AC 2007-2918: MENTORNET'S WISCONSIN AND HAWAII STATEWIDE INITIATIVES

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MentorNet's Wisconsin and Hawaii Statewide Initiatives

Abstract

The state of Wisconsin and state of Hawaii are the only states in the nation to have offered MentorNet membership to all public universities and technical colleges. This innovative partnership highlights a new model to launch MentorNet on college campuses. MentorNet, the E-Mentoring Network for Diversity in Engineering and Science and an award-winning nonprofit e-mentoring organization, offers a proven effective means to connect students (protégés) in science, technology, engineering, and math (STEM) majors with professionals (mentors) in industry, government and higher education. Since mentoring is recognized as an important engagement strategy to encourage women and girls to pursue STEM education and careers, other states can benefit from the story of the Wisconsin and Hawaii collaboration.

Hawaii's Maui Economic Development Board and Wisconsin's Milwaukee School of Engineering have partnered under a Women in Technology grant from the U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service. This grant is to encourage women and girls in rural areas to pursue STEM education and careers.

Because students at the Hawaii and Wisconsin partner campuses were enthusiastic about their MentorNet experience, the Women in Technology grant funded a two-year contract to waive membership fees for MentorNet for all four-year and two-year University of Wisconsin System and Wisconsin Technical College System campuses; 30 institutions could potentially participate. One of the aims of this program was to encourage more technical/community colleges to partner with MentorNet, broadening the range of mentoring opportunities for the diverse population of students who attend such schools.

To promote MentorNet participation in the Wisconsin systems, a collaborative team from Hawaii, Milwaukee School of Engineering, MentorNet, the University of Wisconsin System, and the Wisconsin Technical College System held a one-day orientation training in August 2005. A hands-on training session was offered via a phone/web conference in October 2005. During the first year, 24 campuses participated. The University of Wisconsin System includes 26 campuses: 13 two-year campuses, 11 four-year campuses, two large Ph.D. granting institutions and the University of Wisconsin Extension. Of the participating University of Wisconsin campuses, a majority of the MentorNet protégés (73%) came from four-year undergraduate programs. A solid majority (83%) were female. Students at one of the University of Wisconsin four-year campuses rated MentorNet higher than the national average for the statement "I feel that my college should continue to participate in MentorNet." The Wisconsin Technical College System has 16 colleges with 47 campuses; 12 of the 16 Wisconsin Technical College System colleges joined MentorNet in 2005 and have continued the relationship. Additionally, MentorNet created an E-Forum group specifically for technical college nontraditional students. In October 2006, the collaborative team followed up with a third MentorNet workshop for campus representatives.

This paper describes the statewide initiatives of Hawaii's and Wisconsin's projects, including the administrative aspect, the profile, numbers and evaluations of the protégés; a comparison of the

models; several case studies; and, the resulting collaborative efforts that evolved after the 2005 MentorNet in Wisconsin orientation workshop. This paper provides insights regarding implementation of such statewide mentoring initiatives and suggests effective strategies for other states to consider.

Problem

Gender equity is a key strategy for maintaining our Nation's preeminent status in science and technical innovation. The last 30 years have seen women make great strides in education and employment.[1] Women now receive more than 50 percent of the bachelors degrees conferred and are close to reaching parity in the once male-dominated fields, such as law and medicine. Unfortunately, these gains have not been uniform in all fields. Women continue to be persistently underrepresented in high-demand, high-wage employment fields of science, technology, engineering and math. While women make up nearly half of the American labor forces in 2003-2004 (Bureau of Labor and Statistics), they are less than 30 percent of the total science and engineering workforce.[2] At a time when we face a shortage of skilled STEM workers who are U.S. citizens, women provide an untapped national resource to fill the workforce pipeline.

Collaboration

The Maui Economic Development Board in Hawaii launched it's Women in Technology Project in 2000 to help educate, support and retain local women as part of the STEM workforce. The program is designed as a national demonstration project, originally piloting initiatives in the rural island community of Maui, and in subsequent years expanding statewide and regional programs. In 2005, the Milwaukee School of Engineering formed a partnership with Hawaii to encourage girls and women in rural Hawaii and Wisconsin to pursue STEM education and career opportunities. The Women in Technology project is funded in part by the U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service.

The state of Wisconsin and the state of Hawaii were the first states in the nation to offer MentorNet membership to all public universities and technical colleges. In 2000, the Women in Technology Project of the Maui Economic Development Board joined with MentorNet to engage MentorNet's programs with students in the state of Hawaii. Because Hawaii, Milwaukee School of Engineering, and the University of Wisconsin-Madison had a very positive response from students regarding their MentorNet experience, Hawaii negotiated a contract with MentorNet. Women in Technology monies funded two-year membership fees in MentorNet for all four-year and two-year public higher education institutions in Hawaii and Wisconsin.

Mentoring has been frequently cited as one of the key components of retention for students in engineering and related sciences, particularly for women and students of color.[i] MentorNet was founded as an e-mail service as e-mail became increasingly ubiquitous across college and university campuses and within workplaces, offering a new and highly-efficient means of connecting individuals who otherwise would not have the opportunity to communicate due to constraints of time and/or location. Because research suggested that women's retention in

engineering and related sciences is enhanced by effective mentoring, MentorNet was designed initially for women.

MentorNet (www.MentorNet.net), is a nonprofit (501(c)(3)) internet organization[ii] which offers technology-based systems and programs for matching thousands of undergraduates, graduate students, postdoctoral scholars, and early career faculty members in engineering and related sciences for one-on-one e-mentoring relationships with scientific and technical professionals working in industry, government, higher education, and nonprofit sectors. Given changing demographics in the student populations, as well as those evolving in the workforce, MentorNet has particularly focused its efforts on bringing mentoring to a highly diverse set of constituents. As of mid-2006, 92% of the protégés participating in MentorNet's One-on-One mentoring program[iii] were women and/or people of color underrepresented in science and engineering fields. These mentorships help the student-protégés learn more about career opportunities in their fields of interest, how what they are learning in class and labs relate to applications and "real world" situations, and how people with backgrounds in engineering and science engage in their work and lives on a daily basis. Through structured, e-mail-based conversations, student-protégés gain valuable information, confidence, increased interest, and the development of early professional networks.

Research-based and regularly evaluated, MentorNet's One-on-One program has matched more than 18,000 pairs of mentors and protégés since its One-on-One program was initiated in early 1998. MentorNet has been recognized with many national awards, such as the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring.[iv] During the 2005-2006 fiscal year, the MentorNet One-on-One program nationally matched a total of 2,523 protégés with mentors. Evaluation reports are readily available on the MentorNet Web site,[v] as are stories from individual protégés and mentors.[vi]

As a nonprofit service, MentorNet's financial model serves and relies on the partnership of organizations which provide financial support for operations, and also serve to connect the services to their constituents – engineering and science students and/or professionals. In 2007, MentorNet provides the centralized mentoring program and technology infrastructure for approximately 150 different partnering organizations - colleges and universities,[vii] corporations and government labs,[viii] professional societies, and other nonprofit organizations. To enable their students to participate, institutions of higher education and professional societies elect to provide an annual fee, based on institutional size, which is subsidized through support from MentorNet's corporate and government lab sponsors, as well as through individual donations and some grants and contracts. Campus fees range between $1,000 and $4,000 annually.

Partnership Model

The heart of this collaboration is the dedication of the members in advancing it's mission to advance women especially and people of color into the opportunities that STEM careers offer; thereby, making a difference in their own lives and that of others. This partnership brought together a diverse group of institutions, positions and geographic regions. Public and private universities, technical and community colleges, and nonprofit organizations worked toward a common goal. This included one CEO, one vice-president, three STEM faculty members, and

four program directors that planned and organized the structure of the initiative via phone conferences and e-mail over the summer of 2005.   These members shared responsibilities and gracefully exchanged power, thereby, avoiding getting waylaid by territorial politics.

Implementation

While MentorNet provides an infrastructure, the individual campuses implement the program in ways that work for their system. Thus, the campus representatives bring MentorNet to life. After a series of phone conferences to identify the needs of the participants, two members of the collaboration team recruited campus representatives within their systems. Three orientation workshops for campus representatives were held; one in August 2005 at the University of Wisconsin-Madison, a second web-based conference in October 2005, and a third at Fox Valley Technical College in October of 2006. These conferences provided campus representatives with basic information and confidence about MentorNet and how to spread the word to students on their campus.

The format for the first orientation included: an overview of MentorNet by Carol Muller, Founder and CEO; a diverse student panel; the perspectives of three professionals on the value of mentoring as a successful strategy; a panel of campus representatives experienced with MentorNet explained marketing strategies and responsibilities of campus representatives (communicating to students, verifying the eligibility of students and trouble shooting); and, participants were informed of STEM outreach initiatives in Wisconsin. The orientation ended with small group discussions on implementing MentorNet so that participants had an opportunity to process the information before leaving. The feedback received about the program was very positive, with respondents appreciating the variety of viewpoints presented, the opportunity to network, and the opportunity to learn about MentorNet.

After the 2005 orientation, 24 campuses registered with MentorNet of which 10 were technical colleges. Three conference calls were held with technical college campus representatives to share tips on identifying and creating teams of champions for STEM students. Best practices related to promoting MentorNet were shared.

Responding to feedback from the 2005 orientation workshop, the 2006 orientation included a hands-on session conducted in a computer lab so that participants could work with the MentorNet site as features were highlighted. Within this structure, new representatives were able to register. Participants appreciated hearing the keynote speaker from a STEM field who provided inspiration and showed the necessity of support systems for women in STEM majors. This second orientation drew not only new campus representatives but some veterans who wanted to learn more about MentorNet resources. The feedback was again very positive.

Prior to this project, there were few technical/community colleges enrolled in MentorNet which can be an ideal format for women at technical colleges who are largely nontraditional students. This pioneering venture propelled MentorNet to develop a forum on their E-forum discussion group site for women enrolled at technical colleges.

Further Outreach as Result of the Collaboration

The August 2005 orientation was the first time that campus representatives from the University of Wisconsin and Wisconsin Technical College System met on a large scale. As a result, networking between institutions began which resulted in seed grants from the Women in Technology program for a targeted area in rural Wisconsin.

MentorNet memberships were a part of the larger Women in Technology program that focuses on serving females from middle school through college age. The MentorNet orientation meetings provided fertile ground to develop relationships with educational institutions in the Women in Technology target area. Successful partnerships resulted from individuals meeting at the MentorNet orientation that continue to grow and develop into new programs. A sampling of these activities included a seed grant to University of Wisconsin-Sheboygan to develop Grow Your Future, a hands-on STEM day-long program for high school girls. Personnel from University of Wisconsin-Sheboygan, Milwaukee School of Engineering and community organizations met to collaborate on this program. Milwaukee School of Engineering female engineering students planned and led an engineering section while an alumnus was the event's keynote speaker. From this event a mailing list of high school girls interested in math and science was developed. Scholarships to summer engineering programs were offered to these girls. Three girls accepted this invitation. In addition, a trip was coordinated with personnel from the Wisconsin Technical College System, the Grow Your Future mailing list and local high school technology education teachers to take girls to a statewide career conference for high school girls. Tables have been staffed at county career fairs for high school students by a partnership of Milwaukee School of Engineering and the Wisconsin Technical College System. Milwaukee School of Engineering recruited an alumnus to keynote an orientation training. This individual has been recruited to be the keynote speaker at the 2007 Grow Your Future event at University of Wisconsin-Sheboygan. Milwaukee School of Engineering was invited to participate in the Young Women's Conference, a career exploration day for middle school girls, at University of Wisconsin-Sheboygan. That participation led to collaborations with two of the community planning organizations (4-H and Girl Scouts) to recruit the first female team to participate in Rockets for Schools. Girls will construct a six-foot rocket, design a payload and launch the rocket along with 40 other teams in May. Over 350 middle and high school girls have been served by relationships developed at the Mentoring orientation training. These programs help to increase the number of girls in the STEM pipeline.

Campus Models

University of Wisconsin System

The University of Wisconsin System comprises 26 campuses which include 13 two-year campuses, 11 four-year campuses, two large Ph.D. granting institutions and the University Wisconsin Extension. The population size and degree of student diversity ranges widely from campus to campus. Some of these campuses offer engineering and technology degrees, but most offer only science and math degrees. When MentorNet was offered for free to the System campuses, it was met with varying degrees of excitement. One Ph.D. granting institution, the University of Wisconsin-Madison, was previously enrolled and the other immediately registered. Of the four-year campuses, eight out of 11 campuses enrolled right away. These campuses

immediately enrolled between 2 and 25 students. The two-year campuses did not embrace the opportunity to host MentorNet as quickly. Presumably, this is because they have fewer staff people on their campus that would be able to take on the job of a campus representative. Faculty members at these institutions have very heavy teaching loads, and there are fewer student support services.

The University of Wisconsin-Madison is a public university with approximately 28,500 undergraduates and 11,400 graduate and professional students. Thirteen schools and colleges and 133 academic departments form this 157-year old university. Schools and colleges that focus on subjects in sciences, engineering and mathematics include the College of Agricultural and Life Sciences, the College of Engineering, the College of Letters and Sciences, the School of Medicine and Public Health, the School of Nursing, the School of Pharmacy, and the School of Veterinary Medicine.

University of Wisconsin-Madison has offered students the opportunity to participate in MentorNet through the Office of the Provost since 1998-1999. Historically, staff members in the Provost's Office have played a coordinating role by seeking contributions from the deans of STEM disciplines to cover the MentorNet participation fee (including a contribution from the Provost's Office), and by disseminating information about MentorNet to prospective students, in collaboration with colleagues from across campus. Provost Office staff members verify student eligibility to participate. Also, staff members make efforts to encourage the involvement of faculty members as mentors (since the Academic E-mentoring Program began in 2003-2004), and inform University of Wisconsin-Madison STEM alumni of the opportunity to serve as mentors by sharing information about MentorNet with alumni newsletter coordinators.

The University of Wisconsin-Madison advertises MentorNet through a variety of sources including direct e-mails to students in STEM fields, and to members in student organizations such as SHPE (Society of Hispanic Professional Engineers), SWE (Society of Women Engineers), and NSBE (Wisconsin Black Engineering Student Society). Also, in more recent years, e-mail messages have been sent to coordinators of women and science programs (WISELI, WISE), TRIO program directors (Student Support Services, McNair Scholars Program), directors of undergraduate summer research programs, and directors/coordinators of campus advising and research programs such as the Academic Advancement Program and the Undergraduate Research Scholars Program. Additionally, announcements have been made and MentorNet posters distributed at University Honors committee meetings and academic advising committee meetings. All new faculty receive a copy of the MentorNet brochure in their new faculty welcome packet. Finally, MentorNet is introduced as a valuable opportunity to undergraduate students in the Women in Science and Engineering residential learning community (dormitory).

Since the University of Wisconsin-Madison became a member of MentorNet in 1999, 329 protégés have been satisfactorily matched. This count includes 296 women and 18 men (known) or 121 undergraduates, 203 graduate students and 5 post-docs. There are 109 University of Wisconsin-Madison alumni/ae in the MentorNet community with 42 active in MentorNet and 37 matched as mentors at the present time. Periodic evaluations of the program have been conducted by University of Wisconsin-Madison. Feedback from student participants suggest that

they find the MentorNet program very valuable and they recommend the program to their friends.

Wisconsin Technical College System

Wisconsin Technical College System has 16 colleges with 47 campuses. The mission of the Wisconsin Technical College System has been, and continues to be, education for employment. Most students have multiple, non-optional commitments including family and work that compete for time. The median age for a Wisconsin Technical College System student is 32 years[3]; 87% of full-time students work at least one job, and 14% are economically disadvantaged.[4] Sixteen percent are single parent/displaced homemakers with many students performing the work of parenting without remuneration. MentorNet has been added to an array of support services addressing needs ranging from financial, academic, family and personal support, leadership development and career development. It is a tool and resource that helps the Wisconsin Technical College System colleges promote the career development, advancement and retention of students in STEM related programs. The pipeline of students from STEM-related programs in the technical college to advanced STEM related degrees will most likely include employment as part of the educational pathway.

The Vice Presidents of Student Services for the technical colleges were the chief administrators to support the service. The campus representatives, however, were recruited from front line staff who work with students who are enrolled or wish to enroll in programs of study which are nontraditional for their gender, as well as staff who provide recruitment and support services for minority students.

The technical college nontraditional program coordinators wanted to be able to offer additional services to women who were in technical programs of study such as welding and machining, that are not STEM, but which may lead to an increasing interest in STEM fields. In response, MentorNet customized a discussion board specifically for Wisconsin Technical College Students in nontraditional programs of study. A campus representative utilized this site to generate traffic.

Milwaukee School of Engineering

Milwaukee School of Engineering is a private university where the majority of undergraduate and graduate degrees are in engineering. The majority of the student body of approximately 2,000 students is full-time, white males. It has offered MentorNet through the Student Life Office under the leadership of the Dean of Students since 2001. The primary role of promoting MentorNet is through the Coordinator of Women's Connections (part-time employee) and a secondary role is performed by the Assistant Director of Counseling Services. Women's Connections begins the promotion process in June with the on-campus registration of students. Female students and their parents receive handouts on MentorNet in a packet designed for women. When female students arrive on campus for a Women's Connection three-day orientation before school starts, they hear about MentorNet experiences from returning students and receive MentorNet brochures. Once school begins, Women's Connections encourages MentorNet participation through MentorNet posters throughout the campus and colorful monthly e-mails; frequently with a reward of a gift certificate/shirt/goody bag if a student signs on by a

certain date. E-mails frequently contain testimonials of why students value MentorNet (taken from MentorNet's "Evaluation results for your protégés"). In the past two years Counseling Services notified students, faculty and alumnae every other month through its e-mail distribution system. Counseling Services encourages MentorNet for students who come in for career counseling. During the annual career fair, a MentorNet outreach occurs to students and employers. When MentorNet was first offered on campus, Women's Connections met with faculty members and sent emails and flyers to explain the benefits; consequently, many of these faculty members promote MentorNet in the classroom. This model is effective at the Milwaukee School of Engineering because of the outreach of Women's Connections, the interactive style of the Student Life Office, and students encouraging students. Since the 2001-2002 academic year, 199 MSOE protégés have been satisfactorily matched primarily white females (155 women, 44 men). In the past two years, the percentage of male protégés has increased (13 out of 28 for this academic year). Currently, 43 alumni/ae are active in MentorNet with 14 matched as mentors.

Maui Economic Development Board

The Women in Technology Project of the Maui Economic Development Board enlists a statewide partnership which began in 2000 with the campus enrollment of one community college within the university system. Discussions with the MentorNet's CEO culminated in Maui Community College being part of the first cohort of community colleges to participate in the MentorNet's protégé program expansion. With a shared mission, both partners recognized that community colleges have significant female and minority enrollments--often more diverse than their university counterparts--and that bringing community college students into the STEM pipeline is a key strategy for building diversity in the engineering professions. The Hawaii program continued to expand over the next three years growing to the point where today it serves the nine public institutions in the state, seven community colleges and two universities,[ix] providing their students with access to MentorNet programs. Between the start of the partnership in 2000 and January 2007, 236 students across these nine institutions have been matched in mentoring relationships through MentorNet's One-on-One program. Recruitment efforts are spearheaded by a program manager from the sponsoring Women in Technology project who cultivates a local campus representative to provide ongoing recruitment. Each campus reflects its unique community, so it has been important that recruitment strategies are customized to meet differing campus needs. Faculty, staff and students have all been engaged to serve as campus representatives. Peer recruitment by fellow students has proven to be most effective. At the University of Hawaii, MentorNet has provided a platform for reinvigorating the student chapter of the Society of Women Engineers. SWE members promote MentorNet participation as a benefit of membership.

Mentors

Mentors report a great deal of learning from their mentoring relationships, including increased mentoring and communication skills, new information and relationships, insights into the experiences of those who are different from themselves, and new perspectives on their work. The use of e-mail enables the participation of busy professionals and students alike whose time and schedules might not otherwise allow these mentoring relationships to develop and thrive. Scott Morgan, an engineer with Motorola, has mentored a senior and a freshman from the

Milwaukee School of Engineering. Morgan focused on interviewing and the job search with the senior student and how to get involved with campus life with the freshman. Morgan believes that "they have become more successful in their endeavors because of it. This is satisfying to me." Interestingly, although not unexpectedly, the percent of mentors from private industry decreased with an increase in the educational level of the protégé, while the percentage of mentors from the academic sector increased concurrently with the educational level of the protégé. This makes sense, as protégés who are seeking advanced degrees are likely seeking these degrees because of a desire for a research-oriented position. While the majority of mentors for the Milwaukee School of Engineering were male (55%), a majority of 63% for the University of Wisconsin System and Wisconsin Technical College System were female.[5] These two Systems have a mix of science, technology, engineering and math students.

Protégés

Prospective protégés and mentors are matched based on a 34-variable algorithm, including gender. Thus, they have the option to express a preference or requirement to be matched with someone of the same gender or other gender. Protégés report they especially value the input of an "objective" and more experienced person with whom they can explore questions, decisions, and opportunities separate from the resources available to them on campus. Enrollment of protégés from this partnership tended to be cyclical with peaks in matches near the beginning of the participating semesters. There was a peak of matches between protégés and mentors in October and November following orientation events.[6]

A total of 330 protégés from the Hawaii-Wisconsin partnership were matched with mentors during the first 17 months of the partnership. A large majority of the protégés was female (75%). The mentors for these students were primarily women (58%); however, it was not unusual to see a woman matched with a male mentor and vice versa. A total of 16% of protégés identified as a racial or ethnic minority as classified by the National Science Foundation (African American, Latina/o, Native American or Hawaiian), while 9% of the mentors identified with one of these classifications. Wisconsin has a relatively large population of Southeast Asian students who are underrepresented in the higher education system overall in the state. Unfortunately, these students fall under "Asian" for census purposes and are thus lost to us in the typical racial/ethnicity data classifications. However, for enrollment purposes, we do classify Southeast Asian students separately in the state of Wisconsin.

Table 1, describes several factors about MentorNet protégé participation from Wisconsin (including the private partner, Milwaukee School of Engineering) and Hawaii schools. The data below refers to protégés who were matched between August 2005 and December 2006.

Table 1 Protégé Participation

	Wisconsin Schools	Hawaii Schools	Total
Number Schools Enrolled	25	9	34
Total Matches	261	69	330
Female (%)	80	57	75
Male (%)	20	43	25

Two-Year College (%)	10	20	13
Undergraduate (4-year) (%)	73	65	71
Masters Degree (%)	6	7	6
Ph.D. (%)	9	7	8
Postdoctoral Scholar (%)	1	0	1
Early Career Faculty (%)	1	0	1

Case Studies

In the University of Wisconsin System MentorNet consortium, a majority of the MentorNet protégés (73%) came from four-year undergraduate programs. A solid majority (83%) were female. Student survey results from one of the University of Wisconsin System four-year campuses show that their students rated MentorNet higher than the overall MentorNet average for the statements "I feel that my college should continue to participate in MentorNet" and "I think more students in my program would participate if they knew more about MentorNet benefits." However, they rated MentorNet less than the overall average for statements such as "I am more motivated to succeed in my chosen field" and "MentorNet filled a gap in my support system." This campus is a relatively small 4-year campus that, compared to the overall MentorNet average, may have more student support services available and one-on-one faculty.

University of Wisconsin-Madison student, Natalie Enright, has been involved with MentorNet not once, but twice; her story was the focus of an article in MentorNet News, October 2005. A doctoral student at the University of Wisconsin-Madison, Natalie turned to MentorNet when she was a sophomore at Purdue University. But when she sought guidance again as a second-year graduate student at the University of Wisconsin-Madison, she received even greater insight the second time around. When Enright first turned to MentorNet, she wanted to learn what it was like to be an engineer; something her classes weren't able to show her. She was also considering an internship and wanted advice on jobs and how she should structure her resume. Her first mentor offered this and more. "My mentor gave me more confidence and made me feel like I was on the right track," said Enright. "She painted a picture of what being an engineer was like for her, what her job entailed, and what options I had available to me." When she began her graduate studies, she was 95% sure that she wanted to pursue an academic career. However, she wanted to be absolutely certain that it was the best path for her. "I thought a mentor with a master's or Ph.D.—who had opted to work in industry—could help me see the differences between the two careers," explains Enright. But that wasn't the main reason Enright sought a mentor's guidance. "I was really struggling that year and feeling very isolated, like I was fighting this constant uphill battle to prove myself," Enright continues. "I questioned whether it was possible to balance a research position with a family. I didn't know any women at my institution who were doing both and making it work. I was looking for reassurance." And that's exactly what she got—and then some. Enright's second mentor relationship offered more, because she had clearer expectations this time. Enright was also more comfortable asking her mentor—who was a great sounding board and very supportive—anything. "Whenever I would tell her about an incident that I found frustrating, she would often tell me of a similar situation she experienced," says Enright. "For me—and many female engineering students—we simply want to know that we're not alone and that it's possible to succeed. My mentor really helped me feel that." One situation in particular stands out for Enright. Shortly after she started working with her second

mentor, she took a six-month internship at a company, where she encountered sexism and discrimination. Not knowing any other women at the company, Enright turned to her mentor, who shared her experiences with Enright. "Even if I had known other women within the organization, I probably wouldn't have sought their help. I needed a safe environment to discuss the issues; and my mentor, who was completely removed from the situation, provided that," states Enright. She has found this to be true in a number of situations. Although she has a great relationship with her advisor, Enright is sometimes more comfortable sharing her concerns with someone outside of her immediate academic world. While her girlfriends are extremely supportive, they don't always offer an objective perspective. "Sometimes, I need someone who can take a step back and say, 'hold on, you're blowing this way out of proportion,' or 'yeah, you have every right to be upset,'" Enright explains. "And my mentor does exactly that." When Enright first contacted MentorNet, she didn't feel she needed a mentor. She was doing it because she thought it would be fun and she needed a bit of advice. But now she realizes the benefits of having a mentor and credits the supportive relationship with helping her stay on track and believe in her abilities. She also looks forward to being a mentor. [7]

It remains a challenge to get a large enough group of students participating to be able to determine how effective MentorNet may be with Wisconsin Technical College System students. MentorNet has been very receptive to making changes to address the needs of the technical and community college student by creating customized discussion boards and by helping campus representatives better guide students to fields that are aligned with technical college programs of study. Wisconsin Technical College System students are more attracted to mentors who could help them network for a potential job. A counselor from one of the Wisconsin Technical College System colleges followed up at the end of 2005-2006 by phone with their six protégés. She found that students were generally pleased with the experience. A young female student in the information technology program shared that she found the program extremely beneficial and that she has developed a relationship for future mentoring/assistance. The counselor observes that this young woman had a lot of ambition and drive coming into the program and was a perfect candidate to be a protégé. The counselor observes that she is a student less encumbered than some by competing priorities and one to make the most of her opportunities. The student is interested in continuing with her mentor/protégé experience and is expanding her career options to include the pursuit of a degree beyond the associate degree level.

Milwaukee School of Engineering student, Mandy Plumley, has been active in MentorNet for four years. She appreciated the informality of communicating with the mentor; i.e., not putting on a professional demeanor that she perceived a face-to-face contact would include; therefore, "I can be more myself." Especially during her first two years of school when she did not have a professor who she knew well enough to ask personal questions, Plumley valued the support and influence of her mentors. At times that meant help with homework, resume writing, and interpersonal situations. She valued hearing about the reasons behind her mentors' decisions to change positions or to go back to school. Her first three mentors felt like "an experienced peer"; females who were flexible with communicating bi-monthly. She has discontinued her relationship with her male mentor this year because she felt frustrated with his expectation that communication should be weekly and prompt, and he was not in her major field. Plumley took advantage of MentorNet's resume posting but was dissatisfied with the formatting result of the text box and wished she could upload her resume as a pdf. She valued the anonymous posting

on the E-Forum and the up-to-date topics, but wished that there was more interaction. Plumley valued the freedom of choice that she had in communicating with her mentors over a four-year period, the sharing of their experiences and perspectives, their sense of humor, and the encouragement and concern that they expressed for her.

Voices from Hawaii express gratitude for their MentorNet experience. From Maui Community College student-protégés remarked about their MentorNet experiences: "The most important information was that a woman can succeed in the IT field while having a family life. My mentor was very busy dealing with a new job, and she provided a positive outcome, as well as a good example." "Knowing that there were other women working happily in the technical field was the best knowledge there was, especially when the homework assignments got harder and jobs were hard to come by." From Maui Community College: "It allowed me to take a big step and become very clear on my major, to not fear or care about preconceived notions concerning women in science. To continue focused on my course even if against odds." From a student-protégé at University of Hawaii: "I've learned what's actually being used in the work force. Because school and the work field are so different, I've learned to see how they tie together and what I really need to focus on in school to get where I want to be."

Campus Representatives

In the University of Wisconsin System, a slight majority of the campus representatives are faculty members at their institution. In the Wisconsin Technical College System, the campus representatives are predominantly student advisers. The advantage to having faculty representatives is that they can target the science and engineering students in their classes. However, this population of campus representatives also has a harder time attending conferences and collecting data about their student protégés, due to their instructional and research responsibilities. The advisers who are MentorNet representatives have been able to be more active in providing feedback and attending meetings. However, these representatives may have less contact with STEM students because they have a responsibility to other populations of students.

Depending on the campus model that is used, campus representatives are recruited from faculty, staff or students. As stated under "Implementation" three orientation workshops were held for campus representatives. In addition, MentorNet created two web-based discussion groups to support the Wisconsin initiative: "Wisconsin-MentorNet" and "Wisconsin Technical College Students." Campus representatives and MentorNet staff have used these to post information. At this time the replies (3) to questions are low in comparison to the number of individuals who are viewing (182) them.

Although MentorNet is an e-mail based program, the face-to-face workshops gave confidence in the execution of MentorNet. In addition they generated awareness and enthusiasm for STEM outreach to underrepresented populations. An August 2005 evaluation response to the question, "What did you like most about this program?" summed up the majority of workshop participants: "Super program and excellent presentation (the day went quickly!)." Responses with more than three similar answers to "what did you like most" were: "the opportunity to learn about MentorNet", "the variety of viewpoints presented—campus reps, protégés, mentors, students'

perspective", and "the networking opportunity with individuals from across the state." It was noted at this workshop that campus representatives who were staff members often did not have a background in STEM and had felt alone in trying to promote it.

The October 2006 workshop evaluations were also positive. Evaluations showed that participants valued the hands on navigation of the MentorNet Web site, tips on promotion, revision of protégé profiles to get a match, and encouragement of underrepresented populations. Needed support for staff/faculty in carrying out their responsibilities was shown in the comment, "I didn't know any of this existed, thanks for sharing the knowledge." Break-out discussions were again used to process the information and take ownership. Some questions to assist this process were:

    What student need do you hope that MentorNet will serve?
    How will you get the word out about MentorNet?
    How can you follow-up to ensure that students register for MentorNet and continue
    their relationship with their mentor?

In response to "What challenges do you face in retaining and/or recruiting women and underrepresented students to STEM programs?" respondents cited lack of academic preparation, lack of exposure to STEM programs/careers, lack of role models, and lack of interest on the part of women.

In February 2007, two members of the collaborative team surveyed the campus representatives from their systems. With three of the University of Wisconsin System campuses responding, the results were fairly unanimous in response to all questions. All campuses would like to continue to offer MentorNet. Campus representatives felt that some of the benefits that students receive include a unique link with the professional world, guidance and support from mentors as students attempt to enter the competition of the workforce, and practical professional advice. The primary method for letting students know about MentorNet on these campuses has been through e-mail messages. The unanimous response to the question of campus obstacles to participating in MentorNet is cost of the service. The biggest obstacle they all saw to student involvement was lack of student time (or students not taking the time to sign up). When asked if the representatives thought that faculty would benefit from participating in MentorNet, the response was not as positive. One representative did not see any benefits to faculty members, and another representative mentioned that it's difficult to get faculty to engage in activities outside of teaching, research and college service requirements.

With four of the Wisconsin Technical College System campuses responding, the results were fairly consistent in response to the survey. Many strategies have been used to promote the service including forming teams of champions to spread the word to faculty, deans, counselors and students by means of campus newsletters, email correspondence, posters, flyers, support group meetings and announcements. Three of the campuses were skeptical about their continued involvement. It has been very difficult to get students to make the commitment to developing a mentor/protégé relationship because of a lack of time available to the adult commuter student. Since the campus representatives value the development of mentoring relationships for students, it becomes disheartening to struggle to get the technical college student to invest in such activities.

It may be very beneficial to involve Wisconsin Technical College System faculty in MentorNet as members or as protégés. The women who teach in the STEM programs in our system may benefit from the guidance and networking that a mentor could provide. Also, faculty is required to have work experience in the field related to their specialties, and they could be excellent potential mentors for technical and community college students. Once a faculty is fully certified to teach in our system, participation in an activity such as mentoring may be able to count toward certification renewal.

Challenges and Opportunities

The passion for bringing women forward into STEM fields is essential for the collaboration team to be effective; thus, the political issues or territorial concerns of institutions can be put aside and the team can focus on its mission.

Institutions that are considering statewide mentoring initiatives may want to consider implementation strategies that made this partnership cohesive. First of all, start early. In order for the team to proceed with its business they profited from getting to know each other; part of the tele-conference calls dealt with finding out the roles and activities of the members. Before the first orientation session, most of the collaboration team met for the first time over dinner to discuss the orientation agenda and to get to know each other. Secondly, put together a strong team in which the members know the campuses within their institution and who have influence with high-level administrators who make financial decisions. Third, recruit campus representatives who understand the importance of STEM education and career opportunities, and who have the time to do an effective job. Fourth, make the orientation sessions practical so that campus representatives, who typically perform a variety of roles, can hit the ground running rather than lose time trying to figure out how to implement a valuable tool on their campus. Lastly, provide time for the campus representatives to meet with each other and the team in small groups so they can build on each other's ideas. That way they will feel free to ask more questions and contact each other throughout the year.

The workshops have worked well because representatives could share best practices and implement ideas. Thus, the exposure to STEM career development awareness mushroomed. Participant feedback from the orientations expressed a high value for the hands-on sections of the agenda. Campus representatives with a variety of responsibilities could see exactly where to go for their campus statistics, and even get started on registering and ordering brochures. At the October 2006 workshop, it was noted that campus representatives were not aware of the special Wisconsin website that MentorNet had designed for them. Therefore, MentorNet decided to send them the link quarterly.

The technical college campus representatives asked if additional programs of study could be added to the MentorNet list of programs as technical college students did not always relate to the fields that they were allowed to choose from. Some students had opted not to participate in MentorNet rather than attempt to figure out an appropriate field. MentorNet programmers were concerned that if programs of study became too specific, it would be come more difficult to find mentors. Additionally, the programming might by very difficult and costly as the current data base is aligned with occupational categories recognized by the Occupational Outlook Handbook.

MentorNet will explore incorporating occupational descriptions that are inclusive of the associate degree titles affiliated with the various fields of engineering and technologies. Such changes will benefit those who are studying in the STEM fields below the baccalaureate level.

From an administrative stand point the two year universities and the technical colleges utilize MentorNet differently than the four-year campuses. Another finding was institutional infrastructure: because the University of Wisconsin System operates from the top-down, not all administrators recruited campus representatives to carry out MentorNet.

Concerns were voiced by campus representatives from technical colleges about the competing needs of the adult student and skepticism (along with hope) that students would see the value of e-mentoring for technical college students. As most of these campus representatives serve a wide variety of students, their expertise is not necessarily in STEM issues. Therefore, campus representatives who are not in STEM fields may have to be educated on what STEM careers entail, the benefits of the recruitment of women into STEM, and how to support women in STEM education.

Participants appreciated the many self-contained services of MentorNet which allows for immediate usage by an institution after registration. The Wisconsin campuses identified varying degrees of concern regarding funding to continue with MentorNet. Generally, it is a new budget item for a campus. Since the Women in Technology grant funded a two-year contract to waive memberships fees, campuses in the Wisconsin partnership have the advantage of using MentorNet for up to two years and can report on student usage and student feedback. Some suggestions for funding sources have come from campus representatives and MentorNet associates during this last year of the grant-funded program. Universities can pool their funds from all of the colleges that enroll students in STEM fields. Colleges can consider a combination of academic and student services departments. Funding can be obtained through grants that focus on increasing student diversity or student retention. Local corporations can be enlisted to cover fees for campuses in their area, since they often look to these institutions for their future STEM employees. For example, Texas Instruments is helping to support some college and university memberships to MentorNet in Texas. In addition, MentorNet offers a 10% discount for campuses that renew their registration ahead of time.

The next challenge for the Wisconsin MentorNet partnership is to identify more employers and researchers (particularly Wisconsin-based) that will support our students and our programs more directly. Also, there is interest in some of the Trade Associations in starting an e-mentoring project that would help encourage and support more women and underrepresented minorities to begin apprenticeships in skilled trades. MentorNet could be a potential platform for such a service should the idea unfold.

Because the first orientation brought three Wisconsin institutions together and provided for interaction and the sharing of opportunities in STEM career development, the spirit of collaboration expanded benefiting more organizations and young girls in rural Wisconsin. A number of further collaborations and seed grants resulted.

The MentorNet outreach adapts to the campus culture and campus representatives. Another benefit that was experienced was that the involvement reinvigorated existing campus departments. The results of the workshops and outreach meetings of resulting collaborations promoted awareness of STEM careers, and campus representatives are now more aware of STEM opportunities. For MentorNet this has been its biggest partnership. It has been positively impacted by the dedication and enthusiasm of the collaborative team to spearhead the project. MentorNet values the effectiveness of the team to work locally on the ground with campus representatives within their respective institutions who are familiar with them. Campus representatives value participating in MentorNet's award winning, effective program as a means to encourage and support more women into nontraditional fields.

Endnotes

[i] Just as one example, the United States Government Accountability Office (GAO) cited mentoring as a key component in retaining students in STEM fields in its October 2005 Report to the Chairman, Committee on Rules, House of Representatives (Higher Education: Federal Science, Technology, Engineering, and Mathematics Programs and Related Trends) – see http://www.gao.gov/new.items/d06114.pdf

[ii] MentorNet's mission is to further the progress of women and others underrepresented in scientific and technical fields through the use of a dynamic, technology-supported mentoring network, and thereby to advance individuals and society, and enhance engineering and related sciences, by promoting a diversified, expanded and talented global workforce.

[iii] Within MentorNet's One-on-One programs, prospective participants get full information, complete online profiles, and access training materials including case-study-based tutorials from MentorNet's web site. MentorNet has developed and refined software programs and related systems to conduct bi-directional matching of protégés and mentors based on the profiles completed by the students and professionals who are prospective protégés or mentors. These profiles collect information about the protégés' and mentors' backgrounds, demographics, topics of primary interest, and preferences for characteristics of the individual with whom they will be matched. Prospective mentors and protégés also include a short personal statement as a part of their profiles, and these can be part of the information upon which a protégé bases a decision about which mentor to select. Once a protégé completes a profile, s/he then may select a mentor from among anonymous profiles of the top five mentors available who best fit the protégé's specifications, and for whom the protégé meets the mentor's specifications. Once a mentor is selected, s/he receives an email to make sure the mentor is still available, and when confirmed, the pair is matched. At that point, the protégé and mentor are each provided the first of a series of email messages which offer direction and coaching to develop and sustain the e-mentoring relationship, using MentorNet's customized training and coaching curricula. The coaching curricula are based on research related to developing strong mentoring relationships, to the common experiences in engineering and science of students (or early career faculty), and to using electronic communications to develop relationships. Coaching messages are emailed weekly to undergraduate students and their mentors, and every two weeks to graduate students, postdocs, and early career faculty members and their mentors. In developing MentorNet's One-on-One program, distinctions were 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) masters students, and 5) doctoral students. Different, but parallel, coaching messages are sent to mentors and protégés. There are also specialized coaching curricula for the Academic Career E-Mentoring pilot program, for graduate students, and for untenured tenure track faculty, as well as for their tenured faculty mentors. Due to the electronic nature of the relationship, mentors and protégés may communicate when it is convenient for each party. The relationship is also very efficient – many participants report very productive relationships with a time commitment of only 20 minutes per week or less. MentorNet's One-on-One e-mentoring relationships are designed to last for an initial period of eight months, at which time the mentor and protégé are advised to evaluate their relationship, and are given guidance either to bring it to a close, or determine if the relationship will continue, for another eight month cycle via MentorNet, or on some more informal basis. As the relationship ends, all participants are asked to complete online "end-of-relationship" surveys which help to inform evaluations. All of this

is accomplished through MentorNet's customized patent-pending systems, which link the database, matching algorithm, and a very large number of scripts, timing, etc. to allow the programs to work on a large scale.

iv See http://www.Mentoring.net/Documents/About/media/awards.aspx Awards and Recognition

v See http://www.MentorNet.net/documents/about/results/evaluation/

vi See http://www.MentorNet.net/Documents/Files/Mentoring_panel_program.pdf for some examples.

vii See http://www.MentorNet.net/Partners/Campuses/currentcampuses.aspx for a current list.

viii See http://www.MentorNet.net/Partners/Sponsors.aspx for a current list.

ix Hawaii Community College; University of Hawaii, Manoa; Maui Community College; Kauai Community College; Honolulu Community College; Kapiolani Community College; Leeward Community College; Windward Community College; and University of Hawaii, Hilo

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[2] 2004 Women Minorities and Persons with Disabilities in Science & Engineering NSF, NSF 04-317, p.176.

[3] Wisconsin Technical College System client reporting data, 2005-2006.

[4] A comparison of Wisconsin Technical College System client report data with Wisconsin Department on Workforce Development Unemployment Insurance data, 2005-2006.

[5] Statistics from MentorNet.

[6] Statistics from MentorNet.

[7] Madison Case study: MentorNet News, October 2005, by MentorNet, the E-Mentoring Network for Diversity in Engineering and Science. www.MentorNet.net