

**THE CRA DISTRIBUTED MENTOR PROJECT:  
Mentoring Undergraduate Women  
in Computer Science and Computer Engineering**

**Baine B. Alexander, Anne E. Condon, and Mary K. Vernon**

**University of Wisconsin, Madison, Wisconsin**

**INTRODUCTION**

The goal of the CRA Distributed Mentor Project (DMP) is to increase the number of women entering graduate school in Computer Science and Computer Engineering (CS&CE). To achieve this, the project matches outstanding female undergraduates in the U.S. with female mentors for a summer of research at the mentor's institution. Students are thereby provided with a window on research and graduate life, and enjoy the benefits of a close mentoring relationship. Conceived and managed by the Computing Research Association Committee on Women (CRA-W), this project was initially awarded approximately \$240K from the National Science Foundation for the two years 1994 and 1995. In 1995, CRA-W received \$530K to continue the project for the three years 1996 to 1998 and to perform a third-party evaluation of the project.

The purpose of this paper is to describe the project and the preliminary results of the evaluation.

**Background.** Women are severely underrepresented in CS&CE, with the percentages of women decreasing at successively higher levels of both academic and industrial ranks<sup>3,4,6</sup>. The Distributed Mentor project is designed to improve the statistics at one stage of the so-called "shrinking pipeline," in order to increase the representation of women holding high-level positions in industry and academia. Because of its distributed nature, the project reaches a wide pool of students that can benefit from the experience, not just those who are already in a position to locate an advisor that can support undergraduate research.

A research experience is widely considered to be a key means of attracting students to careers in technical professions<sup>5</sup>. The ideal environment for the student is at a university that provides the student with a window on graduate student life, enabling

her to form a mental model of the graduate school environment. The project emphasizes the mentoring role as well as the research role of the advisor, since informal mentoring relationships have traditionally been linked with learning and professional success. Since the number female faculty in CS&CE departments is extremely low (in PhD-granting institutions the average is less than 2 per department, with many institutions having none at all), undergraduate women in CS&CE currently have extremely limited access to role models at their institutions. Mentors provide students with this and several other valuable mentoring functions.

**Implementation.** Each year, over 70 student applications and over 30 mentor applications are received from all over the U. S. An informational and application brochure is mailed to all CS&CE departments and the project is advertised on web sites and electronic mailing lists, most effectively on the systers<sup>1</sup> list. A selection committee formed by CRA-W matches students with mentors at research universities. Selection criteria for students emphasize potential for success in graduate school and ability to make effective use of the research and mentoring opportunities. Criteria for mentors emphasize an active research program, a suitable research project for someone at the undergraduate level, and ability to mentor effectively. Students and mentors may request specific matches. A mentor may support more than one, though typically no more than two, students.

Students typically travel to the mentor's institution early in the summer, and work there for approximately ten weeks. Research projects range from designing and building autonomous mini robots that perform useful tasks in an unstructured environment, to interactive algorithm animation to detection of correctness and performance bugs in an implementation, to development of architectures and resource management algorithms for multimedia servers.

Students receive a stipend and travel expenses. Mentors typically help students find accommodations and arrange for use of office space and computer equipment. There is a small budget to support conference travel for students and mentors either during or after the summer of research. In 1996, a short list of guidelines and two scholarly articles on mentoring and collaboration between students and faculty were sent to mentors and students in advance of the summer to help prepare them for the experience.

An electronic discussion forum was created in 1996, to help establish cohesiveness among all participants and to combat the isolation that some student participants initially feel upon moving to a new institution. The electronic discussion forum has a web-based interface with student-only, mentor-only and student-mentor forums. The interface allows participants to create threads of discussion and to selectively read and

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<sup>1</sup>Systers is an electronic mailing list for women who are professionals in the field of computing, with over 2,000 members.

contribute new messages to the discussions. All participants are encouraged to post informal introductions and to use the forums to get advice and to share experiences during the summer.

## EVALUATION

A third party longitudinal evaluation of the project is being undertaken by the Learning through Evaluation, Adaptation, and Dissemination (LEAD) Center at the University of Wisconsin. Two principal methods are used to assess the impact of the project. One is structured open-ended interviews to obtain a rich understanding of the experience of a cross-section of the participants. The other is a written survey to test the experiences across a broader sample (i.e., nearly all participants). Although the evaluation will not be completed until 1999, two preliminary reports (which are described below) are available that describe the initial findings of the evaluation.

Ten 1994 participants were interviewed in Summer 1995, ten 1995 participants were interviewed before and after their summer research experience, and twenty-two 1995 participants were surveyed in Fall 1995. Mentors of the interviewed 1995 students were also interviewed in Fall 1995. The principal questions addressed in those evaluations were: (1) what, if any, kinds of qualitative effects are experienced by DMP students and can patterns of mentee/mentor interactions be ascertained and associated with measurable effects of the program, and (2) what, if any, special problems and/or satisfactions do faculty members experience as mentors in this program? A preliminary report was prepared by LEAD in January of 1996<sup>1</sup> and is available on the web via the distributed mentor project home page at <http://www.cs.wisc.edu/con-con/mentor.html>.

The 1996 report, which is over 100 pages long, finds that students are utilizing the program in accordance with its goal of encouraging undergraduate women to consider and pursue graduate studies in CS&CE. Many students stated that they: gained 'strategic' information on applying to graduate schools; were able to relate to and identify with the graduate student experience; and developed confidence in their abilities to succeed in graduate school or in a research career. Of the twenty-two 1995 students who completed the survey in Fall 1995, seventeen indicated that they intended to go to graduate school and two were undecided. Perhaps not surprisingly, some students realized that they were either not interested or not prepared to do research and decided not to attend graduate school following their undergraduate education.

Since January 1996, the LEAD staff have conducted follow up interviews and a follow-up survey of the 1995 participants (Spring '96), and have conducted a survey of two control groups of students who have not participated in the program. One control group is matched with the '95 participants while the other is matched with the '96 participants. A cross-section of 1996 participants were also interviewed before and after their summer experience, and the 1996 participants were surveyed in Fall 1996. A

report containing the findings from these evaluations will be made available by LEAD in March 1997<sup>2</sup> and will be available on the same web page as the 1996 report. The 1997 report contains a description of the pre-program experience of the participants in their undergraduate CS departments. This section provides important background information for understanding the nature and scope of the impact of the DMP. In addition, the report contains a comprehensive section on the impact of the program and a discussion of how the different program components function to bring about the impact.

The next sections briefly describe findings of the evaluation on the importance of selected aspects of the project implementation.

### **Involvement in a research project.**

“I’m being pulled right in to their ... research project! Right at the heart of it, and I wasn’t expecting that. It’s been a confidence booster for me...”

Most students entered in the program with no experience with research. Through “doing” research, students expressed that they experienced a completely different mode of learning in which they were actively utilizing and applying their knowledge to solve new problems. Although students initially felt overwhelmed when faced with learning how to do research, for many students, involvement in the research project resulted in increased confidence about their understanding of and abilities to succeed in CS&CE. Students benefited most from doing something “real” that contributed to their mentor’s research. For many, this experience helped them realize that they were capable of contributing valuable information to the field.

Many mentors stated that they were impressed with their students’ abilities and initiative but cautioned that they needed to spend time introducing their DMP students to the research topic. Students relied on mentors to provide structure and guidance throughout the project. Most mentors commented that having a well-defined and doable project that challenged the students and was part of the mentor’s research program was essential to having a successful DMP experience for both the student and mentor. Many mentors suggested having multiple projects prepared at the beginning of the program.

**Immersion in a Graduate Research Community.** Most students expressed that ‘living the life’ of a graduate student helped them because they developed a more complete understanding of graduate school, the research process and the faculty role within the university. Both students and mentors commented that interaction with graduate students was a very important part of the experience. This was especially true for students from non-PhD granting institutions.

"Choosing the right graduate school is important, but now I know better how to do that. And I know that I can go to grad school and make it through and enjoy the time, and get something very, very important out of it."

"I guess it's really made me sure that I want to get my Master's... just meeting some of the master's students, ... they seemed like people I could see myself being in a couple of years or next year."

Some mentors purposefully chose projects that ensured that DMP student would interact with graduate students. Mentors observed that graduate students helped students understand the collaborative nature of the research process, and provided multiple resources for the student encompassing both research-related questions and social interaction.

**The Mentor as Role Model.** In the 1996 survey, students did not strongly indicate that female mentor was important to them, but in the interviews almost all students emphasized that their interaction with a female faculty member in the DMP was important. The following quotes illustrate their reasons for this.

" I think it was a very good thing...it gave me a chance to see that a female could get all the way to the top, sort of a tenure position, really well respected, very good researcher, and also still have a life..."

"... [my DMP mentor has] really been a great influence. She has ... kids now and it's just so interesting to see someone – I mean I don't have any real role models that I've ever looked up to. Just to see that she'd gone through college and gotten her PhD and now is teaching and has kids. It's interesting to be able to see that first hand..."

"I think it's good [that the mentors are female]. Yeah. It definitely helps. I mean I have other professors where I am that are interested in the same things that I'm interested in. But they are men and ... I just can't talk to them the same way I can talk to my mentor."

"She's like this shining model of success, you know? Not a success in terms of like you think of business school success, but success in terms of like, how one would want to live their lives..."

Many students perceived the role of the faculty in the university to be flexible, fairly autonomous and full of variety. Some students commented that these aspects of the role appealed to them and as a result, they were planning to attend graduate school in order to become a professor.

**Electronic Discussion Forum.** In the summer of 1996, approximately half of the participants used the email forum, although only about a third posted a message and only a fifth responded to a message, indicating that the level of interaction was low. The primary use of the forum by participants was simply to introduce themselves to the group. Students also exchanged mail about their home institutions and raised questions about graduate school. One student used the forum to raise motivational problems and received helpful responses.

When asked why they did not participate in the discussion forum, 30% of participants cited a lack of time or the fact that they do not normally participate in these types of forums. The low level of interaction was cited by 20% of the students. Other reasons cited were the lack of anonymity in raising problems, and the difficulty in stimulating interaction among people who do not already have a rapport with one another.

## References

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