SESSION 2555

E-MENTORING FOR WOMEN GRADUATE STUDENTS IN ENGINEERING AND SCIENCE

Jennifer Dockter, Ph.D., Director of Programs, Carol Muller, Ph.D., Founder and CEO

MentorNet, c/o COE, SJSU, One Washington Square, San Jose, CA 95192-0080

Abstract

Mentoring is a frequently employed strategy for retention of women in engineering and science. The power of mentoring is sometimes poorly understood, and mentoring is not always effectively practiced, however. At its strongest, mentoring is understood as a powerful learning process, which assures the intergenerational transfer of knowledge and "know-how" on an ongoing basis throughout one's life. Mentoring helps make explicit the tacit knowledge of a discipline and its professional culture, which is especially important for underrepresented groups.

MentorNet (www.MentorNet.net), the E-Mentoring Network for Women in Engineering and Science, was founded in 1997 as an innovative large-scale electronic mentoring network; its signature One-on-One mentoring programs pair engineering and science students at colleges and universities with female and male professionals in industry, government, and higher education for email-based, structured mentoring relationships, lasting eight months at a time. Between 1998 and 2003, MentorNet matched more than 10,000 undergraduate and graduate students with e-mentors in its One-on-One mentoring program. MentorNet program design is guided by research and evaluation, and formative and summative evaluations have been conducted at the end of each year. One consistent finding is that graduate students in particular have benefited from these relationships. This paper will explore the benefits and outcomes of e-mentoring

"Proceedings of the 2004 American Society for Engineering Education Annual Conference & Exposition Copyright © 2004, American Society for Engineering Education" specifically for Master's and Ph.D. students in engineering, providing and discussing data from participant surveys.

In response to numerous requests from both students and faculty to support academic ementoring, and with support from a grant from the National Science Foundation, MentorNet in 2003 began a pilot program for MentorNet ACE (Academic Career E-Mentoring). This new project focuses on providing One-on-One e-mentoring services for graduate students, matching them with tenured faculty as mentors, and will eventually experiment with offering such services to tenure track faculty members seeking or pursuing academic science and engineering careers. The paper will also describe initial engagement with this new program, and offer preliminary findings about the potential benefits to be gained from e-mentoring for those pursuing academic careers.

Introduction

MentorNet (www.MentorNet.net), the E-Mentoring Network for Women in Engineering and Science, is a nonprofit organization headquartered in offices at San José State University, which since early 1998 has offered online mentoring programs particularly to serve women studying engineering and science. MentorNet's mission is to further women's progress in scientific and technical fields through a dynamic, technology-supported mentoring program and to advance women and society by developing a diversified, expanded and talented workforce. MentorNet's vision is three-fold: to establish excellence in large-scale e-mentoring, to create the ecommunity of choice for women in engineering and science through online mentoring and networking, and to leverage that community for positive social change. MentorNet leverages technology to build large-scale impact for its programs, scale which has increased over the five years since its founding. Since 1998, nearly 10,000 undergraduate and graduate women studying engineering and related sciences at more than 100 colleges and universities across the U.S., and in several other nations, have been matched in structured, one-on-one, email-based mentoring relationships with male^a and female scientific and technical professionals working in industry and government. MentorNet's innovative, award-winning^b e-mentoring network provides mentoring opportunities that otherwise would not exist for women in engineering and science. MentorNet provides a centralized infrastructure to serve a growing number of colleges and universities, corporations, professional societies, and government labs and agencies, and their respective students, employees, and members, all interested in advancing women in engineering and related sciences through mentoring. These organizations provide financial support for MentorNet operations, and help to recruit prospective participants. MentorNet uses research and evaluation in its design, for continual quality improvement, and to assess preliminary outcomes.

^a MentorNet intentionally encourages men as well as women to serve as mentors, for several reasons: 1) there are too few women to meet the need, 2) women are already more frequently called upon to serve mentoring functions to help develop the future generations of scientists and engineers, and even more importantly, 3) through serving as mentors, men can gain improved understanding of the obstacles women encounter and a vested interest in helping to change practices and policies that impede women's full participation in the professions, thus enhancing systemic change. The preferences of protégés to be matched with a mentor of a particular gender, however, will be accommodated.

^b In 2001, MentorNet was awarded the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring.

Previous to the 2003-2004 academic year, graduate students made up approximately 17% of MentorNet participants in any given program year; engineering fields account for approximately 51% of those graduate students^c. While MentorNet has heretofore concentrated its efforts on mentoring between students and professionals working in industry and government as a complement to academic mentoring, MentorNet is now, through an ADVANCE Leadership grant provided by the National Science Foundation (Grant No. SBE-0318510), modifying and extending MentorNet's capacity in order also to advance women in *academic* careers in engineering and related sciences, including planning and implementing a pilot program to link graduate students and pre-tenure faculty with tenured faculty in one-on-one e-mentoring relationships.

Present State of Knowledge in the Field

The underrepresentation of women in science and engineering, both in industry and in higher education, has negative implications for the future technical work force, for equal opportunity, for individuals, and for the disciplines and professions themselves. In academic science and engineering, women comprise less than 20% of faculty positions in 4-year colleges and only approximately 22% of full-time senior faculty appointments in life sciences¹, despite that field being the scientific and engineering field graduating the highest percentage of women at all levels for many years (excluding psychology and the social sciences)². In a number of other fields, the percentages of women faculty are much lower, leading to scenarios in which women studying engineering frequently never are taught by even one female professor. Though women enter the study of science and engineering just as or better prepared than their male counterparts, they are more likely to switch to other areas of study ^{3,4}. On average, women who switch out of these fields have higher achievement than the men who remain.

Among the demonstrated educational obstacles to women's persistence in these fields are an academic climate where engineers and scientists are typically seen as male, where few women students have relationships with or even know women engineers and scientists ⁵⁻⁷, and classroom environments that are competitive and unwelcoming to women ^{8, 9}. As women enter graduate school and faculty positions, they face difficulties such as subtle and outright systematic discrimination ¹⁰, competing family and career demands (particularly as women approach tenure), and feelings of isolation as they encounter fewer and fewer women colleagues ^{11, 12}. The situation leads to too few role models for would-be women faculty in engineering and the sciences, thus perpetuating the problem for future generations.

Mentoring is a frequently employed strategy for the retention and advancement of women in engineering and science. Whether or not such individuals are labeled "mentors," nearly everyone has one or more mentors in the form of more experienced guides and advisors as they grow and develop as individuals and professionals ¹³. Among other benefits, mentoring helps make explicit the tacit knowledge of a discipline and its professional culture, and with this knowledge, individuals are more likely to be successful. Both protégés and mentors learn from

^c Does not include computer science. This is comparable to the percentage that engineering students make up of undergraduate participants.

mentoring relationships ¹⁴. Well-deployed mentoring can also be highly effective in supporting systemic change^d and in creating positive, productive, equitable learning environments ¹⁵.

In contrast to the obstacles for academic women in engineering and science, noted above, mentoring, deliberate encouragement, and affiliation with a community have been shown to enhance women's retention, self-efficacy, confidence, and likelihood of remaining in these fields ^{16,17}. For women of color, mentoring has been shown to be the only significant predictor of success ¹⁸. Mentoring can also serve to counter the idea that science and engineering are not friendly to women and people of color, and is key to recruiting and retaining women and minorities in science, technology, engineering and mathematics fields ¹⁹. A well-accepted strategy to improve retention of women students in science and engineering in higher education, mentoring helps expose students to the opportunities in their fields, offers guidance and advice based on experience, and provides support, encouragement, and access to professional networks for further career development ²⁰. Mentoring offers one-on-one attention and assistance in "decoding" less obvious cultural and structural elements of a field, and allows students access to an impartial advisor who can provide personalized support and information ¹¹.

Mentoring has also been shown to be an effective tool for faculty and graduate students ²⁰⁻²⁴. This recognition has led many institutions to create faculty and graduate student mentoring programs on their campus, including some programs specifically for women faculty. Some professional societies and associations have created mentoring programs to encourage women to pursue academic careers in science and engineering; the Computer Research Association's Committee on the Status of Women in Computing Research's (CRA-W) Distributed Mentor Project (http://www.cra.org/Activities/craw/dmp/) is one example; this program matches women undergraduates in the computing sciences with female mentors for a summer of research at the

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^d In addressing the underrepresentation of women in engineering and science during the last decade, juxtaposed to a program intervention approach has been approaches for "systemic change." Many have suggested that the question to be addressed instead of "How do these women need to change?" ought to be "What needs to be changed in these fields, disciplines, and institutions so that more women will be attracted to them?" Within this framework, greater attention is paid to institutional and related features of the fields of study, modes of instruction, organizational policies, cultural practices, and structural elements that may impede women's full participation and success. Under consideration, for example, are admissions policies, teaching practices, faculty rewards and incentives, and other forms of assessment, curricular structure, and program and degree requirements. In theory at least, systemic change will address root causes and solve the problems so that they will not recur and will not need recurring treatment. At the same time, however, systemic change requires long-term investment to create measurable shifts in values, beliefs, attitudes, and behaviors, as well as structural changes in complex, interconnected organizations, professions, and practices. These changes are frequently challenging, complex, and time-consuming, particularly if a comprehensive shift is desired, with measurable impact on the participation of currently underrepresented groups. There is a need to address inter-related systems and organizations in ways that are not under the control of any one single group of change agents. Making a distinction between these two approaches is not always easy, and valuing one over the other is not altogether helpful, either. We need to focus on changing systems, practices, and institutions, not on "fixing" the individuals who aren't choosing engineering and scientific fields, but support programs should not be tossed out even as we focus on critical systemic change. Similarly, as we pursue systemic change, it is important to continue to measure the effects of good intervention programs, and offer those which are effective as widely as possible. Programs that support and encourage individuals, helping them to understand and thrive even within current flawed systems and organizational structures, are valuable. Such programs also seed the process of longer-term shifts in institutional practices and culture. For example, in situations where men who are professional engineers and scientists serve as mentors to women students, they may learn more about the barriers women face in ways that lead to changes in their own beliefs, attitudes, and behaviors. And, as more and more women persist, the culture and systems will change.

mentor's institution. Furthermore, networks for informal mentoring for women in academic science and engineering such as the Committee for the Advancement of Women Chemists (COACh) (http://coach.uoregon.edu/) have also been developed. Women graduate students and faculty in science and engineering may also receive mentoring informally, or not at all. One reason mentoring programs are initiated is because women and people of color are less likely to be included in informal mentoring than are white males, who comprise the majority of senior leaders in higher education, including faculty. In informal mentoring relationships, individuals are very likely to choose someone like themselves, and frequently do not label the relationship "mentoring," but these relationship nonetheless take on the characteristics of mentoring relationships ²⁵.

The power of mentoring is sometimes poorly understood, and mentoring is not always effectively practiced ¹⁴; in particular, many well-meaning individuals have constructed mentoring programs without adequate knowledge and resources, leading some participants to conclude "mentoring doesn't work" or "mentoring programs don't work." While not every single mentoring relationship within a constructed program may end up being successful or valuable, there is ample evidence that mentoring programs provide considerable benefit to many participants ^{15, 26-28}. At its weakest, mentoring is viewed as a somewhat offhand strategy to address deficits, providing some needed encouragement and advising of less confident individuals. At its strongest, however, mentoring is understood as a powerful learning process, which assures the intergenerational transfer of knowledge and "know-how" on an ongoing basis throughout one's life ^{14, 15}. When mentoring is understood as a serious and powerful learning process, complete with the need to establish learning objectives, measures, and discipline to achieve results, its potential can be realized ¹⁴.

Structured mentoring programs provide matching, training, coaching, and facilitation for mentoring relationships ²⁷. Such programs are different from naturally occurring mentoring, where a mentor and protégé form their own relationship, without the benefit or intervention of a program. Structured mentoring programs, with training of mentors and protégés and facilitation or "coaching" of the relationships increase the likelihood of satisfying mentoring relationships ¹⁴, ¹⁵, ²³, ²⁹.

E-mentoring is mentoring conducted primarily via email. It builds on the Internet as a social technology that connects and affiliates people³⁰. Email has the obvious advantages of convenience, efficiency, asynchronicity and facilitating distance communication. But mentoring via email and related electronic communications technologies also enable thoughtful, deliberate communication, provide a useful record of that communication, can use the power of writing as a reflective learning tool and as a strategy for socialization into a professional culture ³¹, and limit status differences that might otherwise inhibit communication between protégés and mentors ³². In addition, the restricted channel of communication helps build relationships, especially for those who feel isolated ³³.

How MentorNet Works

Currently, MentorNet pairs undergraduate and graduate students with female or male professionals working in industry or government agencies and laboratories for structured one-on-

one mentoring relationships conducted via email. Designated MentorNet liaisons within colleges and universities, corporations, government sites and professional societies inform professionals and students of the opportunity to participate in the MentorNet program, directing them to the MentorNet web site. Prospective participants get full information, complete online profiles, and access training materials including tutorials from MentorNet's web site. MentorNet has developed and refined software programs and related systems to conduct bi-directional matching of students and mentors based on backgrounds, interests, and expressed preferences entered into a database via the online profiles. Program managers provide direction and coaching to develop and sustain these e-mentoring relationships, using MentorNet's customized training and coaching curricula. These curricula are based on research related to mentoring, women's experiences in engineering and science, and electronic communications. Mentoring relationships last for eight months at a time, and all participants are asked to complete online evaluations at the end of the time period. In developing MentorNet, distinctions have been made in providing coaching and training materials based on five possible educational levels of the students involved, as follows -1) community college students, 2) first or second year undergraduates (lower division), 3) 3rd, 4th, or 5th year undergraduates (upper division), 4) Master's students, and 5) doctoral students. A modified coaching curriculum is now provided for graduate students involved in MentorNet's Academic Career E-mentoring (ACE) program and their mentors То complement and enhance the One-on-One e-mentoring programs, MentorNet also offers a community experience including such features as a monthly electronic newsletter, and an E-Forum, consisting of a series of online topic-based discussion groups focused on life/work balance, women's issues, job search, and similar themes. MentorNet's online community members may participate in these functions alone and/or in the One-on-One Mentoring Program.

Evaluation Results

To date, MentorNet has served more than 10,000 students who have been matched with an equal number of mentors. MentorNet has conducted evaluations at the end of each program year, as well as a preliminary long-term evaluation, largely through online survey instruments^{26, 34-38}.

Evaluation has been conducted mainly by outside evaluators, with the exception of the 2000-2001 evaluation, which was conducted in house ^{26, 34-38}. Matched participants are sent an initial email either at or very near to, the end of their official MentorNet relationship, requesting that they come to the web site and fill out an online evaluation; participants may decline to answer the survey. Follow up emails are sent as necessary. Student (all levels) response rates for various program years were as follows: ^{26, 36}: 2000-2001: 42% (845/2005); 2001-2002: 37% (1101/2973); 2002-2003 (report not published): 44% (1250/2816). When examined, the response rate for graduate students was generally higher than the overall response rate ²⁶.

Overall mentor and student satisfaction with the program has been high each year. Highlights of evaluation findings for students include improved self-confidence (50% of student participants said MentorNet increased their confidence to succeed in science or engineering; 52% said MentorNet increased their desire to pursue a career in their field) and enriching educational and personal experience (94% of student participants would recommend MentorNet to a friend; 64% were satisfied or very satisfied with their MentorNet experience)^{26, 36}.

"Actually meeting a woman who has a physics PhD and is still working in the field has been extremely valuable. Previously, it almost seemed like no such women existed." MentorNet Protégé^e

"You cannot imagine how much I've changed since we started the mentoring process, basically from a timid chicken to a brave fighter. I now know when and how to speak up my mind. As a result, I receive much more respect, consideration and understanding from my colleagues and advisor."

MentorNet Protégé

In addition, MentorNet has found benefits to participating mentors, including 57% of mentors reporting that self-reflection about their own careers was a positive outcome of their MentorNet experience, 18% reporting a renewed commitment to their field as a positive outcome, and 7% reporting improved supervisory skills³⁵. In addition, mentors find benefits in helping another person and some, such as the male mentor quoted below, find MentorNet a means of working towards gender equality in science and engineering.

"Through all my years since 1969, men have outnumbered women in engineering and scientific fields by a huge margin. It is clear that much more work is required to achieve complete equality in the workplace. To make a contribution toward gender equality is the reason I joined MentorNet."

MentorNet Mentor

MentorNet's long-term study conducted by an external evaluation expert interviewed protégés from the 1998-1999 program year one year and three years after their participation ^{37, 38}. A key question for the evaluation was: Does involvement in MentorNet promote the retention of women in math, science, and engineering-related majors and careers? The conclusions drawn from the results were that overall retention in science, technology, engineering, and mathematics fields (STEM) among protégés responding to the survey was 95%. This report noted that 1998-99 MentorNet protégés (women students who participated in the 1998-99 MentorNet program) display unusual levels of confidence and retention in their majors and careers compared to what might be expected in the general population of women in these majors. While MentorNet can probably not be solely credited with generating the high retention and confidence statistics among respondents, it is clear that MentorNet both identifies and supports a population of women who successfully complete STEM majors and enter STEM careers. Furthermore, it is notable that substantial numbers of women believe that their MentorNet participation both encouraged them to complete their academic degrees and boosted their confidence to succeed in a STEM field ³⁸.

Graduate Student Participation

Until the 2003-2004 academic year, graduate students made up approximately 17% of matched MentorNet One-on-One Mentoring Program participants per year, split evenly between Master's

^e All subsequent protégé quotes are from graduate student participants in engineering fields.

and Ph.D. students. For engineering fields alone^f, graduate students made up approximately 14% of matched students, with a 2:3 ratio of Ph.D. students to Master's students.

As of January 2004, graduate students made up 26% of all matched students in the 2003-04 academic year; the increase is due to the addition of MentorNet's academic mentoring program (see below), which is open only to graduate students. Again, the split (for all program participants, not just the academic program) is about even between Master's students and Ph.D. students. For matched engineering student participants, 22% are graduate students, with the ratio of Ph.D. to Master's students just over 2 to 3. In total, engineering students make up 62% of all matched students and 50% of matched graduate students.

Results for Graduate Students - General

Student level is a significant predictor of student satisfaction with the MentorNet program ^{26, 36}. The 2000-2001 year-end program evaluation conducted multiple comparisons by three student educational levels (community college, undergraduate, and graduate, abbreviated CC, UG and GS respectively). Graduate students reported significantly higher ratings of overall satisfaction compared with undergraduates (GS: Mean=4.24; UG: Mean=4.04; CC: Mean=4.02). The difference between graduate students and community college students, although of a similar magnitude, was not significant due to the higher level of variability among the community college students. There were no statistically significant differences based on satisfaction with program features or perceived value of the program. The 2002-2003 program evaluation also found that Ph.D. students had the greatest levels of satisfaction of all participants; 47% of Ph.D. students were "very satisfied" with their one-on-one mentoring experience as compared to community college, lower division undergraduate and Master's students, who had percentages in the mid-30s (the percentage for upper division undergraduates was 43%)³⁶.

To examine reasons for these findings, we analyzed the frequency of emails sent and the amount of time spent on MentorNet by students' educational level. We found that graduate students reported spending more time on the MentorNet program compared with the other students, although community college students indicated that they sent and received a higher volume of email.

Results for Engineering Graduate Students

In the 2002-2003 year-end evaluation, when examining results for female engineering students, we find that women graduate students are significantly different from undergraduates in some of their reasons for wanting to pursue MentorNet; i.e. issues that they are interested in discussing with a mentor. Graduate students are less interested in discussing academic issues such as choosing classes and are most interested in discussing balancing work/family. Balancing work and family is most important - and significantly so - for doctoral students, more so than for Master's, undergraduate or community college students.

^f For this paper, engineering does not include computer science students.

Other than community college students, doctoral students were most likely to say MentorNet had filled a gap in their support system, significantly more so than undergraduate and Master's degree students.

No matter what the student's educational level, community college through Ph.D., the e-mentor provides support and encouragement and engineering students at all educational levels perceive this support to be a critical value of e-mentoring.

"It was important to me to have someone outside of school to answer questions about my chosen path. My mentor, if she could not answer my questions, she found someone who could. My chosen path is very non-traditional and she helped me to find out exactly what I needed to do to achieve my goals."

MentorNet Protégé

Results for Graduate Students' Mentors

In addition, mentors reported different experiences with the MentorNet program based on the educational level of their protégés (includes all fields of study)²⁶. Mentors who were paired with graduate or undergraduate students reported overall satisfaction at levels higher than mentors paired with community college students. Conversely, mentors were more likely to be satisfied with the program features (discussion suggestions, e-newsletters, and web site) when they were paired with undergraduate and community college students compared with graduate students.

MentorNet ACE: Academic Career E-Mentoring

Until the 2003-2004 academic year, MentorNet's One-on-One Mentoring Program was designed for students interested in careers in private industry and government. In response to numerous requests from both students and faculty to support academic e-mentoring, and with support from a grant from the National Science Foundation, MentorNet in 2003 began a pilot program for MentorNet ACE (Academic Career E-Mentoring). MentorNet ACE is focused on substantially refining and expanding MentorNet's programs to include e-mentoring services addressing the needs of women students and untenured faculty seeking or pursuing academic science and engineering careers. To that end, MentorNet is developing specialized components of its One-on-One Mentoring Program, enabling one-on-one mentoring relationships based on 1) matching graduate students and postdoctoral scholars with tenured faculty members as mentors (beginning in fall of 2003), and 2) matching untenured faculty with tenured faculty mentors (beginning in fall of 2004). MentorNet will develop a comprehensive approach for this project, with programmatic features tailored to the needs of the specific protégé-mentor populations.

Since the first matches in this new program were made in September 2003, participating individuals have not completed this eight month program, and thus evaluation results are not yet available. As of January 2004, MentorNet had recruited 169 students (44% of whom are engineering students) and 33 mentors to the MentorNet ACE program. MentorNet has not

emphasized student recruitment for this program because from the outset students have been interested in engaging with academic e-mentors in greater numbers than the tenured faculty members completing profiles to serve as their mentors. On the other hand, active mentor recruiting has been taking place since August 2003. As of January 8, 2004, 22 students have been matched with mentors; 9 of those students are in an engineering field.

Basic demographic information demonstrates that the engineering students signed up for the ACE program differ slightly from those in other fields within this same program. Demand from students to participate in the program has been highest amongst those in (in descending order): computer science, the biological sciences, bioengineering, physics, chemical engineering, and electrical engineering. For students participating in the ACE program in engineering fields, 77% are Ph.D. students, 19% are Master's students and 4% are postdocs. For all other fields, 77% of students signed up are Ph.D. students, 12% are Master's students and 11% are postdocs.

Of those students who chose to provide data and were in engineering fields (n=29), 55% have completed 0-2 years of graduate school, 35% have completed 3-5 years and 10% have completed 6 or more. For those in other fields (n=48), 53% have completed 0-2 years of graduate school, 34% have completed 3-5 years, and 13% have completed 6 or more.

For engineering students participating in ACE who provided data (n=73), 47% self- identified as White, 25% as Asian/Asian American - Chinese, 7% as African American/African, 7% as Asian/Asian-American – Indian, 3% as Hispanic and 7% as mixed race. The remainder identified as other Asian. For all other fields (n=94), 53% self-identified as White, 17% as Asian/Asian American - Chinese, 5% as African American/African, 5% as Asian/Asian-American - Indian, 4% as Hispanic and 2% as mixed race. The remainder identified as other Asian. There were no Native Americans identified either in engineering or other fields (the general MentorNet student population contains less than 1% Native Americans) in the MentorNet ACE program.

Summary and Implications

Graduate students had higher satisfaction with the One-on-One mentoring program^{g 26, 36}, as did the mentors who were paired with graduate students. Mentors paired with undergraduate students reported similar levels of satisfaction with the program. Yet, mentors paired with graduate students had the lowest ratings of the value of the program features. In addition, compared with undergraduate and community college students, graduate students were more likely to spend more time per week on the MentorNet program. Yet, community college students reported they sent and received more email during a typical month.

Multiple reasons could explain the findings that graduate students and their e-mentors experience higher satisfaction with MentorNet. First, graduate students may be more likely to engage in behaviors that facilitate the establishment and development of an e-mentoring relationship. They may be better able to follow through on a commitment with some, but not a lot, of external support and reinforcement due to greater maturity and experience or due to fewer co- or extracurricular options compared with undergraduate student life.. Other reasons include that

^g These results do not include the Academic career program, which has not yet completed its first year.

they may have fewer opportunities for mentorship and therefore capitalize on the experience or that they may have more experience with either mentoring relationships or with developing relationships via electronically mediated communications, which informs their ability to establish and develop an e-mentoring relationship online. Finally, the commonality of the graduate school experience between the mentors and protégés in these pairs may provide a foundation on which an e-mentoring relationship can be fostered and established more readily. On the other hand, it may also suggest that undergraduate and community college students may be more in need of training and support, compared with graduate students, to enhance the likelihood they would be involved with successful e-mentoring experiences. Likewise, their ementors may also perceive that they need additional support to establish a successful mentoring relationship, as suggested by the finding that mentors paired with undergraduates and community college students rated the program features more positively.

Engineering graduate students make up a smaller percentage of participants in the ACE mentoring program than they do in the general one-on-one mentoring program. This is perhaps not surprising since the ACE program is for students interested in academic careers, which are a more traditional career pathway for graduate students in scientific careers, particularly the life sciences, than for those in engineering fields. A surprising find was that the engineering students enrolled in the ACE program reflect a higher ethnic diversity than those in the ACE program in other fields; the cause and possible implications of this diversity are unknown at this point. Evaluation is under way to understand students' motivations and expectations for participation and year-end formative and summative evaluation about the experiences of those matched in the program will provide interesting results about the program's effects.

Acknowledgments

MentorNet thanks its participating campuses and sponsors, including major funding from Alcoa Foundation, AT&T Foundation, the National Science Foundation, IBM, Intel Foundation, Cisco Systems and Microsoft. A complete list of sponsors can be found at:

http://www.mentornet.net/Documents/Partners/sponsors.aspx and MentorNet's participating campuses can be found at:

http://www.mentornet.net/Documents/Partners/Campuses/CurrentCampuses.aspx. Initial funding for the MentorNet ACE program was provided by WEPAN (Women in Engineering Program and Advocates Network) through the Faculty for the Future program funded by the GE Foundation.

This material is based upon work supported by the National Science Foundation under Grants HRD0001388 and. SBE-0318510. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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Biographical Information

JENNIFER DOCKTER Ph.D. Dr. Dockter is the Director of Programs for MentorNet (www.MentorNet.net). She is responsible for implementing, maintaining and enhancing MentorNet's programs. Originally trained as a research scientist, she earned her bachelor's degree in integrative biology from the University of California at Berkeley and the Ph.D. in biomedical sciences from the University of California at San Francisco.

CAROL B. MULLER Ph.D. Dr. Muller is the founder and CEO of MentorNet (www.MentorNet.net) and consulting associate professor of mechanical engineering at Stanford University. An educator and social entrepreneur, she has spent more than 25 years in higher education, including work in academic administration, strategic planning and budget development, external relations, faculty recruitment, admissions, educational program development, implementation, and evaluation, and facilities program planning and development.