

Peer-Mentoring among Female Biomedical Engineering Students can be Extended to Other Engineering Disciplines

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Abstract— Mentoring is significant personal and professional assistance given by a more experienced person to a less experienced person during a time of transition. Transitions from high school to university, from university to graduate school are difficult. Organizing and administering mentoring programs in schools or in professional societies provide good recruitment and retention of female students in engineering. Biomedical engineering (BME) is the engineering discipline that has the highest percentage of female degree recipients and tenure/tenure-track teaching faculty as seen presented in “ASEE Profiles of Engineering and Engineering Technology Colleges, 2001 Education. Engineering Education by the Numbers”. Thus there is a great potential for female role models, mentors and mentees in BME. Recently, I have developed a mentoring program for women at the Joint Graduate Biomedical Engineering Program of University of Memphis (UM) and University of Tennessee Health Science Center (UT). Currently our program focuses on peer-mentoring and community building. We follow the book "Giving Much/Gaining More: Mentoring for Success" by Dr. Wadsworth for our meetings and activities to provide a support and discussion group, and environment to women in their transition time of the BME graduate studies. Our future goal is to expand our mentoring program to female students in our engineering school since we believe that the women in BME are excellent role models, mentors and mentees to women in other engineering disciplines.

Keywords: mentoring; support groups; women in engineering; professional development.

Introduction

Based on the American Society of Engineering Education (ASEE) Profiles of Engineering and Engineering Technology Colleges, 2001 Education, the percentage of bachelor's, master's and doctoral degrees awarded to women is the highest for biomedical engineering (BME) discipline [1]. The bachelor's degrees awarded to women in engineering was 19.9% [1]; BME

40%, chemical Engineering 35% and industrial engineering 34%. The master's degrees awarded to women in engineering was 22.1%; BME 38%, agricultural Engineering 35% and chemical engineering 28%. The doctoral degrees awarded to women in engineering was 16.9%; BME 30%, chemical engineering 24% and industrial engineering 23%.

Women tenure/tenure-track faculty members in engineering was 8.9% [1]; 4.4% at the full professor, 11.1% at associate professor and 17.5% at assistant professor levels. The highest percentages of women tenure/tenure-track teaching faculty were in the disciplines of BME (15.8%), and industrial engineering (13%).

BME is the engineering discipline that has the highest percentage of female degree recipients and tenure/tenure-track teaching faculty. There is a great potential for female role models, mentors and mentees in BME.

Recently, I have developed a mentoring program for women at the Joint Graduate Biomedical Engineering Program of University of Memphis (UM) and University of Tennessee (UT). The major goals of our mentoring program are peer-mentoring and community building. We achieve our goals by providing (1) a support and discussion group, and environment during the transition time of the graduate studies, (2) career and study planning, and (3) professional development for the women in our graduate biomedical engineering program.

Higher percentages of female students and tenured/tenured-track faculty in our BME program provide us with a great potential for role models, thus our future goal is to expand mentoring to female students in our engineering school.

Mentoring

In her book [2], Dr. Emily M. Wadsworth, former Administrator for Women in Engineering Programs (WIEP) at Purdue University, defines mentoring as significant personal and professional assistance given by a more experienced person to a less experienced person during a time of transition. As we all experience, transitions are difficult: from high school to university, from university to the first job, from one job to another. Dr. Wadsworth's book "Giving Much/Gaining More: Mentoring for Success" [2] can be applied to both personal and career development. Her book had its beginning in three engineering mentoring programs that she developed at Purdue University to retain female engineering students during 1991-1999. The programs were recognized in 1997 with a Presidential Award for Excellence in Engineering Mentoring from National Science Foundation. Her book describes life lessons that can be gained from mentoring.

In 1990, Dr. Wadsworth conducted a national survey of WIEP at degree granting engineering institutions throughout the United States. She found that a major concern of the 293 schools surveyed was recruitment and retention of female students in engineering. Two important results of her study were (i) the critical time for retention of students was during the first year; and (ii) female students transfer out of engineering due to feelings of isolation and incompetence.

She stated in her book [2] that mentoring programs were needed where females had role models, were regularly supported by peers, had their self-esteem affirmed, received pertinent strategies, and were encouraged to persist. Dr. Emily M. Wadsworth and her book motivated me to start a mentoring program for the female students in our graduate BME program in December 2002.

Peer-Mentoring Program at BME Program of UM/UT

In the peer-mentoring program that I have started in our BME program, currently we are forming our meetings with the topics that are named as polarities as in Dr. Wadsworth's book [2]. In our group meetings, the individuals share personal experiences with the group based on the meeting topic. We summarize the group meeting and also circulate its summary and highlights, and what we discussed and talked about.

These 12 opposing actions, termed polarities, that push and pull us in different directions are presented in detail in Dr. Wadsworth's book [2]. The polarities are:

1. welcoming and excluding
2. communicating and bickering
3. trusting and doubting
4. accepting and rejecting
5. affirming and ridiculing
6. forgiving and condemning
7. reframing and stagnating
8. letting go and holding tight
9. rejoicing and grieving
10. balancing and tilting
11. focusing and blurring
12. gracing and alienating

In our mentoring group meetings we emphasize 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

Different Formats for Mentoring Programs

Mentoring groups can have different formats and models. In early and mid-1990s when I was a graduate student, I took part in the email list server that Dr. Susan Blanchard (Professor, Department of Biological and Agricultural Engineering, North Carolina State University) developed and maintained. Through, Dr. Blanchard's leadership, this group was very active in sharing information that can be applicable to women during their BME studies, advancement in their BME careers and job search.

Recently, I was invited to take part as a senior female faculty in a unique mentoring and networking program that Dr. Naomi Chesler (Assistant Professor, Biomedical Engineering, University of Wisconsin at Madison) and her colleagues started for female faculty in engineering [3]. Dr. Chesler's program was funded by Engineering Information Foundation to develop a three-year workshop series of community-building and peer-mentoring in a small group of untenured women faculty. First year their workshop with an Outward Bound adventure in Maine focused on leadership skills and risk-taking. The second year workshop emphasized writing and creative-expression skills in Vermont. The workshop attendees were joined by senior speakers and role models, Dr. Ilene Busch-Vishniac (Dean of Engineering, Johns Hopkins University) and Dr. Denice Denton (Dean of Engineering, University of Washington), who shared their insights and lessons from their years in the engineering academy. Last year's workshop was in Northampton, MA and the goal was to focus on the personal and professional mission statements and plans for post-tenure. Dr. Maria Klawe (Dean of School of Engineering and Applied Sciences, Princeton University), Dr. Lorna Gibson (Professor, MIT), Dr. Delcie R. Durham and I were the senior attendees.

Mentoring can be also obtained through the professional societies. For example, the Women in Academia (WIA) Committee (WIA) of Society of Women Engineers (SWE) provide an "electronic" mentoring environment via email and web pages and shares issues and information of interest to women in academia. Since I have been the Chair of SWE WIA Committee in 1999, I have noticed that even women who work in industry subscribe to WIA interest group to be aware of "paths to and from academia". The perspectives that we hear from women in industry have been very stimulating to our group. SWE WIA shares lots of information and data electronically in addition to mentoring and networking we provide at our conferences. What we share is of interest to those in academia and to those who would like to be in academia full-time or part-time.

As a BME faculty, my mentoring efforts are not only for female students. In addition to directing the peer-mentoring program for women in BME that I started at my universities, and that we will expand to our engineering school, I also mentor male and female engineering students at UM, UT and Işık University by giving very popular workshops entitled "Getting Ready for Graduate School and Research", "Critical Thinking and Planning during Graduate School", "How to Get Ready for a Job Search" and "Interactive Resume Writing". The goals of these workshops are to assist the students with deciding on a degree, career or research program, networking, writing resumes, interviewing, negotiations and deciding on an offer.

All of these mentoring efforts are to enhance the professional development of men and women in BME and engineering.

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