhD
- No BS, BS ≠ PhD
- No BS, BS ≠ PhD
- No BS, No MS, PhD only
Master’s Degrees En Route
Summary

- Gender pathway differences are not significant
- Although Carnegie classification of master’s degrees earned by women differ, there are no gender differences in proportion who earn master’s degrees en route to the doctorate
- URM students take significantly different pathways to the doctorate and are more likely to earn the BS, MS and PhD at three different institutions
Summary

- **URM students** are significantly more likely to earn a master’s degree en route to the doctorate.
- **Carnegie classification of master’s institutions** URM students are significantly different than White/Asian students.
- **URM students** more likely to experience transition between master’s and doctoral degrees.
- **Transitions** are not unique to master’s only institutions.
Issues Raised by Study

- Transition between the master’s and PhD is neither accounted for nor explained by existing theoretical models of graduate degree progress
- We do not know why students transition or what factors hinder and facilitate transition
- Attrition literature treats transition as drop-out
- We do not know to what extent social and academic integration occurs in master’s programs
Why Is This Important?

- Resources and recruitment programs structured at undergraduate level
- Women and URM may be concentrated in less selective undergraduate and master’s institutions which impacts access to doctoral institutions
- Earning master’s degree first can impact eligibility for funding of doctoral program
- Time to degree is longest for students who transition between master’s and doctoral degree
Time for Change

- Master’s degree is untapped resource, and any loss of URM talent that occurs is due negligence
A New Model: Doctoral Pathways and Levels of Degree Progress

**Level 1: Initiation to graduate education**
- Establish membership in academic community
- Establish relationships with peers and faculty advisors
- Accept discipline and graduate education norms
- Commit to career goals
- Establish relevancy of further study to career goals
- Begin acquisition of knowledge & competencies needed for doctoral study
- Learn to negotiate conflicts between career goals and family/community

**Level 2: Transition and Development of Competence**
- Continue knowledge acquisition through additional coursework
- Develop academic research competencies
- Attain doctoral candidacy
- Review and revise career goals
- Strengthen membership in and connections to academic community
- Resolve conflicts between goals & family/community
- Conduct and defend dissertation research

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Limitations & Further Research

- Non-response or no master’s degree – variable is incomplete, master’s institution used instead
- Does not address questions about students who do not continue on to doctorate
- Does not provide us with information about why students transition between master’s and doctoral degrees