Peer Mentoring in BME can be Extended to other Disciplines

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April 16, 2008
Brown University
Providence, RI
Outline

• Building the business case for mentoring
  – Statistics for engineering workforce and education
  – Attributes of engineers

• What is mentoring and what are mentoring models?

• Personal experiences

• Making peer-mentoring work for you
  – Recommendations
  – Some advantages of peer-mentoring
My Career Journey

• Industry
  – Intern, research engineer, medical laser engineer, technical manager

• Academia
  – Graduate student, postdoc, faculty, lab director

• Government
  – Funding administrator
Part 1/4

Building the business case for mentoring

- Statistics for engineering workforce and education
- Attributes of engineers
Statistics for Workforce, R&D and Education
By 2012 Future Job Growth will be in

1) Healthcare and social assistance (↑ 32.4%)
2) Biomedical, biotechnology, bioengineering (↑ 21-35%)
3) Nanotechnology
4) Security & defense
Your Best Bet for the Future

What technology area, including academia, would you advise students interested in R & D to get involved with?

IEEE Spectrum February 2007

1. Biomedical
2. Wireless/Mobile
3. Energy
4. Academia
5. Nanotechnology
6. Customized Software
7. Aerospace
8. Security
9. Semiconductors
10. Consumer Electronics
Recent Reports, Articles and Statements:

Talent Pool of Scientists and Engineers!
Innovation and Competitiveness Debate!

1) American Competitiveness Initiative: Leading the World in Innovation
   – Domestic Policy Council, Office of Science and Technology Policy

2) Grand Challenges for Engineering
   – National Academy of Engineering

3) Innovate America Executive Summary
   – Council on Competitiveness

4) Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future
   – NAE: Committee on Science, Engineering and Public Policy

5) Tapping America’s Potential: The Education for Innovation Initiative
   – Business Roundtable

6) Inventions and Impact: Building Excellence in Undergraduate Science, Technology, Engineering and Mathematics (STEM) Education
   – American Association for the Advancement of Science AAAS

7) National Science Board Science and Engineering Indicators
Fastest Growing Disciplines: 
BME and Aerospace engineering 
during 1999-2005 (ASEE)

BME showed growth of

• 137% for BS degrees (3% of Eng degrees)
• 135% for MS degrees (2.5% of Eng degrees)
• 78% for PhD degrees (4.5% of Eng degrees)

ASEE, 6 Year Trend Analysis (1999-2005)
Bachelors Degrees Awarded to Women
(19.9% in 2001 & 20.4% in 2003)

2001
- 40% Biomedical Eng.
- 35% Chemical Eng.

2003
- 42.1% Environmental Eng.
- 40.4% Biomedical Eng.

Masters Degrees Awarded to Women
(22.1% in 2001 & 22.3% in 2003)

2001
• 38% Biomedical Eng.
• 35% Agricultural Eng.
• 28% Chemical Eng.

2003
• 42.2% Environmental Eng.
• 40.9% Agricultural Eng.
• 38.3% Biomedical Eng.

• ASEE Profiles of Engineering and Engineering Technology Colleges, 2001 Education. Engineering Education with Numbers.
• ASEE Profiles of Engineering and Engineering Technology Colleges, 2003 Education. Engineering Education with Numbers.
### PhD Degrees Awarded to Women

**16.9% in 2001 & 17.4% in 2003**

<table>
<thead>
<tr>
<th>Year</th>
<th>Biomedical Eng.</th>
<th>Chemical Eng.</th>
<th>Industrial Eng.</th>
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<tbody>
<tr>
<td>2001</td>
<td>30%</td>
<td>24%</td>
<td>23%</td>
</tr>
<tr>
<td>2003</td>
<td>33.3%</td>
<td>32.7%</td>
<td>31.6%</td>
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Women tenure-track Faculty Members
(8.9% in 2001 & 9.9% in 2003)

2001
- 17.5% Assistant professor
- 11.1% Associate professor
- 4.4% Full professor

2003
- 17.4% Assistant professor
- 12.3% Associate professor
- 5.2% Full professor

Attributes of Scientists & Engineers
Working in

- Industry
- Academia
- Government

Similar knowledge, skills and professional development are NEEDED.
Attributes of Scientists and Engineers

• Strong technical development
  – Interdisciplinary, integrate knowledge at different levels
  – Critical thinking and questioning; strategic planning
  – Excellent designer and manufacturer
  – Depth and breadth
  – Multidisciplinary
Attributes of Scientists and Engineers (cont)

• Professional development and “soft” (“interpersonal”) skill development
  – Team work, conflict resolution, negotiation techniques
  – Written and oral communication and presentation skills
  – Ethics in multicultural and international work environment
  – “Engineering business etiquette”
  – Maintaining the engineering leadership
    • higher-level operational and supervisory control

• Fundamental knowledge of non-technical disciplines
  – Economy and business; finance; marketing
  – Public policy making, regulations, law
Building the Business Case for Engineering Mentoring

The previously mentioned attributes of engineers make us focus on mentoring and effective team work.

Peer-mentoring is a solution for community building of engineers.
What is mentoring and what are mentoring models?
Definition of Mentoring

significant personal and professional assistance given by a more experienced person to a less experienced person during a time of transition

Transitions are difficult:

– from high school to university
– from university to graduate school
– from school to a job
– from one job to another
Definition of Mentoring

trusted business counseling relationship between two professionals

Mentor is a wise and trusted guide and an advisor, counselor, coach and teacher.

The mentor offers
– Advice
– Access
– Advocacy
Different Mentoring Models

• Formal mentoring programs

• Informal mentoring
  – Networking
  – Technical and professional societies

• Virtual/electronic mentoring programs

• Peer-mentoring programs
Mentoring contributes to

• professional development and
• personal development.
A Peer-Mentoring Program

• is a support and discussion group, and peer-mentoring environment

• provides role models and peer-mentors

• recruit and retain people in the work place

• focuses on community-building based on the culture of the organization
Peer-Mentoring contributes to

• professional development,
• personal development and
• community-building
Part 3/4

Personal Experiences
Semahat’s Personal Experience in participating or developing mentoring programs

- Professional societies
- Electronic mentoring group
- Formal mentoring program
- Peer-mentoring program at my universities
A Peer Mentoring Program: Female Engineers Mentor for Success (FEMS)

At Joint Biomedical Engineering (BME) Program
– UT Health Science Center campus
– UM Engineering School campus
– Graduate program (MS, PhD, MD/PhD)
– 15 tenure line faculty (2 female = 13%)
– Women graduate students (35%)

Official started by Dr. Semahat Demir in March 2003
Biomedical engineering is the engineering discipline with

- the highest % of female tenure and tenure-track faculty
- the very high % of female degree recipients

according to ASEE Profiles of Engineering and Engineering Technology Colleges, 2001 & 2003 Education. Engineering Education by Numbers

Great potential for female role models, mentors, mentees, and peer mentors in biomedical engineering.

- Biomedical engineering is an ideal field for community building and peer-mentoring.
Goals of Peer-Mentoring Program for Women in Joint BME Program of UM/UT

- to provide a support and discussion group, and peer-mentoring environment during the transition time of the graduate studies
- to provide career and study planning,
- to provide professional development
- to provide self-awareness of leadership and communication styles
- to provide role models and mentors, and peer-mentors,
- to recruit and retain women in BME and engineering.

for the women in the graduate biomedical engineering program.
Survey of Dr. Wadsworth: 293 WIEP at degree granting engineering institutions in USA in 1990

1. the critical time for retention of students was during the first year; and

2. female students transfer out of engineering due to feelings of isolation and incompetence.

**Conclusion:** Mentoring programs are needed where females had role models, were regularly supported by peers, had their self-esteem affirmed, received pertinent strategies, and were encouraged to persist.
“Giving Much/Gaining More: Mentoring for Success” book by Dr. Wadsworth

- Dr. Emily Wadsworth, former administrator of WIEP at Purdue Univ.
- Started a mentoring program
- Recognized with a Presidential Award for Excellence in Engineering Mentoring from NSF
- Wrote the book “Giving Much/Gaining More: Mentoring for Success” with 12 former female graduate students who were staff members of the mentoring program.
Topics from Dr. Wadsworth book: 12 opposing actions, termed polarities, that push and pull us in different directions

- welcoming and excluding
- communicating and bickering
- trusting and doubting
- accepting and rejecting
- affirming and ridiculing
- forgiving and condemning
- reframing and stagnating
- letting go and holding tight
- rejoicing and grieving
- balancing and tilting
- focusing and blurring
- gracing and alienating
The book emphasizes the importance of

• reaching out and welcoming others
• listening and communicating with others
• being a reliable person
• accepting and appreciating our differences and diversity
• encouraging commitment and ownership
• teamwork and team building
• learning from mistakes
• reframing situations from life
• being yourself
• catching joy
• balancing work with leisure
• focusing, reflecting, and regrouping ourselves
• giving and receiving grace
Peer-Mentoring Program for Women in Joint BME Program of UM/UT

• Group meetings cover topics from Dr. Wadsworth book and sharing personal experiences

• **Ultimate goal:** Recruit and retain more female engineering students by utilizing the BME potential of female mentors

• Sharing our experience: We hope our mentoring program can be a model that can be extended into other disciplines or schools.
Dr. Demir’s Mentoring efforts are not only for female students

• Professional development workshops to all students:
  – “How to get ready for a job search” workshop
  – “Interactive Resume Writing” workshop
  – The goals: to assist the students with deciding on a career, networking, writing resumes, interviewing, negotiations and deciding on an offer
Making peer-mentoring work for you

• Recommendations
• Advantages of peer-mentoring
Peer-Mentoring contributes to

- professional development,
- personal development and
- community-building.
Peer-Mentoring Programs

• provide a support and discussion group, and peer-mentoring environment
• to provide role models and peer-mentors
• to recruit and retain women in the work place
Some Advantages of Peer-Mentoring

• Improves interpersonal skills
  – listening and communication skills

• Team and community concept

• Trusted relationships among colleagues

• No issue of credit for anyone’s success

• Time commitment is less than formal mentoring programs
Some Advantages of Peer-Mentoring

• Confidence in yourself
  – Know your own potential

• Motivation

• Become aware of leadership abilities early
  – Take on leadership roles
  – Better team players

• COMMUNITY BUILDING in the work place
  – Based on the culture of the work environment
In short: Peer-Mentoring can help you in

- Work/life balance
  - Balance of Professional/personal development
  - Work hard, play harder
- Enjoying what you are doing
- Believing in what you can do
  - Your own potential

Enjoy the life-long learning experience and the mentoring journey!
Thank you very much!