Strategies for Recruiting Women in Science and Engineering in the context of Title IX

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Outline

• The National Problem
• National Statistics: Undergraduate and Graduate
• Recruitment Challenges in Science and Engineering
• Strategies for Successful Recruitment of Women S/E Majors
  • Undergraduate, Graduate and Postdoctoral
• Examples of Successful Strategies at the University of Maryland
• NASA Title IX Review
• Title IX Review Observations: What are we doing right
• Title IX Recommendations: Room for Improvement
• Final Thoughts
• Acknowledgements
The National Problem:

Women face multiple challenges—that may lead to their attrition at key junctures in higher education. Some of the reasons for this attrition have to do with women’s ambitions and career preferences; others stem from the demographic characteristics of female S&E students and faculty. Still others result from not enough being done by peers, departments, and institutions to create a climate that is as comfortable for women as it is for men.

Studies conducted by NRC and National Academies
National: Undergraduate Data

Percentage of AP Examinees Who Are Female, by Subject, 2004

<table>
<thead>
<tr>
<th>Subject</th>
<th>Percentage of Examinees Subject Who Are Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>58</td>
</tr>
<tr>
<td>Calculus AB</td>
<td>48</td>
</tr>
<tr>
<td>Calculus BC</td>
<td>40</td>
</tr>
<tr>
<td>Chemistry</td>
<td>46</td>
</tr>
<tr>
<td>Computer science A and AB</td>
<td>15</td>
</tr>
<tr>
<td>Physics B</td>
<td>35</td>
</tr>
<tr>
<td>Physics C</td>
<td>25</td>
</tr>
<tr>
<td>Statistics</td>
<td>50</td>
</tr>
</tbody>
</table>


Percentage of Bachelor’s Degrees

Awarded to Women, by Field, 2001

<table>
<thead>
<tr>
<th>Field</th>
<th>Field Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>All fields</td>
<td>57.4</td>
</tr>
<tr>
<td>S&amp;E</td>
<td>50.6</td>
</tr>
<tr>
<td>Sciences</td>
<td>55.9</td>
</tr>
<tr>
<td>Biological/agricultural sciences</td>
<td>57.3</td>
</tr>
<tr>
<td>Computer sciences</td>
<td>27.6</td>
</tr>
<tr>
<td>Earth, atmospheric, and ocean sciences</td>
<td>40.9</td>
</tr>
<tr>
<td>Mathematics/statistics</td>
<td>48.0</td>
</tr>
<tr>
<td>Physical sciences</td>
<td>41.7</td>
</tr>
<tr>
<td>Psychology</td>
<td>77.5</td>
</tr>
<tr>
<td>Social sciences</td>
<td>54.8</td>
</tr>
<tr>
<td>Engineering</td>
<td>20.1</td>
</tr>
<tr>
<td>Non-S&amp;E</td>
<td>60.5</td>
</tr>
</tbody>
</table>

National: Graduate Data

Steady Progress

Figure 2-10
S&E master's degrees, by sex: 1985-2005
Thousands

Female
Male

Figure 2-21
Percent

Figure 2-32
Postdoctoral students at U.S. universities, by citizenship status: 1995-2005
Thousands

NOTES: Physical sciences include earth, atmospheric, and ocean sciences. Life sciences include biological sciences, agricultural sciences, and medical/other life sciences.


Science and Engineering Indicators 2006

Courtesy of National Science Foundation

THE A. JAMES CLARK SCHOOL OF ENGINEERING

UNIVERSITY OF MARYLAND
Recruitment Challenges

Undergraduate Recruiting
✓ Female students are less likely to take higher levels of mathematics prior to enrolling in college and are more likely to concentrate on the biological sciences or chemistry.
✓ Female students have a less positive view of science and mathematics.

Graduate Recruiting
✓ Departmental cultures are more of an obstacle for women than for men.
✓ Universities often lack female-friendly policies.
✓ Students have negative perceptions of academic careers.

Postdoctoral Recruiting
✓ Universities provide insufficient advising and mentoring during the graduate program.
✓ Postdocs had negative experiences during their graduate careers.
✓ Postdocs have individual preferences about career goals and views on the relevance of higher education.
✓ There may be bias against female postdoctoral candidates.
Recruitment Strategies

**Undergraduate Recruitment Strategies**
✓ Have the institution signal the importance of women.
✓ Enhance science, engineering, and mathematics education at the K-12 level.
✓ Reach out to students at the K-12 level.
✓ Develop better methods for identifying prospective students.
✓ Create alternative assessment methods for admissions.
✓ Organize/improve on-campus orientations.
✓ Develop bridging programs.

**Graduate Student Recruitment Strategies**
✓ Have the institution and S&E departments signal the importance of recruiting women.
✓ Enhance science, engineering, and mathematics education at the undergraduate level.
✓ Develop better methods for identifying prospective students.
✓ Organize on-campus orientations.
✓ Offer financial aid.

**Postdoctoral Recruiting**
✓ Have the institution and S&E departments signal the importance of recruiting women.
✓ Enhance science, engineering, and mathematics education at the graduate level.
✓ Develop better methods for identifying prospective postdocs.
✓ Establish female- and family-friendly policies and practices.
✓ Increase postdoctoral salaries.
University of Maryland
Impacting the Future: Outreach & Recruitment

Women in Engineering-(WIE) Program emphasizes society serving opportunities available through engineering and increasing individual confidence

iEngineer@UMD
Current 3rd & 4th Grades

KEYS to Empowering Youth
11-13 year olds

Stepping Stones to Your Future
Current 6th & 7th

Girl Scout Engineering Saturday
Cadettes & Seniors

SPICE Camp
Current 8th & 9th

WIE LEAD Academies
High school

WIE DREAM Conference
High school

Exploring Engineering at the University of Maryland
Current 10th & 11th
University of Maryland
Networking, Applied Experiences & Leadership Are Critical to Retention

• Peer mentoring for all first year women
  – Team based, grouped by major and dorm
  – Matched to a successful upper-level female
  – Monthly networking events, weekly contacts

• Research experiences
  – Undergraduate fellowships with faculty
  – NSF Funded Research Experience for Undergraduates Site

• Teaching fellowships for undergraduates

• Engage engineering undergraduates as role models and leaders for outreach programs
University of Maryland
Creating a Community Builds Retention

• FLEXUS: the Dr. Marilyn Berman Pollans Women in Engineering Living & Learning Community
  – Live on a common floor in a residence hall
  – Participate in a 1-credit seminar each semester
  – Cluster 1st semester courses (math, chemistry & introduction to engineering design)
  – Technical skills workshops

Ellicott Hall
Title IX Review in 2006

NASA conducted its compliance review of the University of Maryland Aerospace Engineering (AE) Department as part of its effort to ensure that individuals have equal opportunities, without regard to sex, to pursue, participate in, and benefit from academic, extracurricular, research, occupational training, and other educational activities. This policy is based on Title IX of the Education Amendments of 1972, which prohibits discrimination on the basis of sex in educational programs and activities receiving federal financial assistance.

Key Study Objectives:
• To evaluate the University of Maryland’s compliance with NASA Title IX regulations, specifically regarding the Title IX Coordinator’s functioning and responsibilities; Title IX policy and dissemination; Title IX grievance procedures and the effectiveness of their implementation; self-evaluation efforts; admission and enrollment; recruitment and outreach practices; faculty advising/career counseling, research participation, classroom experiences, and policy relating to parental/marital status (“family friendly” policies), safety and sexual harassment.

• To report on promising practices of the University of Maryland Aerospace Engineering Program in promoting gender equity and increasing the number of women participating in its aerospace engineering program.
Title IX Review -
What we’re doing right!

- University committed to equal opportunity and diversity
  - Diversity Director devoted to these issues
  - Sexual Harassment Prevention Training
  - Regular Diversity Assessments
- Maintaining women from undergrad to grad program
  - Retention and mentoring programs
  - Undergraduate research experience
- Hospitable learning environment
  - Welcoming atmosphere, role models, town hall meetings, living and learning environment
- Continued and equitable funding until graduation
  - Fellowships, research and teaching assistantships
  - Health benefits for student, spouse, and children
Title IX Review - Room for Improvement

• Policies on Gender Equity and Discrimination should be more widely known
  – Students may not know their rights
  – Students may not know how to deal with problems

• Monitoring of possible inequities is important
  – Monitoring admissions data to verify funding of women is equitable and that women are not held to a higher standard
  – Monitoring experiences of women after enrollment regarding treatment, exam pass rate, time to degree, and funding

• Exit Interviews for all graduate students
  – Interviews with students who quit program early as well as those who earn their degrees
  – Include questions about gender-based issues
Lessons Learned at Maryland and What can Congress Do to Help?

Lessons Learned at Maryland

- **Focus on what can be done as an engineer.**
  - Engineering creates change, improve society, Engineers serve society
  - Engaging undergraduates in talking to prospective students is a key to improving the image of engineers
- **Focus on career clarification at every opportunity.**
  - Many first year students entering engineering do not understand what engineering is
  - Many women who leave, leave for other science or mathematics fields
- **What can Congress do to help?**
  - **ENFORCE:** Strongly encourage that universities adhere to Title IX recommendations for all federal government funding.
  - **INCENTIVIZE:** Offer additional government programs that would improve the climate for women at all ages in science and engineering. Living and Learning Environments, Additional scholarships and fellowships. Diversity training.
  - **MEASURE:** Ask recipients of federal funding to demonstrate how they are achieving a diverse workforce.

Special Thanks to Drs Paige Smith, Mary Bowden and Nicole Roop
University of Maryland Firsts

- 1st Engineering Graduate, John Hanson Mitchell, 1898
- 1st First Female Graduate, Evelyn Barstow Harrison, 1932
  - Worked on 1st Presidential Commission on Women in the Workforce with Ms. Eleanor Roosevelt
- WIE-Women in Engineering Program started in 1974
  - Sloan Foundation Grant in 1994
- WEPAN, Assoc. Dean Marilyn Berman on Founding Board in 1990.
  - Founded by Women at Purdue, Univ. of Washington and Stevens Institute of Technology.