THE VALUE OF INDUSTRIAL ELECTRONIC MENTORING PROGRAM WHAT HAVE WE LEARNED OVER TWO YEARS?

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In 1995, WISP received funding from the AT&T Foundation for Electronic Connections, a telecommunications initiative which included a two year pilot program to investigate the potential value of industrial electronic mentoring ("e-mentoring") as a way to link undergraduate and graduate women in science, math, and engineering with professional scientists and engineers in industry. WISP developed this program to foster a stronger connection between students' academic studies in a remote, rural college campus with the world of the industrial workplace. Through e-mentoring, mentors offered students avenues for information about post-graduate opportunities in industry, and provided personal and professional guidance, support and encouragement in pursuit of their studies in the sciences. WISP has completed this two year pilot electronic mentoring program and is now one of 15 institutions participating in MentorNet, the new national electronic mentoring program, sponsored by WEPAN and based on the model developed by WISP at Dartmouth.

An evaluation for each of the two years of the pilot program was conducted by independent research consultant, Dr. Cynthia Char (Char, 1996, 1997). Findings provide insight into the value and distinctive qualities of electronic mentoring for both student proteges and their mentors, and suggest recommendations for improving electronic mentoring programs in the future.

Description of E-Mentoring Program (EMP)

EMP Participants: In Year I, 34 students at Dartmouth and 31 professionals from industry participated in the program. The students ranged from first year to graduate students and the professionals from industry (25 women, 6 men) were drawn from nine different organizations located in northern New England, including computer and communication companies, a bio tech firm, and scientific research companies.

In Year II, the EMP expanded to include 43 students and 41 mentors. As in Year I, students ranged from first year students to graduate students. The pool of mentors (37 women, 4 men) expanded beyond New England representing 22 organizations located in 13 states across the country. Organizations included computer and communication companies, chemical and pharmaceutical companies, a bio tech firm, an automotive manufacturing company, and scientific research companies. Fourteen mentors and three students were returning EMP participants.

Program structure: For the initial year of the EMP, the program structure and resources were streamlined and relatively modest. Project staff—a part-time administrator and part-time student coordinator—identified, selected and matched interested protégé and mentor participants based on common fields of interest. An initial face-to-face dinner was organized to kick off the program in the fall, and all protégés and mentors were required to attend. Additional requirements for participation were fairly minimal: participants must be willing to communicate via e-mail at least once a month, throughout the full seven month duration of the project (November '95 - May '96). E-mail communication between the student coordinator and participants was limited to reminders to keep up communication at the mid-point of the program, and delivery and follow-up of the on-line surveys conducted as part of the program evaluation.

In Year II, the program structure and staff resources were expanded. Modifications in Year II were based on recommendations from the Year I program evaluation. Some protégés and mentors in Year I had expressed a desire for a closer match between a student's projected career interests and her mentor's profession, the need for a clearer set of program goals and participant expectations, and concerns about the low level of communication between pair members. Therefore, greater attention was given to the recruitment, selection and matching process of the mentors and protégés; a protégé kick-off event was initiated to focus on goal-setting, the face-to-face dinner (no longer required) was moved to mid-year and the requested rate of communication was increased to twice a month throughout the five month duration of the program (January - May 1997). The part-time WISP administrator and student coordinator assumed a more visible on-line presence in the program, with bi-weekly messages, including suggested topics for discussion, updates to mentors about students' academic schedules and general reminders to maintain communication. The final survey was also distributed on-line with distribution, completion and follow-up conducted via e-mail.

In both years, EMP participants were given a hard copy *Mentor's Guide* or *Protégé's Guide*, which outlined the program's objectives, possible benefits for mentor or protégé, program expectations of participants, tips regarding electronic communication, and suggested topics for discussion. No in-person or on-line training for protégés or mentors was provided as part of the program.

The effectiveness of program improvements in the second year is indicated by enhanced satisfaction, for protégés and mentors. 91% of mentors expressed a desire to participate in the program once again the following year, in contrast to 60% in Year I.

Research Methods and Objectives: In the initial year, the evaluation was primarily formative in nature, to provide input for matching mentors and protégés, document use patterns, gather program feedback, and begin examining what is distinctive about telecommunications as a form of mentoring. A series of three surveys -- an initial application/background information form; a mid-point survey, and a final survey—were distributed on-line to both protégés and mentors.

In Year II, the focus of the evaluation shifted to being more summative in nature, to assess the perceived program value and impact for both protégés and mentors, and to further investigate what is distinctive about electronic mentoring. A single, final survey was distributed on-line to both protégés and mentors.

Summary of Findings [1, 2]

Findings from both evaluation years suggest that protégés and mentors found their tele-mentoring relationships to be a valuable, viable and personally rewarding experience.

Value of the e-mentoring program from protégé perspective
A little more than half the protégés reported that they had had someone who served as a mentor for them prior to the EMP (Year I: 58%; Year II: 57%). Most of the mentors described were college professors, high school teachers, parents, or someone they had worked for in a lab setting.

Approximately 3/4 of the proteges (75% in Year I; 79% in Year II) rated the value of having an e- mentor as somewhat high to very high. In the second year, specific aspects of this value were explored in terms of students' increased understanding, interest, and confidence in science, mathematics and engineering.

Most protégés in Year II indicated that the EMP provided them with an increased understanding of the professional and personal rewards of careers in industry, as well as some of the challenges and difficulties of industrial careers. A number of protégés also indicated that they gained an increased understanding of strategies to overcome challenges to women pursuing careers in science (Figure 1).

(n = 30 students)	1 (Not at all)	2	3 (some)	4	5 (Very Much)	Average rating
Day-to-day work life in industry	4%	26%	30%	33%	7%	3.2
Range of SME careers in industry	11%	30%	26%	26%	7%	2.9
Differences between career paths in industry vs. academia	11%	26%	26%	37%	0	2.9
Connections between college studies and the world of work	3%	36%	18%	28%	14%	3.1
Value of non-academic experiences and abilities to world of work	3%	21%	34%	0	10%	3.2
Professional and personal rewards of industry careers	3%	18%	21%	50%	7%	3.4
Challenges and difficulties of industrial careers	3%	14%	25%	50%	7%	3.4
Strategies to overcome challenges to women pursuing careers in science	13%	20%	40%	23%	3%	2.8*

(* mean for total sample. 3.0 for students with female mentors; 1.75 for students with male mentors)
Figure 1: Proteges' self-assessment of increased areas of understanding-Year II

Most protégés indicated that the EMP had increased their interest to continue taking science-related courses in college and in choosing a major in science. Similarly high numbers of protégés indicated that the program had increased their interest to pursue graduate studies in science and a science/math/engineering career in industry (Figure 2).

	1 (Not at all)	2	3 (some)	4	5 (Very Much)	Average rating
Continuing to take science-related courses in colleges	22%	0	17%	44%	17%	3.3
Choosing a major in science	14%	0	14%	36%	36%	3.8
Pursuing graduate studies in science	23%	4%	18%	36%	9%	3.1
Pursuing a SME career in industry	14%	14%	28%	18%	14%	3.0

Figure 2: Proteges' self-assessment of increased areas of interest-Year II

A closer examination of protégés who described lower increases of interest indicated that several of these students were positive about the program but viewed themselves as already possessing a high level of interest.

Most of the protégés also indicated that the program had increased their confidence in their abilities in science/math/engineering, in initiating an internship or job-search process in industry, and in balancing career and personal/family life (Figure 3).

Protégés described the value of the EMP experience in a number of ways:

> *I thought this was a really great program. Due to a particular set of rare occurrences this past term I would say that M. was instrumental in keeping alive my interest in chemistry as a career (rather than turning to medicine or some other field of science), by dispelling a number of myths in regards to the lifestyle and safety of such a career.*

> *It definitely gave me the assurance that there are women who made the choice to enter industry who are happy with the decision and are successful in what they are doing. There is still a real tendency for people (professors) to look at academia as the "ultimate" and to have the tendency to look down on the idea of entering industry. We (Ph.D. students) are basically trained for academia and getting past the attitude that other options are acceptable is tough. I have plenty of people to talk to about how to succeed in academia, but I did not have anyone to talk to about how to succeed in industry. With this program I was able to talk about ways to approach my education that will be beneficial in an industry career.*

> *I think no matter how many brochures, articles, etc. that you may read, there's no substitution for talking to an actual person who's going through the experience. Plus, having a mentor meant that I could get very personalized input that would be relevant to "me."*

Value of the e-mentoring program from mentor perspective
In Year II, mentors were asked about the value of their experience. The vast majority of mentors (90%) in Year II felt that serving as a mentor had been a rewarding experience. Mentors described a variety of professional and personal benefits. Professional benefits included attracting a new talented pool of young women into the field, becoming conversant with the young people soon to join the work force and networking with experienced and newly emerging colleagues.

> *This is really a chance to help someone develop their interest and enthusiasm for the field; an opportunity to get bright young people motivated to work in science/engineering.*

> *I felt that it was a good chance to get in touch with the next wave of talent coming out of college and to see where the curriculums and the interests of young engineers/scientists are heading.*

> *...it gave me a greater appreciation for the types of information {new college grads} need in helping to chose a career path.*

A number of mentors expressed the enjoyment of forming a mentoring relationship with a young woman considering a field in the sciences, as well as finding it personally gratifying to have someone interested in you, your experiences and opinions. Others described how they enjoyed sharing in their protégés' successes and prospects for success:

Most rewarding for me was just getting in touch with a young student, finding out what makes her tick, and learning of the issues on her mind. Also, I enjoyed answering her questions. On a selfish note, I have two daughters and I wanted an idea of the kinds of issues they may face.

L. wasn't as self-confident as she might have been going after an internship-type of job. I told her all she needed to do was show the interviewer that she could learn whatever was necessary. The next week, she got the first job applied for and was very proud. (So was I!)

Mentors also mentioned personal benefits in terms of their own professional development, which in turn would positively impact their own organization, such as acquiring broader perspectives, having an opportunity for self-reflection, and fostering particular mentoring, management and communication skills.

Having to describe what you do helps you reflect on why you think it's important and fun. I also found it helpful in thinking about the qualities I was looking for in new employees in my company.

Watching/helping others allows me to see where I have been. It helps me to reflect on my past to better design my future.

One's ability to develop others is something my company rates us on, this opportunity helps my ability to do that.

Mentors described a range of reasons for wanting to serve as a mentor. Some described the desire to "give back" to the system, or to make a difference for someone else, given their lack of mentors earlier in their own lives. Mentors also described the personal satisfaction of sharing information, wisdom, or a love of science with others.

I benefited greatly from my mentors and I wanted to be involved with helping young women who are interested in working in science.

I didn't have someone to ask miscellaneous questions to when I was in school and I know that it would have helped in some of my decision making. I wanted to offer that option to students.

I love science and engineering and was interested to help in any way I could.

Distinctive qualities of electronic mentoring
Protégés and mentors regarded electronic communication as an ideal medium for quick, convenient and easy communication with a partner, enabling interaction between members in different time zones across the country, and around the world. Benefits of electronic mentoring were most often described in terms of the speed and flexibility of communication.

A number of participants spoke to specific advantages of electronic communication: the written form allowed protégés to express themselves more thoughtfully, or to feel less intimidation in speaking boldly, and there was value seen in having a written trace of correspondence.

> *I was able to think clearly before asking and stuttering on the phone or in person. I could write and rephrase my questions, in order to get the response/answer that I was looking for. Through e-mail, I feel no intimidation. I felt that I could be more upfront than be courteous and slowly ask my questions after we established a relationship. There was no hesitation. (Protégé)*

EMP participants also described some limitations of electronic telecommunications for mentoring. E-mail could be impersonal; asynchrony of communication made difficult the more natural flow of conversation and exchange of ideas possible with face-to-face or phone conversations. Spontaneous open discussion, guiding a conversation, or correcting a misinterpreted question or comment was more challenging.

> *Without any immediate feedback (as in normal conversation) it takes a while to work up to a point where you can actually be comfortable in the discussions. It can be hard to know how the other person is reacting, especially if there is limited contact, since you don't know if the person is just busy or is uncomfortable with the relationship. (Protégé)*

Recommendations for enhancing the electronic mentoring experience
Participants recommended that e-mail be supplemented with other means of communication such as in-person visits over meals and/or to a mentor's workplace, and occasional phone calls. Several mentors suggested other kinds of materials or activities that mentors and protégés might share with each other, such as mailings with work-related brochures and pictures, or exchanging resumes for a "resume critique." A number of mentors also recommended that video-conferencing technology, and other technology-based group forums such as user groups and web-sites be considered as additional forms of communication, to enable some virtual "face-to-face" conversations, and group discussions and gatherings.

Participants appreciated the "on-line presence" of program staff; i.e., the reminders to communicate regularly, information on students' term schedules and suggested topics for discussion. Continued improvement will be achieved when the goals and objectives of the students are made more explicit at the beginning of the mentoring relationship and even greater attention is given to matching the mentor and protégé's specific field of scientific interest.

References
[1] Char, C. (July 1996) Evaluation of the Electronic Mentoring Program: A Telecommunications-based Pilot Program for Women in Science, Mathematics and Engineering (Year I). A report prepared for Dartmouth College.

[2] Char, C. (July 1997) Evaluation of the Electronic Mentoring Program: A Telecommunications-based Program for Women in Science, Mathematics and Engineering (Year II). A report prepared for Dartmouth College.