Examination of Pathways to Excellence Scholarship Program for women in STEM fields*

Joseph Di Rienzi, Professor of Physics

2014 AAPT Summer Meeting 2014
July 30, 2014

*This program is supported by S-STEM #1060595 grant by the National Science Foundation
Description of Program

Notre Dame of Maryland University (NDMU) has completed the third year of a NSF S-STEM grant that awards 11 scholarships annually to academically talented women undergraduates with financial need in physics, mathematics, engineering and computer systems. The program provides in addition to scholarships, support and activities to encourage pursuit of STEM fields.
Profile of Scholars

First year (2011-2012):
10 scholars: 5 first year, 5 current students
Diversity: Under-represented: 40%
Majors: Physics/Engineering: 7
Mathematics: 1
Computer Systems: 1
Undecided: 1
Retention: 70% (loss of 3 first year students)

Second year (2012-2013):
11 scholars: 1 first year, 10 current students
Diversity: Under-represented: 45%
Majors: Physics/Engineering: 7
Mathematics: 3
Computer Systems: 1
Retention: 91%*
* Three went on to engineering school and one to graduate school by fall 2013
Profile of Scholars (cont’d)

Third year (2013-2014):
11 scholars: 1 first year, 1 transfer student, 9 current students
Diversity: Under-represented: 37%
Majors: Physics/Engineering: 4
   Mathematics: 5
   Computer Systems: 2
Retention: 82**%
** One is going on to engineering school and two to graduate school in fall 2014.
Program Academic and Professional Development Support

• One credit course in fall semester
• Tri-mentoring system: Each scholar has three mentors: faculty, peer (for new scholars) and external to provide academic and career advisement
• Career Development: Each scholar participates in career assessment sessions and constructs an Annual Career Development Plan assisted by mentors and members of the Career and Student Success Center.
Program Activities

First Year (2011-2012): Renewable Energy and Sustainability
- Attendance at Energy and Sustainability Conference University of Delaware
- Seminar with environmental activist and artist Robert Shetterly
- Sustainability field experience using GPS with Environmental Scientist Dr. Cynthia Hamel.

Second Year (2012-2013): Space Science and Engineering
- Meet and Greet NASA Electrical Engineer and alum LaVida Cooper
- Presentation by NASA Scientist, Dr. David Batchelor on the Feasibility of Silicon Based Life Forms
- Trip to NASA/Goddard Space Flight Center
Program Activities Third Year (2013-2014)
Computer Systems and Robotics

CyberMaryland 2013 Conference
October 8-9, Baltimore, MD
Trip and Tour of NASA/Goddard Space Flight Center – Microelectronics Branch
October 22, Greenbelt, MD
Technology and Sustainability Field Experience
with Dr. Cynthia Hamel
November 9, Baltimore, MD
Table 1

<table>
<thead>
<tr>
<th>Decision</th>
<th>Influenced decision (% reporting “Yes”)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Program year 2</td>
</tr>
<tr>
<td>To attend NDMU</td>
<td>67</td>
</tr>
<tr>
<td>Have declared STEM major</td>
<td>67</td>
</tr>
<tr>
<td>First Generation College</td>
<td>33</td>
</tr>
</tbody>
</table>
To the Objective of providing career trajectory support from professionals in the field

Table 2
Discussion of goals with Mentors

<table>
<thead>
<tr>
<th>Discussion Type</th>
<th>Percentage Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Program Year 2</td>
</tr>
<tr>
<td>Mentor, long term career</td>
<td>89</td>
</tr>
<tr>
<td>Mentor, academic/scholarly</td>
<td>68</td>
</tr>
</tbody>
</table>
Subjective reports from Participants on Their Experiences in the STEM program vs Control Group

### Table 3

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean (Median)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 2</td>
</tr>
<tr>
<td>Scholars found the program intellectually/ scholastically challenging</td>
<td>4.56(5)**</td>
</tr>
<tr>
<td>See academic advisor more since joining STEM program</td>
<td>5.00 (5)</td>
</tr>
<tr>
<td>Career goals clarified by participation</td>
<td>5.56 (5)</td>
</tr>
<tr>
<td>Program has been a <em>positive</em> experience</td>
<td>6.33 (6)</td>
</tr>
<tr>
<td>Program has been an <em>essential</em> experience</td>
<td>6.78(7)</td>
</tr>
</tbody>
</table>

*Control data collected for 12 students majoring in Biology/Psychology

**Likert-type scale: Score of 1 denotes disagreement with the statement, score of 7 denotes complete agreement**
Table 4

Totals of activities/meetings since joining STEM and a comparisons to Non-STEM Science Majors.*

<table>
<thead>
<tr>
<th>Activity</th>
<th>STEM students</th>
<th>Control Cohort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meet with advisor</td>
<td>6.62</td>
<td>6.20</td>
</tr>
<tr>
<td>Met with Mentor/ Other professional</td>
<td>2.44</td>
<td>4.00**</td>
</tr>
<tr>
<td>Meet peer</td>
<td>2.80</td>
<td></td>
</tr>
<tr>
<td>Overall Number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Of seminar/ Lectures attended</td>
<td>3.36</td>
<td>3.30</td>
</tr>
<tr>
<td>Attended Conference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Or presented scholarly work</td>
<td>0.80</td>
<td>1.33</td>
</tr>
</tbody>
</table>

Internships

<table>
<thead>
<tr>
<th>Year 1: 0</th>
<th>Year 2: 2</th>
<th>Year 3: 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study Abroad</td>
<td>Year 1: 0</td>
<td>Year 2: 1</td>
</tr>
</tbody>
</table>

* Data is by semester participation for individual students, not program years.
** One outlier in this distribution
Figure 1

Professional Contacts across semesters for STEM and Control Cohort Majors

- Brown = Control
- Blue = STEM Participants

Mean Meetings/semester vs. Semester in STEM or Science Major
Figure 2
Contacts with Professionals and Mentors (other than advisors) for STEM participants and Control Cohort MAj
Figure 3

Contacts with Peers Across Semesters for STEM Participants

Mean Meeting/semester

Semester in STEM Program
Lessons Learned

• Value of one credit course in fall to encourage participation in activities
• Need to include research component in activities
• Peer mentors need better training and development
• Build network of alumnae scholars to support current scholars
Acknowledgements

Co-PI’s: Barbara Mento and Margaret Sullivan

Evaluator: Jon Stanton

and

The Pathways to Excellence Scholars
Ad Astra