UPRM: Achieving High Percentages of Women Engineering Students

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Associate Professors

“Engineering for ALL Women: Exploring Perspectives”
Presentation Outline

- UPRM Overview
  - Campus
  - Engineering School
  - ECE Department
  - Women Statistics

- Survey Results

- IAP Program
  - Background
  - % women in IAP
Mayagüez is a Land-Grant, Sea-Grant, and Space-Grant College Founded 1911

Student Population Around 14,000

Over 4,600 Engineering Students

Approximately 1,500 students at the ECE Department
Approximately $4M/year in sponsored research
- NSF, NASA, DoD, DoE, Government, Industry

High Caliber Faculty
- 1 Presidential Early Career Award Recipient
- 4 NSF CAREER Program Recipients
- 2 NSF MRI Grant
- 1 NSF NGS Award
- 1 NSF CISE Award
- 2 NSF ERC Award - (CenSSIS & CPES)
- 1 NASA FAR Award
Research Centers

- Center for Computing Research and Development (CECORD)
- Tropical Center for Earth and Space Studies (TCESS)
- Laboratory for Applied Remote Sensing and Image Processing (LARSIP)
- Center for Subsurface Sensing and Imaging Systems (CenSSIS)
- Center for Power Electronics Systems (CPES)
- Radiation Laboratory
- Capstone Labs (Control, Robotics, Networking, Electric Power Systems, Software Engineering Lab, Integrated Circuit Design Lab)
- CLoud Microwave Measurements of ATMospheric Events (CLiMMATE) Center
Largest Engineering Colleges (ASEE 98)

Penn State
Texas A&M
Purdue
Georgia Institute of Technology
Illinois-Urbana Champaign
Virginia Polytechnic Institute
North Carolina State
University of Puerto Rico
University of Michigan
Iowa State
University of Texas-Austin
California Polytechnic Institute
University of Florida
California State-Sacramento
University of Maryland
Ohio State
Number of Engineering Degrees Granted 1999-2000

- Penn State University
- Georgia Tech.
- University of Michigan
- University of Illinois
- Purdue University
- Texas A&M University
- Virginia Tech
- North Carolina State University
- University of California, Berkeley
- University of Texas at Austin
- University of Florida
- California Polytechnic State Univ.
- Michigan Technological Univ.
- Massachusetts Inst. of Tech
- Iowa State Univ.
- Ohio State University
- Cornell Univ.
- University of Puerto Rico
What Characterizes our UPRM Undergraduate Education

- A five year program (EE & CE: 168 Credits)
- A capstone design experience
- Bilingual Program (Spanish / English)
- R & D opportunities (IAP, AMP, PASCOR, Tren Urbano, CenSSiS, CPES, TCESS)
  - Hands on experience
  - Solution of real world problems
Undergraduate Engineering

Hispanic Full-time Student Enrollment: Top 10 Institutions, Fall 1997

<table>
<thead>
<tr>
<th>Institution</th>
<th>Enrollment</th>
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<tbody>
<tr>
<td>University of Puerto Rico</td>
<td>4360</td>
</tr>
<tr>
<td>Poly. Univ. of Puerto Rico</td>
<td>2444</td>
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<tr>
<td>Florida Intl. Univ.</td>
<td>1224</td>
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<tr>
<td>Univ. of Texas El Paso</td>
<td>1072</td>
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<tr>
<td>Texas A&amp;M</td>
<td>713</td>
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<tr>
<td>New Mexico State Univ.</td>
<td>482</td>
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<tr>
<td>Cal Poly-San Luis Obispo</td>
<td>469</td>
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<tr>
<td>Cal Poly-Pomona</td>
<td>466</td>
</tr>
<tr>
<td>CCNY (City College-CUNY)</td>
<td>442</td>
</tr>
<tr>
<td>Univ. of Florida</td>
<td>425</td>
</tr>
</tbody>
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Women in Engineering Enrollment: Top 10 Colleges, Fall 1997

- University of Puerto Rico: 1671
- Purdue University: 1601
- Texas A&M: 1379
- Georgia Inst. of Tech.: 1244
- U. Michigan: 1237
- Penn State Univ: 1236
- U. Illinois: 895
- NC State Univ: 834
- Michigan State Univ: 868
- Univ. of Texas Austin: 786
% Women amongst UPRM Engineering Departments
Results from Survey

■ In the Spring of 2002, a small group (36) of UPRM students were asked to answer a questionnaire to try to identify reasons for UPRM high percentages in women.

■ 100% were Hispanic,

■ MARITAL STATUS: all single, except one

■ AGE:
  ◆ 25 were from 21-24 years’ old
  ◆ ten (10) from 18-20 years’ old
Family Annual income

< $10,000  $10,000 - $20,000  $20,000 - $30,000  $30,000 - $50,000  > $50,000
When started to think about Engineering

When first think majoring in Engineering?
Factors Contributing to High % of women in Engineering*

- Career image as empowering (engineering viewed as a great professional opportunity for women)
- HS program, non-traditional
- Encouraged by teachers
- Hi peer support from males
- Attended career day activity
- Financial Aid readily available
- Good grades in S&M in HS
- Cultural

Factors Contributing to High % of women in Engineering

- Was good in M&S in HS
- Did well in SAT exams
- Parents/relatives motivated me
- It is an empowering career
- Participated in FEP
- Participated in S&E Fairs
- To be economically independent
- HS counselor suggested eng
- Have role models
- For financial reasons
- HS teachers motivated me
- Other
Support from Classmates

- Generally supportive
- Sometimes supportive
- Not supportive
- Neutral
- Sometimes hostile
- Quite hostile
- Other

Males
Females

[Bar chart showing the distribution of support levels for males and females.]
Encountered Resistance?

*47% women did not encounter resistance
Why High % of women in UPRM according to students?

Cultural reasons:
- Encouraged by parents
- Motivation in HS
- Studying environment (not hostile)

Economic reasons:
- Encouraged by profs

Role models:
- Encouraged by HS teachers
- Encouraged in S&E fairs
- PEP

HS counseling

Encouraged by professors
IAP Program

- Unique educational experience for students
- Acquire knowledge, skills, and expertise not possible through the traditional classroom
- Undergraduate Research and Development
  - State of the art technologies
- Highly attractive for employment
- Link Industry, ECE students, and Faculty
  - Promote joint projects between ECE faculty and IAP companies.
- Enhance ECE Department Infrastructure
Percentage Female Participation in Undergraduate Research Programs compared to %women in ECE
Conclusions & Future Work

- Small measures like Awareness can make a big difference
- Career decision made late in HS
- Mothers had a post-college degree, =>role model
- Non-hostile environment
- Support from classmates
- Cultural reasons were a key factor
- Geographical location of PR - effect?
- Economic conditions effects?