STEM Success in Selective Colleges: Effects of Relative Strength of Preparation

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STEM Success is Race-Blind, but not Preparation-Blind


- *Relative* preparation matters
- No matter your race
Institutional Mean SAT-M of STEM-planners

(*Standardized by 1989 national SAT-M mean=476, SD=121)
SAT-M National Z-Scores by Institution

<table>
<thead>
<tr>
<th>Institution</th>
<th>Mean (SAT-M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>22</td>
<td>14</td>
</tr>
<tr>
<td>23</td>
<td>14</td>
</tr>
</tbody>
</table>

SAT-M National *Std Score SAT-Math for 23 C&B Institutions

(*Standardized by 1989 national SAT-M mean=476, SD=121)
SAT-Math by Gender & Race
(centered within institution)
SAT-Math by Gender & Race (centered within institution)
SAT-Math by Gender & Race (centered within institution)
HSGPA by Gender & Race
(centered within institution)
HSGPA by Gender & Race
(centered within institution)
STEM Grad Rates by Gender & Race

\((\pm 1 \text{ standard error})\)

STEM Graduation Rate

Female

Male

<table>
<thead>
<tr>
<th>Gender</th>
<th>U UR Minority</th>
<th>W White</th>
<th>A Asian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>N= 281</td>
<td>1601</td>
<td>300</td>
</tr>
<tr>
<td>Male</td>
<td>220 U</td>
<td>2291</td>
<td>354</td>
</tr>
</tbody>
</table>

\(N=\)
STEM Grad Rates by Gender & Race

(± 1 standard error)

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STEM Grad Rates by Gender & Race

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220 2291 354
STEM Grad Rates by Gender & Race
(± 1 standard error)

STEM Graduation Rate

1.8 times

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U W A
Female

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U W A
Male
STEM Grad Rates by Gender & Race
(± 1 standard error)

N= 281 1601 300
Female

U W A

1.8 times
1.4
2.6

1.8 times
1.4
2.6

N= 220 2291 354
Male

U W A

UR Minority
W White
A Asian
Estimated Odds of STEM Graduation by Race and SAT-M

- • = White
- ○ = UR Minority
Estimated Odds of STEM Graduation by Race and SAT-M

- White
- UR Minority

SAT-M Centered Within Institution

Estimated Odds of STEM Grad
Estimated Odds of STEM Graduation by Race and SAT-M

A = Asian
● = White
○ = UR Minority

SAT-M Centered Within Institution

Estimated Odds of STEM Grad
Estimated Practical Effects

Underrepresented Minority STEM losses:

72 women
62 men
Why reanalyze Bowen & Bok?

... “Blacks and Whites were equally likely to have majored in ... the natural sciences, and engineering” (p. 71).
Pre-Bowen & Bok evidence of Race Differences in STEM Persistence

- Adair, 1991
- Astin & Astin, 1993
- Dunteman, Wisenbaker, & Taylor, 1979
- Elliott, Strenta, Adair, Matier & Scott, 1995
- Hilton, Hsia, Solorzano, & Benton, 1989
- Ware & Lee, 1988

**Common finding:**
- Academic prep explained race differences
STEM Grad Rates:
* N > 26,000 at 4-Year Colleges

(Astin & Astin, 1993)
STEM Grad Rates:
Brown, Cornell, Dartmouth & Yale

(Elliot et al., 1995)
Why is Bowen & Bok’s report different?

No account for initial aspirations.
The Mismatch Explanation
(Bowen & Bok, 1998)

“A student with a given SAT score, high school grades, and so on, who attends one of the most selective schools, should be expected to have a lower rank in class than a student with the same credentials who attends a school that enrolled a smaller number of top-rated students.

This is precisely the pattern we found. Competing against fellow students with very strong academic credentials naturally affects one’s class rank, even though this disadvantage may well be counterbalanced by other benefits.” (p. 73)
Grade and Rank Gaps
Bowen & Bok (1998)

“While the majors chosen by black students are similar to those chosen by their white peers and provide no cause for concern, their college grades present a more sobering picture.”

<table>
<thead>
<tr>
<th></th>
<th>Black</th>
<th>White</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cum GPA</td>
<td>2.61</td>
<td>3.15</td>
</tr>
<tr>
<td>Class Rank</td>
<td>23rd</td>
<td>53rd</td>
</tr>
</tbody>
</table>

This difference “is very large when seen in the context of the overall distribution of grades.” (p. 72)
Summary

• *Relative* preparation differences explain STEM race differences (except Asian bonus).
• Same mechanism offered by Bowen & Bok to explain overall grade and rank gaps.
Recommendations

• Awareness of potential trade-off between different diversity goals
• Institutional self-study
• Information to prospective STEM students:
  – How does a student “like me” –academically– fare in STEM at each college?
Thank you.