Evaluation Report #1

Computing Research Association -
Distributed Mentor Project
(CRA-DMP)

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**prepared
for**

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**by
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Executive Summary

This document summarizes the findings of the LEAD Center report entitled, "Evaluation Report #1: The Computer Research Association - Distributed Mentor Project (CRA-DMP)." This summary is primarily intended for those who have not read the entire report, and presents no new analysis.

1. Background

1.1 Evaluation Methods

We conducted structured, open-ended interviews with the mentor and student participants who participated in the 1994 and/or 1995 program years.

We interviewed ten out of the twenty-eight total 1995 student participants in the summer of 1995. Each student participated in two interviews: one at the beginning of her program and another upon the completion of her program. We conducted one interview with ten out of the twenty-five total 1994 student participants. (One of these students participated in 1994 and 1995.)

We conducted a single interview with nine out of the twenty-five 1995 mentors in the fall of 1995. Four of these mentors participated in the DMP in both 1994 and 1995. We interviewed ten out of the twenty-four 1994 mentors once in the fall of 1995.

The reader should note that qualitative and quantitative research methods differ not only with respect to data collection but with respect to analysis. Individual interviews allow the researchers to "get inside of" the experiences of these diverse participants. Data collection methods are as open-ended and subject-responsive as feasible to ensure that the experiences of the study participants, not the researchers, are reported. Likewise, analysis processes are fundamentally inductive to ensure that the participants' experiences shape the findings. In practice, this means that the researchers make every effort to at least temporarily suspend the ideas that structured their interview protocols. The analysis of interview transcripts is focused on determining what is most important to the participants. The primary analytical categories that emerge as the researchers process the transcripts are apparent in the table of contents. In contrast to survey methods, these methods do not yield precise, quantitative assessments of the proportion of participants holding pre-specified opinions. However, these methods provide extraordinarily rich information expressing the complexity of the lived experiences of the study participants.

1.2 The CRA-DMP

The National Science Foundation (NSF) awarded the Computer Research Association (CRA) funds with which to support the Distributed Mentor Project (DMP) for undergraduate females in computer science and engineering (CS&E). The intent of the award was to increase the number of women entering graduate school in CS&E by involving them in research. Students from around the country who participated in the program spend approximately ten weeks involved in a research project at their mentor's university. Twenty-five students and twenty-four mentors were matched in 1994 and twenty-eight students and twenty-five mentors were matched in 1995.

2. Evaluation Findings

2.1 Research Question 1

The primary questions addressed in this evaluation are:

> *Are there measurable effects, positive and/or negative, resulting from the Distributed Mentor Project?* If so, *What kinds of qualitative effects are experienced by the DMP students and can patterns in mentee/mentor interactions be ascertained and associated with the measurable effects of the program?*

We have addressed these research questions by summarizing the student section of the report. The italicized text reflects the evaluator's point of view.

Motivations for participating in the program

Almost all of the student participants entered the DMP with the expectation that their experience would give them the knowledge with which to make decisions about their future career paths. Many mentioned that they were particularly interested in finding out if computer science and engineering (CS&E) was "right" for them by working in the field. In addition, many hoped to learn about graduate school, research and academic positions through the DMP and planned to make decisions about whether these were paths they wanted to pursue in the future. *This indicates that the students selected to participate in the DMP are utilizing the program in accordance with its goal of encouraging undergraduate women to consider and pursue graduate studies in CS&E.*

The impact of immersing students in an academic environment

In the DMP, students were immersed in an academic environment through the following processes:

- observing their mentor and her interactions with other faculty and graduate students;
- observing and interacting with their mentor and other graduate students on a daily basis;

and
- actively participating in a research project.

Most students entered in the program with little understanding of graduate school and no experience with research. These students expressed that "living the life" of a graduate student helped them to become more sophisticated about CS&E because they developed a more complete understanding of graduate school, the research process and the faculty role within the university. Many students stated that by observing and interacting with graduate students and faculty and doing a "hands-on" research project, they:

- gained "strategic" information on applying to graduate schools;
- learned about the types of graduate institutions that suited their needs and interests;
- were able to relate to and identify with the graduate student experience;
- realized they had misconceptions about graduate school, research and the faculty lifestyle;
- learned how to work within an open-ended and self-directed environment that differed from their structured undergraduate experience; and,
- developed confidence in their abilities to succeed in graduate school or in a research career.

Defining interests in graduate school and an academic career in CS&E

We came to realize that by immersing students in a graduate and research environment, the DMP is preparing these students to make knowledgeable career decisions. By giving students an opportunity to experience aspects of graduate school life prior to making their actual career decisions, the DMP is enabling students to make informed decisions about a career and about graduate school:

- Many students identified with and enjoyed the people and experiences they encountered and came to realize that graduate school was "right" for them. *With their more sophisticated understanding and confidence about their abilities these students may be more likely to succeed in graduate school because they are better prepared for an academic environment.*

- 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. The students who felt unprepared for graduate school stated that they lacked a well-developed interest in some area of CS&E and did not feel that it was appropriate for them to pursue an advanced degree at this time. *We posit that this is not a negative outcome of the program in that it prevented students from making a potentially inappropriate career choice.*

Most students felt that their observations and interactions with faculty and their experience with research were accurate indicators of a career in academia. As a result, through their experience in the DMP, many students came to understand whether they would like to work in academia:

- Some students commented that the role of the faculty member appealed to them and as a result, they were planning to attend graduate school in order to become a professor.

- Some students enjoyed their work in an academic environment, but were still ambivalent about choosing academic CS&E as a career. Many of these students stated that they had not worked in industry and had no basis for comparison and so were hesitant to decide upon a career in academia. Some of these students commented that although they enjoyed the freedom and flexibility of an academic schedule, they also had reservations about working in such an unstructured environment.

- Some students came to realize that an academic career did not appeal to them. Many of these students expressed that they needed more external direction and structure than a career in research would offer them.

Evaluator Question

If students encounter serious problems in the DMP, do they allow this negative experience to be the defining factor in whether they attend graduate school? We are defining "serious problems" as students feeling that their mentor excluded them from professional and personal interactions with her and as a result, encountered problems with the program itself.

Due to the small number of students who had negative experiences in the program, we cannot draw definitive conclusions about this question. Despite this small sample, their experiences raise important questions and issues about the implementation of the DMP and its effects on the students. In subsequent years of this evaluation as more data is gathered, we will be able to more completely explore the relationship between program implementation and its effects.

Students as "part of a larger whole:" Including students in the research process and graduate school environment creates a more successful DMP experience

Our interviews indicated that involving students in a collaborative research process was critical to their having a successful experience in the program and also achieving the outcomes described in the earlier section. Virtually all students emphasized the importance of doing a project that was related to, and had an impact on, their mentor's research group. These students expressed that their project felt like "real" research precisely because it contributed to the research of someone professionally involved in CS&E and for many, this

experience helped them to realize that they were capable of contributing valuable information to the field.

Moreover, students were more motivated and inspired to do research when their mentor treated them as valuable members of the research group, capable of providing input about their research. A few students said that they felt excluded from the collaborative research process as a result of being assigned to a project that was irrelevant to their mentor's research or not working with members of the research team. These students stated that they felt isolated from the research process and became less motivated to work on their project.

The multi-dimensional role of the mentor

The mentor played a critical role in facilitating a positive experience for the students during their participation in the program as well as through acting as a role model and a professional resource.

Defining the working relationship

Most students expressed that they knew what their mentor expected of them and were able to function within that framework. However, a few students felt unclear about the protocol for interacting with their mentor or didn't feel that they had an understanding of their mentor's expectations.

We came to understand that students viewed their mentor as an authority figure and were uncomfortable, at least initially, with approaching her with questions and concerns. A number of these students lacked confidence about their skills and abilities, and were reluctant to initiate interactions and discussions with the mentor. As a result, the students placed the responsibility on the mentor for defining the nature and frequency of interactions during the program. Thus, the mentor can reduce her student's anxiety about their interactions, both professional and social, by defining when and how often they would meet, what was expected of them in these meetings, and the times at which the mentor would be available for questions (outside of the regular meetings). If the student worked with graduate students, the mentor also needed to provide a clear delineation of their working relationship.

"Making time" for the students

Most students stated that their mentor was available throughout the program to meet with them and address their questions. A few students expressed that their mentor either was not available or was not a good resource. When students felt that they didn't have much contact with their mentor, they were disappointed with the program and questioned the value of the mentoring aspect of the program. In fact, when students perceived their mentor as too busy to meet with them, many felt as if their presence, rather than being helpful, was more of a distraction.

Designing and implementing a project: Giving students freedom within limits

Many students entered the DMP with no experience in how to conduct research and lacked enough knowledge and experience in CS&E to define a project independently. As a result they needed the mentor to frame a project or series of projects for them that provided an overall structure. Yet within this framework students wanted to have some input in helping to define their project as well as a choice in how they would proceed in conducting their research. However, it is important to note that students who did not receive enough structure and guidance, felt lost and without direction.

Orienting students about the field of CS&E

Many students commented that their mentor introduced them to the culture of academia by giving them professional advice and direction. They looked to their mentor as a reliable resource to address their questions about graduate school, research and academic life.

"Modeling" life in the field

Although the students were aware that women could succeed in CS&E, they had little or no contact with female faculty members. By observing and working closely with their mentor, many students said that they were able to identify with and relate to her experiences as a female in CS&E and viewed her as an accurate role model for what they could accomplish in their professional life. Many students commented that prior to participating in the DMP, they feared that an academic career in CS&E would be too time intensive to be able to focus on other interests and said that their mentor showed them that it was possible to be successful in CS&E and have outside interests. These students stated that this interaction with their mentor provided encouragement that they too could succeed in the field.

Logistical problems within the DMP

Many students expressed frustration about organizing various aspects of their living arrangements at the mentor's university. Because the participants were not "official" students at the host university, they were often denied housing and access to other components of university life unless their mentor intervened. Another issue that arose in our discussions with students was that some had difficulties receiving their checks from the CRA on time.

2.2 Research Question 2

A second question in this evaluation is:

What, if any, special problems and/or satisfactions do faculty members experience as mentors in this program?

We have addressed this question by summarizing the mentor section of the report. The italicized text reflects the evaluator's point of view.

The Goal and Structure of the DMP

Virtually all mentors stated that the focus of the DMP was to introduce undergraduate females to research and a graduate school environment in CS&E with the intention of encouraging these students to consider going to graduate school. Many mentors expressed that although they encouraged students to pursue graduate studies in CS&E, they did not pressure these students into going to graduate school. Rather, they attempted to provide an introduction to graduate school and research as well as reinforcing confidence about their capabilities of succeeding in graduate school in CS&E. With this information and encouragement, the mentors stated that the DMP students would be able to make a more informed choice about attending graduate school.

All of the mentors that we interviewed commented that the DMP provided an excellent opportunity to both encourage women to consider graduate school in CS&E and prepare them for a career in CS&E because it immersed them in a research environment and "plugged" them into a network of CS&E professionals:

- The mentors said that by immersing students in a research environment in which they interacted with faculty and graduate students and did "hands-on" research, students developed a better understanding of graduate school and research. They also stated that students developed confidence about their abilities to succeed in graduate school and research through "living the life" of a graduate student and doing "hands-on" research.

- Most mentors that we interviewed commented that a positive outcome of the DMP was that it matched students and mentors from different universities. Given the low numbers of women in many areas of CS&E, many mentors viewed the matching as a good way to create connections between female CS&E professionals and to provide role models for undergraduates that they may not have access to at their own institution.

While the goal of the DMP is to increase the number of women entering into graduate school and research careers in CS&E, we came to realize that the program may also function to increase students' success in graduate school. This is because students became more sophisticated about the field through: developing their networking skills, making connections with professionals in CS&E, realizing possible areas of specialization, and increasing confidence about their abilities.

The Mentors' View of the DMP Students

Many mentors stated that they were impressed with their students' abilities and initiative but cautioned that they needed to spend time introducing their DMP student to the research topic due to the fact that undergraduates have limited background and research experience in CS&E. In

fact, when mentors were asked to give advice to faculty considering participating in the DMP, many commented that the faculty member should be prepared to invest time in the program.

Lack of background may affect program success

Some mentors stated that their student lacked the background necessary to do a research project that would be interesting and productive to either the student or the mentor. In fact, some mentors commented that sophomore-level students may not have the necessary background and sophistication to do research in the ten-week time frame of the program. These mentors expressed that only junior level students should be admitted into the program, because they would have taken the upper-division classes which would give them the background and sophistication to do projects that could interest both the mentor and the student.

Evaluator Question

    Should there be a minimal background requirement of students?

Unmotivated students hinder success of program

A few mentors stated that their student was unmotivated and applied minimal effort toward her research project. When mentors perceived their student to be unmotivated, they viewed their experience in the DMP as a "waste of time" and as not being beneficial to either the student or the mentor.

Inevitably there are students who experience difficulties in any program. In some cases, these problems result from personals issues and little can be done to alter the student's experience in the program. However, in some situations, the problems may result from circumstances involving program implementation. As remarked above, a few mentors described their students as unmotivated. Our interviews indicated that there was a disjuncture between the student and mentor perceptions of the student's intentions. While mentors characterized their student as unmotivated, the students expressed that they wanted to contribute, but felt lost and without direction. These students lacked the confidence to assert themselves and felt shy about asking "basic" or "obvious" questions of the mentor. The students thus retreated from interaction with the mentor and this was misinterpreted as a lack of motivation and interest in working on the research project. We came to realize that initially these students may need more structure and guidance from the mentors in order to proceed in the research and develop confidence. Through gaining knowledge and experience in the programs such as the DMP, these students can develop independence and goal orientation.

Receiving assistance in their research: Two different mentor expectations of the DMP

There were two differing opinions among the mentors when discussing the importance of receiving some research benefit from the student while participating in the DMP. Many mentors participated in the DMP with the intention of volunteering their time to help an undergraduate and viewed any contribution to their research as a bonus. Some mentors viewed the experience in the DMP as an investment of time and felt that some assistance from the student on their research program was a critical part of their participation in the program. These mentors expressed that they would like to have some input in the process of selecting students for the program in order to ensure that the students had the skills and background to complete their project.

Through trying to ensure that the students have the proper background needed to conduct research in the mentor's area of expertise, the mentors are attempting to create an experience that may be beneficial for both mentor and student. However, this could be problematic. As noted earlier, students entered into the DMP with the intention of making decisions about future career paths. Thus, many viewed the DMP as more than a research experience; they viewed it as a way to learn about graduate school and academic life. In fact, through their experience in the DMP, many students were able to decide if a career in CS&E was "right" for them. If the selection process is defined solely by student background, this may prevent the program from reaching students who are at a critical juncture in a career decision and would benefit from a valuable experience such as the DMP.

Evaluator Questions

How important is the student background in CS&E to the success of the DMP for the student? for the mentor?

Would allowing mentors to participate in the selection process fit with the goal of the program?

The Role of the Mentor in the DMP

In our interviews, we asked the mentors about their definitions of "mentoring." Many responded by describing "mentoring" as a process of assessing the individual needs of the mentee and then attempting to provide for those needs. As a result, we came to understand that the role of the mentor was multifaceted and dependent upon the individual student. The undergraduates entered into the DMP with little understanding of graduate school, the nature of research or how to conduct it, the academic community in CS&E and the life of a female faculty in CS&E. Our interviews with the mentors indicated that the main roles they discussed paralleled the students' needs: being a role model, providing professional guidance, and guiding students in their research project.

Being a role model: Providing an example of a successful woman in CS&E

Most mentors expressed that part of their role in the DMP was to provide a model of a "real life" example of a CS&E female faculty member. Many commented that this modelling took two different forms: students could observe the mentor in her daily activities, and the mentor could explicitly discuss and provide guidance about the types of experiences she encountered as a female in CS&E. Many mentors mentioned that, although a discussion of their experiences was beneficial to the student, the largest impact on the student occurred by observing the mentor on a day-to-day basis.

Guiding students in their professional development

Virtually all mentors stated that an important aspect of their role was to guide their student in her professional development. This included:

- Guiding their student in her career choices. For many mentors, guidance involved introducing the student to new opportunities and encouraging her to take advantage of them. Many mentors commented that students were not always aware of their options or, if they were aware of them, did not have the confidence to take advantage of them.

- Giving students an idea of the research process. Many mentors realized that their students had little or no conception of what research was about and, as part of their role, involved and discussed with their student the nature of the research process. As these mentors explained, this immersion involved introducing students to the day-to-day process of "doing" research, providing them with the context of how their area of interest fits in to the larger body of current research, introducing students to other people who can assist them, and giving them names of journals to which they can submit their research.

- Orienting students to the professional culture of academic CS&E. Some mentors took their students to conferences and remarked that this was a way for the students to interact on a professional and social level with other CS&E professionals.

Setting up a framework for the student's research

Many mentors prepared for their student's arrival by setting up accounts for her on the local system, getting an office for her, and helping her to find housing. A few mentors suggested that the DMP provide a list of instructions of what should be done to prepare for a student's arrival.

All of the mentors we interviewed placed their student in an office in their building so the mentors could easily stop by the student's office. Many mentors commented that they did not have a set meeting time with their student, but made sure that they were in contact with their student at least a few times a week. These mentors felt that the almost day-to-day interaction precluded the need for weekly meetings because they could follow the student's progress on her project more closely. Other mentors set up weekly meetings for their student. Many of these mentors commented that the structure of weekly meetings provided a framework and guidance for the student learning and

motivated the students to work on the project. Some mentors commented that weekly meetings helped to ensure that their student were enjoying their project and was also working hard on it.

Guiding the student in her research

Almost all mentors stated that undergraduates did not have enough experience with research to be able to independently choose a research topic and direct their own research. Thus, all mentors provided the direction for their student's research in the form of defining a problem for them to solve, or giving them ideas for a future topic to explore. While defining the structure of the project and providing overall guidance, most mentors expressed that they encouraged their students work out the details of the project. These mentors expressed that it was important for the students to have freedom to do explore solutions within the framework of the project in order to get some experience with research. Many mentors struggled to find the balance between guiding the student and letting the student struggle on her own and emphasized that they wanted the student to be challenged by the project, but not get so frustrated that she would give up.

The role of the graduate student in assisting the students in their research

The mentors who had graduate students working with the DMP students mentioned that their roles differed from the graduate student. While the graduate student answered the day-to-day technical details of the project, the mentor provided the global picture of where the project was headed and the context of how the project fit with other research either in the department or in the research community at large.

Strategies in creating a successful DMP experience

Creating a well-defined and doable project that challenged the student and was part of the mentor's research program

Most of the mentors we interviewed commented that having a well-defined and doable project that challenged the student and was part of the mentor's research program was essential to having a successful DMP experience for both the student and mentor. These mentors stated that by successfully completing a difficult research project, students would develop more confidence about their ability to do research and realize that they could contribute something of interest to the research community. These mentors framed the project around their students' background and abilities and attempted to create a project that was challenging enough for the student to be interested, yet not too difficult that she would get overly frustrated.

Many mentors stated that, given the short time frame of the program, it was important to be able to assess their student's background accurately so that the student can work on a project without a large degree of initial preparation time. Some mentors commented that their student was unable to finish her project because they had overestimated her background knowledge and needed to spend time at the beginning of the program providing information. These mentors expressed that

they should have contacted their student before she arrived to determine her background in order to frame a project more suited to her needs.

In addition, many mentors suggested having multiple projects prepared at the beginning of the program. These mentors expressed that the student would be more motivated when she was able to choose a project that interested her and having multiple projects would prevent the student from getting too frustrated or bored by one project and allow her to learn different material.

<u>Immersing students in a research community</u>

Another strategy for a creating a successful DMP experience was to immerse students in a research community that included the mentor, graduate students, undergraduate students, and other faculty. Many mentors stated that involving a student in a research community would benefit the student by providing multiple resources and social interaction while also benefiting the mentor by decreasing the time demands of mentoring an undergraduate.

Evaluator Question

Should the CRA-DMP require that the mentor have a community of graduate students with which the students can work over the summer?

Receiving recognition for their participation in the DMP

In the 1994 and 1995 program years, the mentors received neither monetary nor professional recognition for their participation. Many mentors commented that they would have preferred to receive some sort of recognition for their participation in the DMP in the form of:

- A letter to the department chair or the academic Dean. Many mentors commented that the CRA should send their department chair or an academic Dean a letter about their participation in the DMP. These mentors felt that such a letter would serve a dual purpose: it would inform their department of their participation in the DMP and also may assist the student in her interactions with the host university.

- Publicity for their participation in a journal. A few mentors mentioned that they would have liked to have been honored for their participation in the DMP by having their name listed in some publication, like the *Computing Research News*. These mentors felt that this publicity would benefit the mentor, her institution, and the DMP.

- Funding which may influence more faculty to participate. Many mentors commented that if the DMP provided some sort of funding, more faculty may be inclined to participate. Many of these mentors stated that the funding would not have to be directed toward the mentor. The funding could be applied to cover expenses of having the student, or to the department, or to be a stipend for both the student and mentor to attend a conference.

Table of Contents

The Mentors' Point of View: Issues involved in Mentoring in the DMP -- Tab 5

Introductory Materials

The Distributed Mentor Project (DMP) Evaluation Report #1 is the first in a series of three reports as part of a three year evaluation project (1995 - 1998) conducted by the UW-Madison's Learning through Evaluation, Adaptation, and Dissemination (LEAD) Center.[1] The report is based on interviews with, and a survey of, the mentors and students who participated in the Computing Research Association (CRA)-DMP during 1994 and/or 1995.

The evaluation was conducted by staff of the LEAD Center. The evaluation team consisted of Baine B. Alexander, the Associate Director of the Learning through Evaluation, Adaptation, and Dissemination (LEAD) Center, as project director, Sue Daffinrud (July 1995- present), and Heather A. Lewis (July 1995-August 1995), both graduate students in the UW-Madison Department of Mathematics, as research specialists.

Because this report represents the first phase of an ongoing evaluation of the DMP and thus we consider it to be preliminary. There are many issues that emerged in our analysis of the 1994 and 1995 participants that will need to be addressed in more depth in subsequent data gathering and analysis phases.

Purpose

One purpose is to provide the CRA-DMP with formative feedback information while the DMP is being implemented. Feedback information is "formative" when it is used by decision makers to reflect on and analyze the project's goals and processes and then make any needed mid-course corrections. In this case, the "feedback" is literal in that much of the report consists of excerpts from interviews with DMP participants. These excerpts are carefully selected through an analysis process of all of the interview data. Those selected are viewed as particularly good articulations of significant themes that emerged from our analysis.

A second purpose is to inform and prepare prospective mentors and student participants about the program.

Research Questions

The following are a set of research questions developed with Professor Anne Condon, Principal Investigator of the CRA-DMP, that inform the evaluation research design:

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[1]Established in August of 1994, the LEAD Center supports individuals engaged in educational reform activities at both the baccalaureate and graduate levels. The LEAD Center focuses on student learning experiences and faculty adaptation and dissemination processes. It provides clients with both summative and "formative" evaluation (defined above).

(1)   Are there measurable effects, positive and/or negative, resulting from the distributed mentoring project? More specifically,

- Do undergraduates who participate in the DMP *enroll* in graduate school at higher rates than a matched comparison sample?

(2)   If the answer to question "#1" is "yes," what kinds of qualitative effects are experienced by the DMP students and can patterns in mentee/mentor interactions be ascertained and associated with the measurable effects of the program? More specifically,

- What, if any, relationship is there between student response to the program and:
  - various characteristics of the mentor's research project and/or methods of involving the student in that project?
  - the level and type of interaction the student had with graduate students at the mentoring site?
  - the overall departmental culture she encountered during her summer research program?
  - the level and type of interaction that the student maintained with the program after her summer research program?

- Did the mentee and/or mentor believe that the DMP program helped effect changes in the student's:
  - level of self-confidence in academic abilities
  - ability to formulate and solve problems typically encountered in CS&E
  - overall appreciation of the basic "ways of knowing" that inform the disciplines of CS&E
  - sense of individual accomplishment
  - time management skills
  - ability to work cooperatively in a research team
  - degree of identity with CS&E
  - level of motivation
  - perception of value of graduate education
  - understanding of national graduate programs
  - understanding of application requirements for graduate school
  - career goals
  - understanding of the research process

- Did other factors in the DMP students' experience have an effect on their decision to attend graduate school, including:
  - departmental climate
  - rejection of science careers/lifestyles
  - pace and coverage of curriculum
  - peer culture in her department: competitive or supportive?
  - financial situation
  - type of pedagogy: peer group learning vs traditional lecture style
  - quality of advising

- family support

(3) What, if any, special problems and/or satisfactions do faculty mentors experience as mentors in this program?

Guide to the Reader

The reader should note that it is not necessary to read this report in its entirety nor is it necessary to read the document in a specific order; each piece in the document may be read independently without a loss of context or meaning.

This evaluation report contains three sections. The two sections are based on a qualitative analysis: *The Students' Point of View: Issues Involved in Participating in the DMP* and *The Mentors' Point of View: Issues Involved in Mentoring in the DMP*. The purpose of the qualitative section is to present the student and mentor perspectives on the Distributed Mentor Project. The third section of this document consists of the presentation of the results of a survey that we conducted via email with the student and mentor participants in 1994 and 1995. The purpose of the survey was to allow us to triangulate across a range of different data sources during the analysis process.

Intended Audience

The qualitative analysis is intended for a varied audience that includes: former and prospective student participants of the DMP, faculty who participated as mentors in the program, faculty who are considering participating in the program, and other interested individuals.

- **Former student participants** may wish to read the student section to determine whether their experience matches that of other student participants and are encouraged to read the mentor section in order to understand more fully the faculty views on mentoring undergraduates.

- **Students who are considering participating in the DMP** may wish to read both the student and mentor sections for in-depth information about the program.

- **Faculty who have participated in the DMP** are encouraged to read the student section in order to more fully understand the students' experience. They may also wish to read sections II ("The Mentors' view of the DMP students"), III ("Receiving assistance from students on their research: Two different mentor expectations of the DMP"), and V ("Strategies in Creating a Successful DMP Experience") of the mentor section in order to compare with other mentors' experiences. These sections may be particularly helpful in preparing for future participation in the program.

- **Faculty who are considering participating in the program** are encouraged read both the student and mentor sections for in-depth information about the program. Section III ("Students as 'Part of a Larger Whole:' Including Students in the Research Process and

Graduate School Environment Creates a More Successful DMP Experience") of the student section and sections II and III of the mentor section provide specific information on strategies which contribute to a successful DMP experience.

A guide to "The Students' Point of View: Issues Involved in Participating in the DMP"

Section I presents students' motivations for participating in the DMP. In section II we discuss the impact of the immersion of students in an academic environment on defining their interests in graduate school and a career in academia. In section III we focus on the importance of students collaborating with and being included as a part of the research team of the mentor. In section IV, we list and discuss the students' perceptions of the roles of their mentor in the DMP. In section V, we present some logistical difficulties that arose for the students.

A guide to "The Mentors' Point of View: Issues Involved in Mentoring in the DMP:

Section I presents the mentors' view of the goal of the DMP and how the structure achieves this goal. In section II we focus on the mentors' view of the student participants and how student background and motivation affect the success of the program. Section III presents the two mentor perspectives on the importance of receiving assistance in their research program from the student. In section IV we present three main roles that the mentors assumed during their participation in the DMP. Section V presents strategies that the mentors viewed as essential to creating a successful DMP experience for both the student and mentor. In section VI we present the mentors' suggestions of the ways in which they would like to receive recognition for their participation in the program.

Methods

We have thus far pursued these research questions through the use of structured, open-ended interviews and through conducting a survey. In addition, we used a diversely trained research team consisting of an anthropologist and two math graduate students. This enhanced the quality of the research because individuals trained in different disciplines bring together different perspectives in both the areas of data collection as well as in analysis.

The reader should note that qualitative and quantitative research methods differ not only with respect to data collection but with respect to analysis. Individual interviews allow the researchers to "get inside of" the experiences of these diverse participants. Data collection methods are as open-ended and subject-responsive as feasible to ensure that the experiences of the study participants, not the researchers, are reported. Likewise, analysis processes are fundamentally inductive to ensure that the participants' experiences shape the findings. In practice, this means that the researchers make every effort to at least temporarily suspend the ideas that structured their interview protocols. The analysis of interview transcripts is focused on determining what is most important to the participants. The primary analytical categories that emerge as the researchers process the transcripts are apparent in the table of contents. In contrast to survey

methods, these methods do not yield precise, quantitative assessments of the proportion of participants holding pre-specified opinions. However, these methods provide extraordinarily rich information expressing the complexity of the lived experiences of the study participants.

Open-ended Interviews

We interviewed both mentor and student participants from the 1994 and 1995 program years. The structured open-ended interviews were conducted individually and lasted approximately one hour. The interview protocols for the students and mentors appear in Appendix A. All interviews were recorded and transcribed; an average transcription was twenty single-spaced pages.

We interviewed ten out of the twenty-eight total 1995 student participants in the summer of 1995. Each student participated in two interviews: one at the beginning of her program and another upon the completion of her program. Interviewing the students at the beginning and end of the program allowed us to observe if and how the students' experiences and attitudes towards graduate school and research in CS&E changed throughout the program. These students will be interviewed a third time in the summer of 1996 in order to determine the long-term effects of the program on their career choices.

We conducted one interview with ten out of the twenty-five total 1994 student participants. (One of these students participated in 1994 and 1995.) The purpose of these interviews was to develop an understanding of their experience in the DMP and also to assess the impact of the program on their career decisions. Only three of the student participants had graduated from their undergraduate institution at the time of the interview and as a result, we were not able to conduct a definitive analysis of the program effect on career decisions. However, our interviews strongly indicated that these students' experiences were similar to those of the 1995 participants and thus served to strengthen our analysis. In addition, many of these students emphasized the effect of their experience in the DMP on their understanding of graduate school and academia reflecting a long-term effect of the program.

We conducted a single interview with nine out of the twenty-five 1995 mentors in the fall of 1995. Four of these mentors participated in the DMP in both 1994 and 1995. We interviewed ten out of the twenty-four 1994 mentors once in the fall of 1995. Six of these mentors participated in the DMP in 1994 and 1995. The purpose of these interviews was to understand the faculty's experiences and attitudes toward mentoring in the DMP.

Survey

A survey was distributed via email to the 1994 and 1995 student and mentor participants in the fall of 1995. Using the survey we were able to collect baseline demographic data on the student participants. The survey was also utilized to determine if the findings from the

qualitative interviews were representative of the experience of the mentor and student participants as a whole. The surveys appear in Appendix B.

The survey response rate is as follows:

Twenty-two of the twenty-eight 1995 student participants and eleven of the twenty-five student participants responded to the survey. Two of the students who responded to the survey participated in 1994 and 1995 and we included their response in the 1995 survey results and not in the 1994 survey results. The low response rate among the 1994 results from the difficulty of contacting students who had graduated and did not have email address. Due to the low response rate among the 1994 student participants (44%), we will not present those results.

Twenty-one of the thirty-eight total mentors responded to the survey. Of the thirteen mentors who participated in 1994 only, four responded. Of the eleven mentors who participated in 1994 and 1994, seven responded. Of the fourteen mentors who participated in 1995 only, ten responded.

We will present in the survey results the number of 1994 students who are currently in graduate school or have plans to pursue graduate study.

Notes on the Use of Verbal Quantifiers

Specific verbal quantifiers are used to denote the relative size of a group of participants who presented particular perspectives or described particular experiences in interviews. It is important to note that due to the nature of qualitative interviews, the size of a group who discussed a particular type of experience does not indicate the size of the group who had this type of experience. Although the same interview protocol was used in each interview, respondents' answers often prompted discussion in a particular area that may not have emerged in other interviews.

The verbal quantifiers used in this report are:

"a few":
    used when up to 30% of those interviewed presented the perspective under consideration

"some":
    used when 30 to 50% of those interviewed presented the perspective under consideration

"many":
    used when 50 to 70% of those interviewed presented the perspective under consideration

"most:"
    used when 70 to 90% of those interviewed presented the perspective under consideration

"virtually all":
   used when 90% or more of those interviewed presented the perspective under consideration

"a subset""
   used to articulate more gradations within a group referred to previously by "a few," "many,"
   or "virtually all." A subset includes at least two individuals.

Notes on Quoted Material

A row of asterisks separating two or more quotes indicates that different interviewees are
represented in the quotes.

Ellipses (...) in quoted material indicate deleted dialogue occurring within the reproduced
material. Deletions are made so that the readers can appreciate speakers' views on a particular
topic without having to sort through the divergent twists and turns of the raw dialogue.
Explanatory words added to quotes appear inside brackets [ ]. The quoted material is presented
as faithfully as possible to the speakers' intent. Interview dialogue is marked "I:" to indicate an
interviewer's speech and is marked "R:" to indicate the speech of the respondent. In interview
passages in which more than one respondent is quoted, "R1:," "R2:," etc. is used.

The Students' Point of View:
Issues Involved in Participating in the DMP

In this section we will discuss characteristics of the DMP as experienced by the 1994 and 1995 student participants. Many of these are themes that the students themselves initiated and discussed in our interviews; other themes arose specifically out of questions asked in the interviews. Our discussion will focus on the following aspects of the DMP: students' expectations of the program, their transition into a more sophisticated understanding of academic life through the immersive nature of the DMP, and their view of the role of the mentor. This report will focus on the experience of both the 1994 and 1995 student participants in the DMP and their perceptions of the program's influence prior to making career decisions.

I. Students enter the DMP to make decisions about future career paths

Almost all of the student participants entered the mentor program with the expectation that their experience would give them the knowledge with which to make decisions about their future career paths. Many mentioned that they were particularly interested in finding out if computer science and engineering (CS&E) was "right" for them by working in the field. In addition, many hoped to learn about graduate school, research and academic positions through the DMP and planned to make decisions about whether these were paths they wanted to pursue in the future. In the following interview excerpts students discussed these expectations:

> Well, [I expected] that [the DMP] would give me a chance to see what graduate school might be like, and what research might be like. Also it would give me a chance to figure out whether I was good for computer science or not.

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> I: What were you initially hoping to get out of your experience?
>
> R: I was initially hoping that I would decide whether or not I wanted to go to grad school, and that perhaps I'd find what I wanted to specialize in.

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> I mean it was kind of like pseudograduate school summer type of thing and I liked that idea too, because at the time when I applied I was really hesitant over whether I wanted to go right on to graduate school. So I kind of wanted to see what it was like and maybe meet some graduate students, because my college doesn't have any kind of graduate program.

I was just looking for sort of a taste of what research was, an idea of what grad school was, just more information really. I was sitting there thinking, "Hey, grad school might be nice." But I didn't have any concrete ideas of what grad school really was and so I was looking for more information.

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I: What made you decide to even apply for the program?

R: Well, it looked like an ideal summer job. Like I would learn a lot. I would learn about research, and I would learn more about grad school.

The DMP was an opportunity to decide between an academic and non-academic career

In our interviews, some students discussed that they were attempting to decide between an academic and non-academic career. Many of these students hoped that their experience in the DMP would provide them with knowledge about academic life, which they could to use as a basis for comparison with other career options.

At [the time I applied for the DMP] I wasn't sure whether I wanted to go to grad school or to industry. And I had two summers left before I graduated. I could spend one summer trying to do research, or something grad schoolyish, and I could spend one summer in industry. And that would help me make up my mind. Because then I could say, "This is what academia's like. And this is what industry is like. Which do you like better?" You have to make an informed decision.

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I got to see how things were working, more or less in graduate school and with a professor and everything. So, I know better now than I did before. Before I thought that being a professor would be so glamorous. And so great, and so easy. And it's not like that at all. And so, I guess it affected my future plans a little bit. I mean, if I were to go into industry and compare industry to graduate school or research, I would form a better educated opinion of what this is about. So definitely I would say, "Oh yeah. I'd rather go to grad school." Or, "I'd rather go to industry."

Students who were already planning on attending graduate school viewed the DMP as an opportunity for professional development

Some students entered into the DMP seriously committed to pursuing graduate studies. Many of these students hoped to, through their experience with the DMP, narrow their interests down to a specific topic in CS&E.

Well, right now my concern for being in this program is trying to figure out what to do, what to go into graduate school with. That's my only real concern. I've had a real broad understanding

up until now of what to take, and what classes there are and things, and what you do in the different fields. ... I really want to cement on something.

Other students wanted to use their experience in the DMP as a way to build up their credentials to be accepted into one of the leading institutions in CS&E.

My big goal, no matter what program I did this summer, was I wanted to do "real" research -- [get] involved [in] research with something that was already ongoing. Which would be something real that I could hand to a graduate school and say, "Here, this is what I've done. This is what I'm capable of doing. You want to take me." Because I come from a no-name school, I have good GPAs, my test scores are going to be okay. ... And so I wanted to be able to say, "This is the kind of thing I can do. And I'm sort of already tried and true. And I should be a good pick for you."

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I: What did you expect to get out of your experience?

R: I expected to get out of my experience connections to go to grad school and experience and research and just general experience that I could put on my resume and it would look good.

I: What do you mean connections to go to grad school?

R: Well, everyone has always said that in order to get into one of the best grad schools, you should know a professor there, a professor that during the application process would say, "Oh yes. We'd like to have this person come to our school."

Evaluator Point of View

The fact that many of these students are viewing their experience in the DMP as a way to "try academic CS&E on for size" in order to make future career decisions demonstrates that the students selected to participate in the DMP are utilizing the program in accordance with its goal of encouraging undergraduate women to consider and pursue graduate studies in CS&E.

II. Immersion in an academic environment: Students' transition to a more sophisticated understanding of academic life

In this section we will first discuss the students' transition into a more sophisticated understanding of the academic world of CS&E through interacting and observing faculty and graduate students and through doing research in the DMP. We will then discuss how the students' experience helped to define their interests and shape their career decisions.

II.A. Learning about the academic environment

As discussed in Section I, many students entered into the program expecting to learn more about graduate school, research, and academic life in order to make decisions about their future career plans. Our interviews indicated that many students felt that they knew little about these academic pursuits prior to their participation in the DMP. We came to understand that through their immersion into the culture of the academic world of CS&E, students made the transition to a more sophisticated understanding of the field. This transition occurred through the following processes: observing their mentor and her interactions with other faculty and graduate students, observing and interacting with other graduate students on a daily basis, and actively participating in a research project.

II.A.1. Learning about graduate school: observing and interacting with graduate students and faculty

II.A.1.a. Being an "honorary graduate student" allowed students to develop an understanding of graduate school life

Most students interacted with faculty and/or graduate students on a daily basis while participating in the DMP. Through these interactions, almost all students stated that they were able to develop a more complete view of graduate school that they would not have had access to through more traditional venues of acquiring information about graduate school. In fact, most students felt that the opportunity to "live the life of a graduate student" was the most positive aspect of the program.

I: What were the most positive aspects of the program for you?

R: Just having the program - being able to go and be sort of an honorary grad student for the summer and see what it was like. And see by watching, instead of just by asking questions. But by being there and sort of watching people do their thing. Figuring out what grad students do. What professors do, when they're not "professoring." That was really helpful because it gave me a much clearer idea of what academia was like.

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I: What were the most positive aspects of the program for you?

R: I think the most positive was just being in a research environment just to see what graduate school is like and hearing about what they did in class, what a typical graduate student does I guess.

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I: What were the most positive aspects of the program for you?

R: We were essentially graduate students for a summer -- being put in that environment so I knew what I was getting into. So now, since I am going on to graduate school, I know what to expect. I'm not like a scared little freshman as I was when I went into undergrad. I know what to expect. And making the contacts was also very helpful, getting other opinions on what graduate schools are good to go to, getting extra recommendations from other people that are in another school I'm sure really helped me a lot.

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Well, for one our mentor is just - she's wonderful. What she did is she put us with some other graduate students, and we've been working with them. We haven't really even been necessarily working with her directly, but we've been working within the lab, which I think is much different than just working on our own. And it really exposed us to a lot of other people. What was really great about it was we had an active and supportive group of students. They were very, very, very helpful, and we have gone out with them and...What's been great about that is being able to go out and meet other people that they hang out with. And we learned a lot about degrees. And the different interests people are in. And how the different labs work. There are different ways that they take their exams.   And advisors offer different kinds of support...You know, you're never just working on just what you're doing, you're learning about what everyone else is doing.

Interacting with and observing graduate students and faculty was particularly useful for students from non-Ph.D. granting institutions. Many students from these types of institutions expressed that since they had no contact with graduate students, their experience in the DMP was extremely useful in their formation of a more complete picture of graduate school life.

Many students who did not have the opportunity to interact with graduate students commented that they didn't have a clear idea of what graduate school was about after they completed the program. Since most students entered into the program with the intention of learning about graduate school, these students tended to be disappointed by the lack of interaction with graduate students.

I think the one thing I didn't have was some interaction with grad students. It was not any fault of my mentor. It was just [that] it was over the summer, and [not many] students are usually taking classes over the summer. They had hoped to get another grant through that would bring in a research group, but that one didn't go through. So it was hoped that I would be doing an independent project but also be interacting with students my own age who were also contemplating graduate school, and that kind of didn't pan out.

II.A.1.b. Students learned "strategic" information about applying and choosing graduate schools

Some student participants commented that their experience in the DMP gave them a unique insight to the admissions process and the selection of a graduate school that fit their needs and interests.

And again, that's sort of that whole eye-opening experience about graduate schools that I sort of got. I sort of feel like I'm living in the real world here. And my advisor here and the students here are people who really know what my chances are for graduate school, and can give me up-to-date information [as opposed to the information that I get from] my profs at my home institution, who didn't go to big-name schools, or went to school so long ago, and you know aren't in the mainstream of high-caliber grad schools, or research, or anything. So that's definitely affected my plans in terms of where I'm going to apply and all that sort of thing.

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What helped me the most was being able to get some advice on what to do about graduate school. Because I'd been kind of floundering on my own, calling schools and getting information, and I wasn't getting very far! (laugh) So now I know a little bit more about what to look for, and how the program works. I always thought when you applied for an undergraduate degree you go to admission. So, it wasn't real clear to me where you apply to a Masters degree [program] in graduate school. I didn't understand how it works within the department.

II.A.1.c. Students realized they had misconceptions about graduate school

Some students realized that they had misconceptions about graduate school and through this immersion into academic life they were able to acquire a more accurate understanding of graduate school life.

I: What's your impression of graduate school after this summer?

R: You work a lot, but I knew that already. It's not as solitary as I thought that it might be, which is something that I have been worried about.

I: Meaning you work by yourself, in isolation?
R: Exactly.

I: How did you come to that conclusion?

R: Well, working with the other two students in the office and I did see some other grad students around and they didn't seem like they were isolated.

Prior to the DMP, a few students weren't considering going to graduate school because they felt that it would be too expensive. The following student envisioned graduate school in CS&E to be similar to her undergraduate experience, where there was little financial support.

I: So you did talk to [your mentor] about her experiences in graduate school?

R: Yeah.

I: How did that go? Was she helpful?

R: Yeah, a little bit. One of the reasons I'm a little apprehensive about going to graduate school is that I'm planning to get married when I got out of school and I don't see how you can pay for graduate school if you're both going to graduate school because my boyfriend wants to go to graduate school, definitely. But she told me that she and her husband were both going to graduate school when they first got married. She was telling me that in Computer Science, at least at this school, you get paid to go to graduate school. It's not like undergraduate where you're in debt.

After learning that graduate students could be supported throughout their study, this student began to consider graduate school as an option, whereas she had previously not considered it at all.

II.A.1.d. Through interacting with and observing graduate students, students were able to identify with the graduate student experience

Some student participants commented that their interactions with and observations of graduate students gave them an opportunity to see graduate students' motivations for attending graduate school.

Well, it was nice to hear people talking about exactly why they had gone to grad school. And it was nice to hear that not everybody had started out knowing exactly what they wanted to do. And about where they had gone to undergrad school. And just stuff in general.

Through these interactions and observations, some students were able to see whether they "fit in" with the graduate students. Some students who did identify with the graduate students felt more confident that they could succeed in graduate school because they saw other people succeeding who were similar to them.

I: Has participating in the program changed your view of grad school?

R: I guess it's really made me sure that I want to get my Master's because I was still kind of unsure.

I: How did it affect that?

R: I guess I was just kind of scared, like I didn't know what to expect. But just meeting some of the Master's students, that they weren't like, I don't know, they seemed like people I could see myself being in a couple of years or next year.

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R: And I got down there, and there was this one girl who's cubby was like right next to mine and we got along great. And she's going for her PhD down there, so it was just great, you know? It's a good influence of watching, you just get to see how people act.

I: Right. How did they act? Did you like things about their experiences, or dislike things?

R: I liked it. I could definitely see myself doing it.

Evaluator Questions

Because students who were able to interact with other graduate students on a daily basis developed a more sophisticated understanding of graduate school, should the DMP require the mentor to have some graduate students to be available as a resource for the student?

II.A.2. Learning about the research process: Shifting from a classroom learning style to the self-directed research process

Through their experience in the DMP, many students came to a more complete understanding of the research process. Upon entering the DMP, most students had little experience with research and were accustomed to learning information from their instructors' lectures and structured classroom assignments. 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. In this section we will discuss the factors involved in the students making this shift from a structured classroom-style learning to a more self-directed and open-ended research process.

II.A.2.a. Students initially felt overwhelmed when faced with learning how to "do" research coupled with learning a large amount of new information

In addition to having no experience with a self-directed research process, most of the student participants entered into the DMP with little exposure to their mentor's area of research. As a result, many students initially felt overwhelmed by the amount of information they needed to learn to prepare for their project and by having to learn how to "do" research.

> I would have liked to have read things on my own. Because in the beginning, everything was new and I felt so overwhelmed. She threw all these big stacks of paper and stuff on my desk and said, "Here. Read this." (both laugh) And I was like, "Oh, my God!" But it was so fun.
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> I: How was [research] frustrating? Just starting out and working on a new project?
>
> R: Yeah, because we were just thrown into this lab, and they were all doing all this work, and I hardly knew anything about it. I had to learn all this weird stuff about [my mentor's area of research] and this new language, and things... There was *a lot* to learn when we got in there. But you kind of begin to think, and you start figuring things out.
>
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>
> I liked [research] eventually.   At first it was kind of overwhelming because, I was reading things that I really didn't understand because I basically just jumped right into things. Although she made up an itinerary for me to kind of introduce me to all aspects of her field of research. But eventually after I fiddled around and [did] some computer coding on my own, I understood. I gradually began to understand more of what I had read and what I was still reading. So, I mean eventually it was very gratifying to be able to read something and understand what I was reading and not having it completely mystify me.

II.A.2.b. Students came to recognize ways to adapt and work within an open-ended and self-directed research process

Many students came to recognize the process of research as a self-directed inquiry process and commented that in the DMP they could no longer rely on an instructor to teach them or to provide the detailed structure for their learning; rather, they expressed that they were "teaching" themselves.

> It was really a change I think for both of us because usually when you're in a class or something they say, "Write a program that multiplies x, y, z." They don't have a set way that you should do it, but they're trying to teach you something. Or, this program has been written before, but

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what we were writing had never been written before and that was a really new experience for both of us.

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Here what I'm doing is just like pretty much my own thing. You come here, they say, "Okay, this is what you have to do here, it's a bunch of reading material -- just read it and do it." And it's just for you, and you have to solve problems yourself pretty much. When you're in school, they take you by your hand, and they tell you, "Okay, read the lesson dah-dah-dah-dah-dah, and do this thing," and they teach you everything. Here you're on your own. I had to learn a new system on my own. Nobody taught me. I had to figure out how to program in it and stuff... and that's very good practice.

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R: Being in a research environment really is a lot different from going to classes every day and doing homework.

I: And how is that different?

R: You don't have a set assignment. You have work that you're doing, and you're kind of on your own, and you're trying to figure things out. And your homework is just kind of like, "You have to read this." Or, "Finish this assignment." So it's a lot different way of studying, I think.

I: Did you like that?

R: Yeah, that was fun. (laugh)

I: What about it did you like? Being able to do different things?

R: I think freedom to do your own thing. I mean, you were on your own to do research, in general. Whatever you wanted to do was what you were able to do. You're like your own teacher, kind of. Everything you learned you did on your own.

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I expected it to feel like I had a bunch of homework. Especially to feel like I was sort of in school, just not going to class, and I had a bunch of homework to turn in. But it wasn't like that at all. I was much more of an equal with [my mentor]. Instead of going and having her tell me to do something and I'd go home and do it, I'd go, and she'd tell me about a problem - sort of an open problem or a problem that is very hard. So she wanted to generate some test cases to look at them to see if there's any trend that she might be able to use to figure out a conjecture about a problem or something. I thought that was really neat. I like to program, so I'd just go program these things and do them, and it was fun. I'd come back and say, "This is what I did. This is how I did it, and everything."

Through their experience in the DMP, many students learned how to work within the open-ended framework of research. The following student commented that she was learning how to structure

her own time in order to achieve a goal, rather than depending upon an external source to provide structure.

I guess having to discipline myself without having a real timetable to stick to. And knowing that I have to get this done, but no one is going to tell me what to do by the end of this day. Because basically I just have this general goal, and so I've had to basically make up my own schedule, and tell myself what to do this day, and what I need to learn, or what questions I need to ask.

Other students came to realize the research benefits of working collaboratively.

I: So then did you and [another DMP student] work specifically together on this project?

R: Yeah, we worked together the entire time.

I: OK. How was that?

R: It was good. It was really fun. We got along really well, so we were lucky. And it was nice -- originally [I] thought we would split off and we would work on different things, but it turned out that we really needed to work at it together. And I think we made a lot fewer errors because we worked on it together, because if one person didn't see it the other person did. So it was good.

I: You said you really needed to work together. Why?

R: ... I think it was helpful just because it was two people looking at the code at the same time. I mean we both had weaknesses and we could reinforce those with the other person's strengths and make better code.

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I: Okay. Did you learn anything about the process of doing research?

R: Oh, definitely! A lot! Not only just from doing research myself. And seeing the roadblocks and the different ways people do research. Like I know that I need a supportive group, that I be forced to check in with somebody at a certain point in time

and go, "Okay, let's take a look at where we're going from here." Not only in terms of how I personally react to this whole big project idea, and doing research.

Some students realized that they needed to collaborate in order to gain support in coping with the frustrations of adapting to the research process.

It's nice to have [other DMP student participants] there, because it turns out that all of us are frustrated by how slow the research is going. So, I guess that's one of the things that I've learned this summer, which is that research can be slow. So it's nice to discover that you're not the only one who feels that things are moving at a slow pace.

II.A.2.c. Students' confidence increased through "doing" research

By adapting to and being able to work within the open-ended and self-directed research process, many students gained a new sense of confidence. In the following interview excerpt a student described this process.

It was actually an interesting process. That is, doing research. Because at first I just kind of dove in to this research, and I was kind of overwhelmed by everything. But then I just kept on plodding through and reading stuff, and then trying to apply it and eventually I understood what I was reading. I just didn't understand the surface of it. So eventually I started applying what I was reading and doing my own thing instead of just rote regurgitating what I just read. So that was interesting. It was a nice sense of accomplishment, or something like that...At first, I didn't [like research] because there were technical papers that I was reading. And so I didn't really understand what I was reading. It was really difficult for me to go through these papers and try to assimilate what I was reading when I didn't really understand it. But eventually I understood it. So it was nice, I could read these professionally published papers about some high level topic and actually understand it. And know that I've done something, maybe not equivalent but similar.

For many students, this shift from "being taught" to teaching themselves resulted in increased confidence about their understanding of and abilities to succeed in CS&E.

I: Do you feel like you can succeed in graduate school?

R: Yeah. I feel more confident now than I did when I started this project. So yeah. I feel confident that I can do it.

I: Did you have doubts before that you would be able to do it?

R: Although I have been doing well [in school], there was all this stuff, you know in the back of my mind all the time. "Well, I was just being lucky. I made this, because I just got lucky. I had an easy professor. Or, whatever." And those things. But, somehow,

maybe it's more than just luck. And this summer, my mentor had said that I did a superb job and everything. So it cannot be luck.

I: So you were able to do this project and realize that some of the work you've been doing has been skill?

R: Yeah, I worked on my own, so whatever I came up with, was with my own doing. I had advice of course. But it was not like another team member rescuing me and not like my project is working out because somebody else had a great idea or whatever. I mean it was all mine really. And I don't think it was just luck.

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I accomplished [my project]. I did what I was supposed to do and I think it gave me a lot more confidence in my ability to do something that wasn't an assignment in classes and it seemed like it was supposed to be harder. And I did it. And I think it really boosted my confidence that summer. Which was great.

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R: It seemed to me that [the graduate students] were really self-directed and really dedicated to what they were doing. That was a little bit foreign to me.

I: You're talking about being an undergraduate where you do what you have to do in class, is that what you're thinking?

R: Yeah, so I knew that grad students sort of were more self-directed. But just to see people sort of playing with a problem because they really like it and then going after a thesis with it. It's sort of scary to think that if I did that I would need to be that dedicated to a problem and do it. But then I was [as dedicated] to the problem that I worked on last summer, and I had a really good time and also got something out of it. So that made me feel like I could get through grad school and a PhD if I could find another problem that I liked as much.

II.A.3. Learning about the role of faculty: Getting beyond stereotypes

Prior to the DMP, many students' interactions with faculty were limited to the classroom and office hours, and thus many had little or no conception of the faculty role within the university. When students interacted with or even just observed the mentor and other faculty on a daily basis, they were better able to understand the faculty role in the academic setting as well as their lifestyle. The following student commented that the DMP allowed her to acquire a more multi-dimensional view of the role of the faculty in a university.

R: [The DMP] was really helpful because - I mean, looking at it from an undergraduate student's perspective, you have no idea how the professors spend most of their time 'cause all you see them is the three hours a week that they lecture. I mean you know they do lecture and they do office hours, and that's it. I mean, I had no idea, how you have to be on committees and stuff to help improve the curricula and you get little groups, they'll be a couple professors in little groups working on a project. They'll have grad students, and each professor will be in a couple groups, or I don't know how many, working on projects or trying to do the research that will lead to a paper that will lead to hopefully publication or something, and that....

I: You were mainly exposed to this last summer?

R: Yeah.

I: How did that work? Were you invited to these meetings, or it was just through osmosis?

R: Well, I watched.

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What stands out about the program for me? Working closely with a professor was a major part of the program. I got to see what sort of things she was doing. What it takes to be a professor. All sorts of projects that [professors] were involved in. And that pretty much gave me a good idea of what would be ahead for me, if I had decided to either go to graduate school or perhaps just for a Master's or for a Ph.D. and maybe regarding becoming a professor.

Previous to the DMP, many students imagined professors' lives to be completely centered around their academic life. Through their daily interactions with their mentor and other faculty, many students were surprised to find out that faculty had interests and activities outside of the academic setting.

I had this stereotype in my mind that most computer science people just did computer science and they had no social life, no families, all they did was computer science all the time. And I found out that almost everybody here has a family. All of the professors. And so I was kind of surprised.

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I always thought that professors would be more like, umm...ahh, I don't know. Always involved in school, and being heroes in the classroom. And all that stuff. But they're just like, you know regular people. They have lives. They have their own world outside and a life.

Some students broadened their understanding of the role of a professor through being at a different institution. The following student did not aspire to emulate the professors at her home institution, but upon working closely with her mentor, was able to see a different side of the faculty role.

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R: It just looked like a cool thing to do. I don't know, really I was just looking at all of them and they're a lot different than the professors at [my home institution -- a small liberal arts college]. And, I don't know, I came back and I thought about it a lot, and I could see myself doing it.

I: Different meaning they're younger and they might have different ideas?

R: Well, just different in general. I had my one impression and I guess you need another just to confirm whatever opinions you have. Because you only get one impression at one school, and you need to go to another place to see something different.

Many students reacted positively to their new understanding of what faculty do at a university. The following student commented that this new understanding allowed her to recognize professors as real people and gave her the confidence to talk to professors after class.

R: And it's also that after last summer and stuff I just felt more comfortable talking to my professors, going up after class and saying, "I'm confused about something, can you explain it?"

I: And that was partially because of your experience with the mentoring program?

R: Yeah.

I: Because it gave you more confidence to discuss with professors these kind of things?

R: Yeah, sort of, the "faculty are people too" attitude. ... They're not necessarily awe inspiring, but they're people. You can talk to them. It's not like, they're up there, and you can't talk to them even though - I don't know. When you go to classes of 200 people, or whatever, it's like they're sort of moving video tapes or something up there. No, you can go up and talk to them. They actually will respond, and stuff, instead of this weird thing.

In addition to developing the confidence to interact more frequently with faculty about CS&E, many students used their new understanding of the faculty role to define their interests in choosing whether to attend graduate school or to pursue a career in academia.

II.B. DMP career outcomes: Trying graduate school in CS&E on for size helped students to define their interests in graduate school and academia

The experience and knowledge that students developed through their immersion in an academic environment allowed them to define the nature of their career interests. Many came closer to deciding whether they were interested in pursuing graduate studies in CS&E and also whether they were interested in a career in academia. In this section, we will present first student realizations about their interest in pursuing graduate studies and then move to a discussion of student career interests in light of their newly acquired understanding about academic computer science.

II.B.1. Defining interests in graduate school

Through their experience in the DMP, most students were able to discern whether they were interested in attending graduate school. By being immersed in an academic environment, students were able to identify features of graduate life that appealed or did not appeal to them.   The following quote reflects student realizations about their new understanding.

> Before [the DMP], the decision I was making was not very informed, because I really didn't know. It was just like, I had this idea, "Oh yeah. Graduate school is so cool!" (laughs) But now I know. I know why I want to be there. I know what to expect. I know what it's going to be like.

In this section we will discuss student reactions to their immersive experience in an academic environment and their realization about their interest in graduate school.

II.B.1.a. Graduate school in CS&E is "right" for me

Through doing research and interacting with graduate students and faculty on a daily basis, many students came to realize their interests in graduate school.

Some students experienced a change in attitude about the importance of graduate studies

A few students had not considered pursuing graduate studies before being in the DMP and developed a new attitude toward learning and came to realize that they would enjoy continuing their education in CS&E.

> When I started my sophomore year [in the DMP] I had no clue what I was going to do when I graduated. I had never even thought about graduate school and continuing my education. It just opened my eyes to a whole, another area where I could just continue my education and learn more things and I think it put me in a different mode when I came back to school too. I mean so many times people in my classes, I don't know why they're at school. I mean they don't put in the effort and they wonder why they don't do well, and then I just think that learning is what it's all about.

Some students came to realize the importance of a graduate school education for specializing in an area of interest, as demonstrated by this 1994 student participant.

I: Has the program affected you today? Is there something about the program that has influenced your choices, career choices?

R: (pause) I'm more likely to go back to graduate school now. I'd definitely say that program emphasized the importance of going to grad school.

I: What is important about going to graduate school?

R: (pause) I think the one really is you need to have a little deeper knowledge. If you're interested in becoming focused on a particular aspect of something, you need to have more education.

With their new knowledge, students had confidence that graduate school "fit" them

Through doing research and interacting with graduate students and faculty, many students realized that they could successfully complete a research project and that graduate school "fit" them. This experience helped these students to define an interest in attending graduate school with the confidence that they could succeed in it.

I: Did this program affect your decision in going or not going?

R: I just finished my sophomore year when I did the program, so I hadn't had to deal with the realities of what I was going to do in two years. So it was more like graduate school is kind of this nebulous idea that I was kicking around. And it definitely showed me that I could really enjoy graduate school. I think I could succeed there. It was something that fit me. So in my case [the DMP] showed me that graduate school was a real possibility.

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I: What made you change your mind [about attending graduate school]?

R: Well it wasn't really that I changed my mind. I wasn't really sure what graduate school was all about or what it involved and this showed me what it was about and it showed me that it was something for me.

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I: So what is your impression of graduate school, then?

R: Oh, gee, I don't know! It's a place for me. It's where I want to go. And, choosing the right graduate school is going to be 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.

One 1994 student participant directly related her experience in the DMP to her decision to pursue her Master's degree. This student had not intended to attend graduate school, and worked in a private firm following graduation. However, she did not find her position as challenging as her experience with research in the DMP and after discussion with her DMP mentor, decided to join her mentor's research team as a Master's student.

I: What were the most positive aspects of the program for you?

R: The exposure to people in the computer science program. The work I did definitely gave me a lot of valuable knowledge, and the insight into how research works. I wouldn't be here if I hadn't had that. I wouldn't be in the Master's program if I hadn't had an idea how great research was.

II.B.1.b. Some students came to realize that they were not interested in or ready to commit to pursuing graduate study in CS&E

Through their experience in the DMP, some students came to realize that they were either not interested in pursuing graduate studies or were not prepared to enter into a graduate program. Many of the students who were not interested in pursuing graduate studies in CS&E cited lack of interest in working on an extensive research program and that they needed more direction and structure than research affords. The following student came to this realization after observing a graduate student at her mentor's university.

R: [Doing research] kind of made me sure that I don't want to get my doctorate...

I: Why is that?

R: Because it's just a really huge project, and [the graduate student I worked with] just works away on it, and ... like the third version, and it just seems like from my perspective of this, like of his doctoral project or whatever, it's just neverending. I feel like I would go nuts after four years of working on generally the same thing. I don't think I could deal with it.

Many of the students who expressed that they were not prepared for graduate school indicated that they had not developed an area of interest or specialization to direct their study. These students stated that it was important to have a "passion" for some area of CS&E in order to make graduate school worthwhile and did not see any benefit to pursuing graduate studies without any clear goal.

R: It showed me how graduate school is different from undergraduate [school]. It's a lot less structured. The idea of doing research. The idea of being more on your own. I guess that's the best way I can explain it, it's different.

I: How did you feel about it?

R: I enjoyed it, I thought it was a real good experience.

I: Is that something you're looking for, that kind of an atmosphere?

R: Honestly -- right now strangely enough -- I know this probably wasn't the intent of this whole program but I think it showed me that I am not ready for that just yet. Maybe in a few years I will be, but not just yet. I think that for one thing, to do research and to go to graduate school you really sort of have [to have a] passion for something, maybe some aspect of computer science. And frankly, I haven't found what that is yet. And I think maybe being out there a few years working or reading on my own will help me to find my passion, if there is one.

II.B.2. Pursuing a Career in Academia

Most students felt that their observations and interactions with faculty and their experience with research were accurate indicators of a career in academia. As a result, through their experience in the DMP, many students came to understand whether they would like to work in academia.

II.B.2.a. A career in academia is "right" for me

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.

R: I'm trying to find something that really excites me. Before I ever had the mentor project job, nobody ever paid me to do something that I thought was really neat. I never could be working and then all of a sudden stop and think, "Hey, I don't have to go somewhere and make some money so that I can eat. This is cool, and I really enjoy this, and somebody is paying me to do this!" I don't know why, they're kind of crazy, but I can sit here and play with these partitions, and I don't have to go earn some money to keep a roof over my head because I'm earning money doing something I really think is neat. When I was growing up, the thing I always saw was, the people around me, they had jobs that they hated. I thought that's what you had to have when you grew up, that you had to do - like your work was just something you had to do to eat, and you couldn't have a great time doing it, it just wasn't possible. Then last year when I had that job [at the DMP] I

was like, "Wow, somebody really will pay you to do something you like to do!" And that was really exciting. I felt that was really neat.

I: Did it give you any perspective on work and what you can do?

R: Yeah, it made me really excited about going to grad school and computer science and going into teaching.

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I: Is that something that helped you decide to go into academia?

R: Yeah, I like the idea of doing a variety of things and also the idea of academia that you teach, you help the students, you work on academic curricula, you're on committees and stuff, you have your office hours, you have your research, you're writing -- and research itself is you're programming or you're writing a paper or you're thinking up ideas or you're working on some proof, or whatever. It's like, you won't be doing the exact same thing. On any given day you spend a couple hours doing research, go to do a lecture, come back, have office hours, where people may or may not show up, do some more research, go to a committee meeting, go talk to somebody from industry about getting money for getting a grant to do something else.

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R: I really like the atmosphere of a university too, compared to that out in the industry. I mean I haven't had that much experience out in industry but I really enjoyed being at [my host DMP university] the last couple summers.

I: What's the atmosphere [like]?

R: I was doing my work because I wanted to and it was my work and I worked in an engineering department my freshman summer and it was just, "Here's this task, do it." And it wasn't so much, "Do research and find out. Investigate a problem."

I: So it was more limited?

R: Yeah. I've loved being at [my mentor's university] the last couple of summers and I'd really like to continue my education. And I think I want to be a professor but I don't know if I've given myself the chance to see what the industry is like, and I'll have to figure that out along the way.

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R: [My mentor is] 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, and things like that.

I: What do you mean by that?

R: Well, she's got two dogs, crazy kids who are- I mean, they're great! ... And, you know, she...had time for vacation, and she's like, "I can't meet at two o'clock today, I've got to take [my daughter] to ballet." All of the reinforcements of the other real reason I want to teach in the college atmosphere is to avoid the 8 to 5, 8 to 7, whatever a typical workday thing. More flexibility in my schedule is very important to me. And I just don't think I could do that sort of punch-in-punch-out kind of physical job stuff. And academic life...while [it may be] more rigorous in other aspects, and [it] has its downfalls, is the kind of thing that I want to do for that reason. It's more flexible when you need it to be.

Some students were able to further define the direction they wanted to take within the field through their experience with research. The following student discussed how her experience conducting research in the DMP inspired her and caused her to re-evaluate an aspect of her career decision.

I was like, "Yeah, I'll do research while I'm in college, and while I'm getting my Ph.D., and that's important and all that sort of stuff, but really I'm interested in getting a job at a small teaching institution." And... I'm not so sure that's actually 100% true anymore. Research here has been really neat. It's been a lot of fun, it's really interesting, especially if you're in a topic that's really interesting. It's really nice seeing how [my mentor] has four or five grad students working with her, full time, and they're each working on a different aspect of her whole big picture problem that she's looking at here. And it's really neat to see how these things all come together. And she's just so excited about it, that you can't help but be excited! It's just like, "This is so great, don't you see?! It's doing this and this is doing that!" And you're like, "Oh my gosh, she's right, you know, this is fairly interesting! This is going to make a difference!" And things like that. And, it is really exciting, and it's a lot of fun, with very big contrast to the research I had done at my home institution. Sort of by myself for my undergraduate honors thesis, and it was a very, very different experience.

II.B.2.b. Some students were ambivalent about a career in academia after completing the program

Some students enjoyed their work in an academic environment during the DMP summer, but were still ambivalent about choosing academic CS&E as a career. Some students had not worked in industry and had no basis of comparison and so were hesitant to decided upon a career in academia without more information. Some students commented that although they enjoyed the freedom and flexibility of an academic schedule, they also had reservations about working in such an unstructured environment.

I liked the fact that you work on your own [in research]. I mean it's your project. You have help, but it's ultimately your project. And also you come in anytime and you can get up at noon if you like and go back to bed at one a.m. And those sorts of things. And then you go to a conference, present papers, and then you get a lot of exposure. And that's nice. I like that. But on the other hand, for the same reason actually, I don't like it because it's open-ended. You don't have a definite assignment, a definite job. And it might not work out. When you have something structured, your boss tells you, "Okay. This is what I expect. This is what I want you to do." So you go and work at it. You go in and you know when you're coming and know when [you're] getting out of work. And that's nice too. And that's something that research doesn't have. So I am really undecided. I mean it has worked out for this summer but I'm not really sure that the same thing would happen if I were to do research for a living.

II.B.2.c. A career in academia is not "right" for me

Some students came to realize that an academic career did not appeal to them. Many of these students expressed that they needed more external direction and structure than a career in research would offer them. These students expressed that they wanted more external structure to frame their work and, in some cases, to motivate them.

I: Did you learn anything new about the process of doing research?

R: I don't know. I guess the only thing that I learned is that it's a lot less structured and a lot less methodical than I expected. And I don't know if it's always like that, maybe it's just like that at [my mentor's university] but that surprised me. I expected to sort of have a schedule of deliverables or whatever and sort of something that you had to stick by, that you had to be at this certain point, you had to progress like to a certain point by a certain date and then at the next date I expect you to be at this point, and it was just really nothing like that. There was no scheduling. There was no itinerary or whatever.

I: How did you feel about that?

R: I guess I work better in a structured environment. I have to admit I like a little bit of bureaucracy.

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I: So are there benefits to working for a Master's degree in computer science?

R: I guess I had a lot of problems seeing what I would do with that degree when I was done with it. I mean, if I wanted to teach at the college level I think I would have had a lot of opportunities, but I wasn't totally convinced I would be happy where I was doing research half my day and teaching the other half. I wasn't very convinced. I did another thesis besides the CRA project across junior and senior year at the University. It was a challenging decision for a lot of us who went through the thesis process. Do we want to do research and teach, or do we want to do something else? I'm still not totally positive, but I think right now I'm happy with

what I'm doing [at my job].

I: Was that something you learned through the program or through your senior thesis?

R: I think to be in a research environment you have to have a lot of internal motivation, and I'm not sure I had that. I'm one that needs a lot of, I don't want to say approval outside, but I need some kind of measure of how I'm doing, and when you're doing research it's very difficult. Unless you're getting a lot of things published there's not a lot of immediate feedback. In a job you have a little more of that.

Evaluator Point of View

We came to realize that by immersing students in an academic environment, the DMP is preparing these students to make knowledgeable career decisions. By giving students an opportunity to experience aspects of graduate school life prior to making their actual career decisions, the DMP is enabling students to make informed decisions about a career and about graduate school. Those students who identify with and enjoy the people and experiences they encounter may realize that graduate school is "right" for them and also be more likely to succeed in graduate school because they are prepared for an academic environment. Others who did not enjoy their research experience may be less inclined to attend graduate school and, in fact, may have been prevented from making a potentially inappropriate career choice.

Evaluator Question

If students encounter serious problems in the DMP, do they allow this negative experience to be the defining factor in whether they attend graduate school? We are defining "serious problems" as students feeling that their mentor excluded them from professional and personal interactions with her and as a result, encountered problems with the program itself.

Due to the small number of students that had negative experiences in the program, we cannot draw definitive conclusions about this question. Despite this small sample, their experiences raise important questions and issues about the implementation of the DMP and its effects on the students. In subsequent years of this evaluation as more data is gathered we will be able to more completely explore the relationship between the program implementation and its effects.

III. Students as "part of a larger whole:" Involving students in the research process and the graduate school environment creates a more successful DMP experience

In section II of this report, we discussed the ways in which immersing students in a graduate school environment increased their understanding of the academic field of CS&E as a way of helping them to more clearly define their career interests. This section serves to present how involving students in a collaborative research process is critical to their having a successful experience in the program and also achieving the outcomes discussed in section II.

III.A. Students benefited most from doing something "real" that contributed to their mentor's research

In our discussions with students, they emphasized the importance of doing a project that was related to, and had an impact on their mentor's research group. These students expressed that their project felt "real" to them precisely because it contributed to the research of someone professionally involved in CS&E. Virtually all students had previously worked only in the context of doing structured undergraduate assignments, and for many, this experience helped them to realize that they were capable of contributing valuable information to the field.

> I really liked [research] a lot. Knowing that it was something new. Actually contributing to a project that wasn't something that tons of people had done before and it was for other people also, not just ourselves.

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> R: I was actually writing programs to do things, and before I was just writing them as a homework assignment. You know, "Do this kind of a program to get an A in the class." They were actually useful; I've never written useful programs.
>
> I: How did you feel about that?
>
> R: That was pretty neat. I was pretty proud of myself.

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> I: Do you feel like the work you did this summer was important?
>
> R: Oh yeah. Important to me and important to them because it's their research.
>
> I: And how is it important to you?
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> R: Because it, like I said before, reinforced my confidence. Also it will give me a sense of having done something real so to speak. I'm used to just doing projects for

academics -- "Just turn this in, get a grade and then throw it away." And this is something that's going to be used for something real, real important.

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So I made this program, a graphical interface type thing so they could draw it up and it would have all the information they needed to convert it to another format, and they could use it with other stuff that they needed. So, it was pretty cool. It was actually useful. I was surprised!

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Things are starting to come together and we've realized that we actually have done something real, you know? It took a long time to get into this, but that's because it was a whole new area of computer science that we were getting into, and we didn't know anything about it. But in the end, we did accomplish some things, and so...so academically we actually did do something that will contribute to the people we're working with, their research. So academically, we really felt like we weren't just sort of extraneous, and we did do some important things and accomplish things.
I think I'd like to just stress how great it was that we were able to work with the [graduate] students, and really get involved in the lab. And we were given our own computer and...You know, we really felt involved and part of what was going on.

One 1994 student commented that the research she did was applicable not just to her mentor's project, but was also valuable to her experiences in the business community.

I: What did you think of the research?

R: Very interesting - very interesting, very applicable. Some of it was cutting edge. When I got out into the working world and they needed something done, it was very similar to what I had done, and I understood all the problems and the drawbacks , all the different options.

III.B. Students were motivated to do research when they were included as contributing members of the research team

Students were more motivated and inspired to do research when their mentor treated them as valuable members of the research group, capable of providing input and direction about their research.

I just wrote some tools that [the graduate student] needed in order to do some of his analysis. And I was helping. And I really did feel involved, because when I analyzed this data, I got to see the results. And I felt like, "Wow!" [I] really felt like I was part of that research. And now I'm working with [another graduate student] and I'm running some tests. And I'm coming up with more results, and making graphs and

charts. And so it's like I'm coming up with some ideas, and some kind of take on the whole thing.

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I was also working with [my mentor] like an equal. We were both looking at a problem, and everything one of us said mattered. It wasn't like, "You are the undergraduate, therefore you are stupid." It wasn't like that at all. It was much more equal. [My mentor] is way more experienced than I am and very, very intelligent, and she knows about these kind of problems, or at least she's been working on them. It felt really neat to feel like I could have something to say about the kind of problem too. That was really good. I really liked that.

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I think I came up here expecting a pecking order, expecting to be given a lot scutwork to do, but I'm not! I'm being pulled right into their research project! Right at the heart of it, and I wasn't expecting that. It's been a confidence booster for me, and every step of the way, [my mentor] who's been very encouraging, and when I get a little bit intimidated, she'll say, "No, no, no, no, no. Don't worry about this."

III.C. When students felt excluded from the collaborative research process, they became less motivated and felt isolated

A few students discussed that they felt excluded from the collaborative research process as a result of being assigned to a project that was irrelevant to their mentor's research or not working with members of the research team. These students stated that they felt isolated from the research process and became less motivated to work on their project.

R: They hadn't really decided on anything until we got there and they said "Oh, well, OK. You can do this." And it was something kind of insignificant.

I: Insignificant to what you wanted to do?

R: No, to anybody. It seemed like it was just something to keep me busy, I'm not sure. I think they had high hopes, but I don't think they realized that what they wanted me to do couldn't really be done with the tools they gave me to do it with. So I ended up with a project that probably is not useable.

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I would've liked to have had someone to sort of go back and forth with and bounce things off of and maybe get some ideas from. I didn't really like being left high and dry so to speak...And my mentor, she admitted herself she was no programmer so she couldn't really help me with the coding.

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Actually the signals I've been getting is that I'm more of a nuisance here than a help. Like, when I have questions, nobody wants to take the time to answer them. I have a lot of questions, and when I'd ask the graduate student he finally said, "Well, you're going to have to stop come asking me so many questions. Write them all down and ask me them all at one time." [My mentor] always seems really busy, so I don't talk with her much. So yeah, I kind of just feel like I'm more of a nuisance than a help here.

IV. The multi-dimensional role of the mentor

In this section we will discuss the students' view of the role of the mentor in the program. The mentor played a critical role both in facilitating a positive experience for the students during their participation in the program as well as through acting as a role model and a professional resource.

IV.A. Within the framework of the program: Orienting and helping students in their research project

IV.A.1. Defining the working relationship

When students first arrived at their mentor's university, they expected the mentor to clearly delineate her expectations for them. This included defining when and how often they would meet, what was expected of them in these meetings, as well as letting the students know the times at which the mentor would be available for questions (outside of the regular meetings). If the student worked with graduate students, they also wanted a clear delineation of their working relationship.

Most students expressed that they knew what their mentor expected of them and were able to function within that framework. However, a few students felt unclear about the protocol for interacting with their mentor or didn't feel that they had an understanding of their mentor's expectations. In the following interview excerpts the students discussed their concerns and frustrations about these issues.

> I mean she was busy, just really, she would shut her door all day like she wanted us to leave her alone. And [someone else] would insist on knocking on her door and bothering her. And I really thought to myself, "[This person] is pushing it." (laughs) You know what I mean? I mean I really thought that. I didn't know that that's what she wanted. And I mean, I blame her for not telling me that.
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> I: What were the most negative aspects of the program for you?
>
> R: Being ignored. I wasn't real happy with that. I don't do well with being ignored anyway. And I felt like there were false pretenses.
>
> I: Set forth by whom?
>
> R: Set forth more by the lack of communication or understanding.
>
> I: What were the false pretenses?

R: Mentoring. The fact that I truly believed that she would spend more time with me.

Other students commented that they were unsure what kind of behavior was acceptable when dealing with graduate students. The following student's comments reflect the fact that it was unclear to her as to what type of relationship she was to have with graduate students.

One incident I had was with the grad student who's helping me with the coding. The professor told me to go see him about his code and go ask him questions. Well, I went over and spent about 40 minutes with him and felt real guilty about that and then left. Then the professor asked me how it went and I told him, "Well, I went over and spent 40 minutes with him." And he said, "Well, I thought you were going to spend the whole afternoon with him." And it never ever dawned on me that I could take up that much of somebody's time. When he said go ask him some questions, I just thought, "Okay. Well, I'll spend maybe half an hour, or hour with him," 'cause I figured he's got work to do. I guess, I ran into little problems like that of just not really knowing how things worked and how to act.

Evaluator Point of View

Most students viewed their mentor as an authority figure and were uncomfortable, at least initially, with approaching her with questions and concerns. A number of these students lacked confidence about their skills and abilities, and were reluctant to initiate interactions and discussions with the mentor. As a result, the students placed the responsibility on the mentor for defining the nature and frequency of interactions during the program. Thus, the mentor can reduce her student's anxiety about their interactions, both professional and social, by clearly stating her expectations and setting up a protocol for interactions.

IV.A.2. "Making time" for the students

Many of the students that we interviewed emphasized that an important part of the program was their interaction with their mentor. These students expected their mentor to be available to address their questions about their project and discuss details of a career in CS&E.

Most students stated that their mentor was available throughout the program to meet with them and address their questions. A few students expressed that their mentor either was not available or was not a good resource. When students felt that they didn't have much contact with their mentor, they were disappointed with the program and questioned the value of the mentoring aspect of the program.

R: I think that perhaps the professor I'm working with wasn't the best choice...

I: Why is that?

R: She's really busy, she doesn't have very much time for me at all. Like weeks go by without me seeing her during more than, like we have a weekly luncheon. I'm actually working much

more directly with this graduate student. Like if I have a questions, problems with the program, I ask him because it's his program. He knows, [and] he can help me out much more quickly, than my mentor. So that's kind of a little disappointing, I don't really know how much of a mentor she is being to me- ... I mean she's kind of left it that if I have questions I can come to her, but it just seems pointless when I have a question about the project to go to her, because she's going to say, "Well, I don't really know the details. Why don't you go ask him?"

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I: So from the whole definition of mentor you assumed that she would perform certain duties?

R: Yeah, be around more, make sure that I wasn't spending all of my nights at home wondering what I was supposed to be doing.

I: HmmMmm. And that didn't happen?

R: That didn't happen at all. As far as she was concerned the more that I stayed out of her life the better.

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I: And then what happened? Did you work with her on a project?

R: No, we worked with the grad students. She's real busy. I hardly ever saw [my mentor]. I had a problem with that, I did. I was real unhappy with that because, I mean she was supposed to be my mentor, and you know what I mean. I wanted to get to know her.

In fact, when students perceived their mentor as too busy to meet with them, many felt as if their presence, rather than being helpful, was more of a distraction.

R: So I didn't have a lot of direct contact with her concerning this project. We would have weekly meetings where we would tell her and the graduate students what we had done during the week. And that was about the only time we interacted with her with regards to the project anyway.

I: How did you feel about that?

R: It was a little disappointing. And I understand she's busy, but I kind of felt like I was in the way, more than being a help to them all.

Evaluator Point of View

This section demonstrates the value that students placed on their interactions with the mentor. The students expected the mentor to provide guidance about their project and about their career decisions. If the mentor is only available to them through weekly group research meetings, the student is apt to become disappointed with their working relationship. Thus, it is important that the mentor set aside time to spend alone with the student so that these issues and questions can be addressed.

IV.A.3. Designing and implementing a project: Giving students freedom within limits

For most students in the DMP, their project was their first experience with research. Through our interviews, we came to understand that while students wanted their project to allow for their intellectual creativity and interests, they also felt they needed some structure and guidance from the mentor.

IV.A.3.a. Choice within structure: Students wanted the mentor to prepare a project or a series of projects

Many students entered the DMP lacking a sense of their interests in CS&E and of how to conduct research in the field. As a result they needed the mentor to frame a project or series of projects for them which would provide an overall structure for their research. Yet within this framework students wanted to have some input in helping to define their project as well as a choice in how they would proceed in conducting their research project.

I: Who decided what you would work on?

R: Actually, she gave me choices so I guess it's hard to say. I kind of said, "What do you think if I do this?" And she said, "Okay." It was like fifty-fifty. Sometimes I came up with the idea. Sometimes she would suggest the idea and I said, "Yes." So, in the last project she gave me a few things to choose from and I chose what I chose. So, I made a choice. So, I don't know. Kind of fifty-fifty. It worked out fine. I mean, she would never push anything on me or anything like that.

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R: Yeah, like if there was several things that were available, [my graduate student advisor] would be "Well, like well, what do you want to do." which was good.

I: You liked that, having that freedom?

R: Yeah, yeah. Because then I wouldn't have to do the stuff that was like "Yuck, I don't want to do it." (laughs) I got to do more fun stuff.

IV.A.3.b. Students wanted structure and guidance in their research

Students expressed that they needed structure and guidance as they conducted research during the program. Many students expressed that they preferred that their mentor provide overall guidance and direction without being involved in the day-to-day details. In the following quotes, students described the nature of the guidance from the mentor that was helpful to them in their research.

She gave me the project and basically told me the eventual goal of what I wanted to accomplish. And then, she basically let me start. And then I'd just come to her with questions. And if I asked her a question, she not only would answer that question, but kind of give me more advice about what I needed to do or say, "Oh this is something that you left out. You need to do this too." So she answered the questions I asked, basically, but she didn't try to [take over the project]. I mean she guided me a little bit, because at the beginning I had no idea what I was doing. But it wasn't a very dominating role that she had.

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R: I like [my project]. It's definitely interesting. It's something I've never done before. [My mentor] said, "Okay, I know nothing about it, but it looks okay and it might be a good idea. I think it will work, so why don't you try it?" And she gave me the book, and I sat down. She generally told me what she wanted. I mean, we're in constant contact because my little cubicle is a whole 25 feet from her office. It works out very well.

I: How often do you talk to her -- several times throughout the day?

R: It depends on what I'm doing. If I'm really, really stuck, 'cause there've been a couple times where I haven't talked to her about the project for a couple days, and then I'll come in and show her, "This is what I did, what needs to be different." 'Cause the way I'm programming is basically trial and error, 'cause I've never used the language and neither has she. It makes it interesting - we're like the blind leading the blind.

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I: What did [your mentor] do in the mentoring program?

R: She did a lot. She basically sort of steered us or not really steered, but helped us get started in a big way. I mean she said "Well, you guys can choose whatever you want. Or if you have no idea, here are four ideas, you know. And you can pick one of these if you want." [The other DMP student] and I were like "Hmm, OK." (laughs) And so she made sure that like we met with [another person on the research team] and she was like, "You know, it's a really good idea if you guys give talks." And so she didn't really sit down there and do the programming or anything, she just sort of directed us and sort of helped us do research. And definitely I mean, she gave us reading assignments and pointed us in that direction of reading, told us what papers she thought would be useful, and stuff like that.

When students worked without structure and guidance, they expressed that they felt lost and without direction. The following student expressed that because she had "too much" freedom on

the project, she wasn't sure what was important for her to concentrate on.

R: I think one of the things that I'm most disappointed in about the program that was just in organizing it they were pretty loose in what they wanted me to do at the beginning. Which was cool 'cause it gave me room to figure out what I was doing. But they had a large code that I was working with and they just sort of let me play around and finally I was like, "Well, can I look at that?" So once I did that things started going, but it didn't happen till almost halfway through the project and I think that slowed me down a lot.

I: They didn't give you a clear project at all?

R: Well, yes it was a clear project. But there were several things surrounding it and basically it was a very independent thing for me. Which I liked a lot and worked a lot and if I ever had questions they were more than willing to do anything and everything to help...But they didn't say, "Okay, it's gonna have to be this design, this whatever." I was pretty much set to design it how I wanted....I played with a lot of stuff and I did a lot of other stuff but I didn't know exactly how it related 'cause I didn't know exactly what I needed, you know.

One student expressed frustration and disappointment that she received almost no guidance and struggled for weeks attempting to understand how to approach her project. As a result this student stated that she was unable to complete her project.

R: I never really did find out [what my project was]. I mean, I had a written description, but nobody ever told me how to do it. And the last three weeks I attached myself to some graduate students and wrote a help module for them, so by then, by the last three weeks I would come in, program for a few hours, go to lunch, program for some more, meet with people to discuss what I was programming. That was a lot more what I thought it would be, overall, but I wasn't doing the project that she wanted me to. In fact, I don't know what she wanted me to do.

I: So she never, she wrote it out but didn't discuss it with you?

R: Yeah, and I always got the idea that it would just become suddenly apparent to me and it never did, and every time I tried to talk to her about it she would either say, "Well, you're doing fine for now, and we'll talk about it when you start something new," but I didn't know what I was doing for now.

Evaluator Point of View

This section demonstrates the importance of the mentor achieving a balance between providing guidance and allowing the student independence in directing the work on her own project. Most students did not have the capacity to independently conduct research and therefore needed a structured project and overall guidance.

IV.B. Beyond the framework of the program: The mentor as role model and professional resource

IV.B.1. Orienting students about the field of CS&E

Some students discussed the value of having someone prepared and available to answer their questions and orient them about a career in CS&E. They looked upon their mentor as a reliable resource to address their questions about graduate school, research and academic life.

> I mean that was just nice to have someone who expected the questions that you were going to ask you know, about grad school or about research, or about careers or whatever. So I mean she was really helpful both directing our research and talking to us about whatever we wanted to talk about GRE's or whatever.

> * * * * * * * * * * *
> I: Now you're about three weeks into it. What is turning [out to be valuable to you]?
>
> R: It's the mentor thing, because I can go and ask her anything. And it's great to be able to do that because she's done it and she's been through grad school and she's done this and she's searched through all them and she's done the job hunt. I mean, she's been through all of it. So if I have a question about it I can ask her, and she'll be able to answer.

> * * * * * * * * * * *
> I: What were the most positive aspects of the program for you?
>
> R: Having a mentor who was female and who was sort of -- by the very nature of the program it sort of made it okay to ask questions like, "Have you encountered sexism?" All that kind of stuff. And also, "What's the process for entering grad school, for going for a PhD." I mean, they don't explain to you as an undergrad, because most undergrads don't go to grad school I guess, but they don't say, "You've got to write a thesis. This class in this university is required." That kind of thing.

Many students commented that their mentor introduced them to the culture of academia by giving them professional advice and direction.

R: I talked to her a couple times about grad school and what it's like to be a grad student or what it's like a professor or how you get in or explain the whole grant getting process, and that kind of thing.

I: You asked her to explain that?

R: Yeah. We had quite a few talks on the whole, how the research world works, stuff.

I: Was that important to you?

R: It was very helpful. I mean, I know a heck of a lot more about it now than I did then.

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Actually, I mostly talked to [my mentor] trying to figure out what college to go to for grad school. She was firmly encouraging me to go to the one with the best name that I could get into, just because then you can get a job at a place with a better name and you have more choices.

IV.B.2. "Modeling" life in the field

Although students commented that they could look to their male professors as modeling the faculty role, most felt that women had a unique experience as CS&E faculty. Since most student participants had little or no prior direct contact with a female faculty member, many looked to their mentor as a role model of what they might accomplish and experience in a career in CS&E. By observing and interacting with their mentor over the ten week period, many students were able to develop a clearer picture of the experience of women in CS&E.

IV.B.2.a. Students identified with, and learned from, their mentor's experience in CS&E

Almost all students emphasized that their interaction with a female faculty member in the DMP was important to them because they could discuss with her experiences particular to being female in the field of CS&E. Many described that they were able to identify with the mentor and relate to her experiences as a female in CS&E.

Yeah, I think maybe we've both been maybe up against the same things, we can sort of relate to each others' situation.

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I: Was having a female mentor important to you?

R: Not important, but I definitely think it was helpful just because guys and girls have different perspectives of things. It's just that she's already been through it all, you know? Like she went through undergrad, she went through grad, she went through not having a ton of girls in her class, you know? It's just nice that someone else could relate to what I was going through,

type of thing.

In addition, almost all students felt that their mentor provided a more accurate picture of the kinds of issues that they, as females, will face in CS&E.

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'm not trying to be sexist or anything but I just can't talk to them the same way I can talk to my mentor. And we cannot address the same issues. They didn't have the same problems a woman is going to have when going to graduate school or getting a job, and so the experience of a woman, a woman mentor, gives me, is more closely to what I'm going to be experiencing.

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R: Why do I think all the mentors were women? I think it was to give us a perspective from a female perspective. I don't know. Maybe I would have gotten along just as well with the male mentor. I don't know. I mean, I've never had any problems with my male professors, I just think I could get a more accurate view of how I was going to go through life through a female mentor's experience. Does that make sense?

I: Meaning that you'll have similar experiences?

R: Right, and we had similar concerns. Like, especially if I want to have children, that's something most males don't consider as necessarily their responsibility, and it was something I knew if I wanted to have kids some day I had to approach and address. And I felt comfortable talking with her about that, and I don't think a male mentor I would have felt comfortable talking to that about.

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I think one of the other things I was worried about was grad school because if I think they're few women in my classes now, it's going to be even worse in graduate school because even a smaller percentage of women. And I don't know. I guess it was just good to talk to a woman who's been there, been through graduate school as a woman, and just can give me encouragement that it's not going to be, I don't know, terrible. I'm not going to feel like a Martian. (laughs)

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You can talk more about personal experiences and stuff like that with women profs. And it is important to understand how their whole academic life plays in with their family. Just sort of the way they grew up and things like that. Because it is different, because for men it is very accepted, that ... if you want to go off and get your Ph.D. and blah-blah-blah, you know, that's fine, whatever. But, you hang out by yourself, it just extends your bachelorhood longer, you get married at the end or whatever. For women, I mean, it's not

so much established. So you learn that, "Yeah this is what I did, and this is how it goes, and it all worked out, and it's okay."

IV.B.2.b. Students realized that a woman could be successful and respected in CS&E

By observing and working closely with female faculty member, students were able to view her as a role model for what they could accomplish in their professional life. Although the students were aware that women could succeed in CS&E, they had little or no contact with any female faculty prior to the DMP. For many students, this interaction with their female mentor provided an example of what type of woman can succeed in CS&E and, in many cases, encouragement that they too could succeed in the field.

> Actually, after the program I was much more gung ho [about graduate school]. I wanted to be just like [my mentor]. I still like the idea. Actually, I'm taking a course from her right now. I think it's a really neat course, and it's sort of reminding me that there is stuff that I like. It's sort of making me think about grad school a second time, in computer science. I think [my mentor] is fantastic. She really makes me believe that you could do something neat with a career in computer science in the university.

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> I: OK. Why do you think all the mentors were women?
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> R: Ahm, well I think ahm, if the purpose of the program is to encourage females to continue on it helps to see a female that actually has continued on and been very successful. Ahm, if you see another male you see them all over the place and I think seeing that, yeah there is a female that has made it and it can be done and I think that's just- I think that's just encouraging.
>
> I: Did it have an effect on you?
>
> R: Yeah it did. [My mentor] impressed me a lot and it was helpful to see her having been so successful. I think I would've come away with a lot of the same feelings with a male mentor but if I had to make a choice I would have chosen a female mentor.

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> But it seemed worthwhile to me [that the DMP was only offered to women]. I didn't really get any close relationships with any female professors otherwise. I do know that women can do it. I never had any trouble with self-esteem or sexism that way, but it still seems useful to me to see that, yes, there indeed really was this female professor that I got to work with that's very successful.

<u>IV.B.2.c. Students realized that women can have a successful career and outside interests</u>

Many students commented that prior to participating in the DMP, they were worried about being able to balance a career in CS&E with other interests, namely having a family. Many students feared that an academic career in CS&E would be too time intensive to be able to focus on other interests. Most students looked to their mentor as an accurate role model of whether it was possible to be successful in CS&E and have outside interests. In this section, we will discuss student reactions to their mentor's lifestyle.

Many students looked to their mentor as someone who could accurately model how to balance family and career. For some students, this was an important issue when considering an academic career in CS&E and they reacted positively to seeing their mentor strike this balance.

R: [Working with a female mentor] made it seem really possible to work and to have a family. I think computer science has a tendency of sort of swallowing up any hours you'll give to it. She put really some boundaries on when she was working and when she stopped working. And that was really good to see. To see that maybe not every Thursday at five o'clock she went home, but she would say "OK, I've done enough today. I need to go home and spend some time with my family. Stuff like that."

I: Was that something you might have been worried about?

R: I was definitely worried about it. (laughs) Having a family is very important to me. I mean even our faculty members [in CS&E] are here more than any other faculty in the entire college. So I wanted to see that it was possible that you could balance it.

I: Did this affect how you viewed graduate school then, or how you viewed going into Computer Science?

R: Well, yeah. It made it more attractive, definitely. To see a successful woman managing career and family.

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I: Why do you think all the mentors are women?

R: Well, it seems that the goal of the program was to show women engineers that there were other women in the field that were enjoying what they were doing. And it was really refreshing to see that. And it was nice to see that a woman could make it and be very respected doing what she was doing. I think that was good. I think that's a good thing. I think it was a very good thing that it was a female because 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, have a family and other things that she likes.
I: Was this something that you had worried about?

R: I was kind of worried that any job that I might get would ask so much of me that I wouldn't be able to have any other dedications to anything. Yeah, so that was something I did worry about, was that a job would ask too much of me. I saw that it could ask a lot of you, but you could still have a lot to give to other things as well.

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R: Yeah, so [my DMP mentor has] really been a great influence. She has three 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's gone though college and gotten her PhD and now is teaching and has kids. It's interesting to be able to see that first hand...

I: How does that influence you? Does it influence you in what you can do?

R: Yeah I think it did. It just made me think that you really can do any kind of thing. I mean just put your mind to it. Which I think a whole part of getting your PhD is, I mean it's a long haul but if you want it bad enough I think you can do it. I might be a little bit too optimistic, I don't know.

V. Logistical Problems with the DMP

Many students expressed frustration about organizing various aspects of their living arrangements at the mentor's university. Because the participants were not "official" students at the host university, they were often denied housing and other aspects of university life unless their mentor intervened. The following quotes are representative of the experiences of many students.

We did have problems with housing for a long time. ... And we were messing and messing around with it. I think there's a real problem with the program in that, since it's not like an established REU program, the host universities just don't know what to do with us. They're like, "But you're not a graduate student!" And I'm like, "But I'm supposed to be living like a graduate student. The *whole purpose* of this program is that we become graduate students for a summer." And I'm like, "So we've gotta live in graduate school housing." And everybody I'd talked to who'd done it last year had said that this was a key part of their experience -- really living *with* graduate students! And I see that, especially being here. Graduate student housing here is like way out, away from everybody else. And everybody lives here! And if we were an undergrad, on campus, in a dorm, and just...it wouldn't work. It would not be the same at all. And it would make things alot more complicated, and we would feel really isolated. And so that was really the only big problem we have [had]. But once we got down to like, "Look, we're getting nowhere. We're getting stonewalled because people know that we're undergrads and they're not taking us seriously." We just wrote our advisor a letter and said, "Hey, this is what we've done, we can't get anywhere, you've got to pull some strings or do something." And she did. She called us two days later and said, "You're in grad student housing" I don't know what miracle she pulled off, but I think that's very hard because from what she's told us, the advisors don't have alot of information on how to deal with the internal politics within the

university, and they don't have enough clout necessarily to get these things arranged as they should be, and if it's not set up.

I: Okay.

R: And we had problems getting ID cards for the exact same reason. They're like, "But you're not getting a paycheck from us!" We're like, "We know. We get paid from somebody else, just *give* us an ID card." So... just... the little things, like that.

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Oh, the thing is that normally what they say is that you're only allowed to get this housing if you're one of the summer session students or if you work for the University, which I sort of was, but I wasn't getting on payroll so they wouldn't accept that. So I had to have my mentor write a letter and then that letter went to the summer session office and then that letter went to housing.

Another issue that arose in our discussions with students was that some had difficulties receiving their checks from the CRA on time.

R: I'll make one comment, but it's not exactly about the program. But that CRA place that pays you is just really disorganized. (laughs)

I: Why? They weren't paying you on time or?

R: No, I got my first check late. Well it's supposed to be there at the beginning of May and I had them send it to my apartment. And I moved out May 13 and hadn't gotten it yet and I had my mail forwarded. So I hadn't gotten it by like, two days before I was supposed to leave. And I thought I was going to have to pay for all my housing up front, so I needed it when I got here. And so they had to Fed Ex me a new check. And I didn't end up getting the first one until like two or three weeks after I had already been here...And then my second check was a month and a half late.

The Mentors' Point of View:
Issues Involved in Mentoring in the DMP

In this section, we will discuss various issues involved in being a mentor in the DMP. Many of these are themes that the mentors themselves initiated and discussed in our interviews; other themes arose more directly from our interview questions. Our discussion will focus on the mentors' views surrounding the significant components of the program.

I. The Goal and Structure of the DMP

In this section we will discuss the mentors' views of the overarching goal of the DMP and how the structure of the program achieves this goal.

I.A. DMP Goal: To encourage female undergraduates to consider graduate school and a research career in CS&E

In our interviews with the mentors, we discussed the purpose of the DMP. Virtually all mentors responded that the focus of the DMP was to introduce undergraduate females to research and a graduate school environment in CS&E with the intention of encouraging these students to consider going to graduate school.

> I think the purpose of the program is to encourage undergraduates to go into grad school, and to possibly go into academia.

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> I think the [purpose of the program] is for the students' sake. Hopefully to give them a positive experience in a research environment that they'll consider going on in their career.

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> The obvious purpose of the program is to give undergraduate women an opportunity to interact with more senior women. In other words, [to] meet and interact with people who would be sort of role models, and also to have the opportunity to participate in a research project. With the idea that this will help them focus their professional goals and, in many cases, encourage some of them to go to graduate school. I think one of the intended [goals of the] program is to encourage more women to go to graduate school and into research careers.

Many mentors expressed that although they encouraged students to pursue graduate studies in CS&E, they did not pressure these students into going to graduate school. Rather, they attempted to provide an introduction to graduate school and research as well as reinforcing confidence about their capabilities of succeeding in graduate school in CS&E. With this information and encouragement, the mentors stated that the DMP students would be able to make a more informed choice about attending graduate school.

One of the functions of the program is, "Let's encourage people to go to graduate school." And I guess I was not real comfortable sort of pushing people hard or pressuring someone, "You *should* go to graduate school." What I am comfortable with is sort of saying, "You should seriously consider it. You are quite capable of doing it. This is what's involved. This is where you go from there if you choose that option, but it's basically your life and your choice."

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I try and encourage them towards graduate school, though I'm not sure that that's necessarily the goal of the program. I think the goal of the program should be to help them decide whether graduate school is what is what they want. So the answer may be "No." Which I think is also not a failure, but just means that they found out what they needed to know.

I.B. How the structure of the DMP achieved this goal

All of the mentors that we interviewed commented that the DMP provided an excellent opportunity to both encourage women to consider graduate school in CS&E and prepare them for a career in CS&E. These mentors stated that the structure of the DMP, which immersed students in a research environment and matched them with a female faculty member, was an extremely effective way to get students interested in pursuing graduate studies in CS&E. In this section we will discuss the mentors' views on how the immersion in a graduate academic environment and contact with a female faculty member influenced the students.

I.B.1. Immersing students in a graduate academic environment increased their understanding of graduate school and research

Virtually all of the mentors stated that a critical factor in the success of the DMP was that it immersed students in research and in a graduate school environment. These mentors expressed that the immersive nature of the DMP provided an excellent opportunity for students to be introduced to academic CS&E in a manner that could not be achieved through more traditional venues of acquiring information about the field. The mentors expressed that by "living the life" of a graduate student, these students would be able to understand the nature of academic life and make decisions about future career paths based on that understanding. In this section, we will discuss why the mentors' felt the immersive nature was important for all undergraduates, particularly female undergraduates.

I.B.1.a. Developing an understanding of graduate school

Almost all mentors stated that the immersive nature of the DMP would benefit undergraduates from both Ph.D.-granting universities and liberal arts colleges. These mentors commented that most undergraduates have little or no understanding of graduate school and therefore often make decisions about whether to pursue graduate studies based on vague notions. As a result, some students may decide not to attend graduate school because it is unfamiliar to them and others may choose to attend without a clear conception of what they want out of it.
Many mentors commented that by immersing students in an academic environment, they developed a more complete understanding of graduate school life. In the following quote, a

mentor discussed the effect of the immersive nature of the program on her DMP student.

> R: They gave an opportunity to a woman from a small college, and that was excellent because she wouldn't have gone to graduate school, I'm sure, if she hadn't gone into this program.
>
> I: Oh really? Because of the confidence issues that she was dealing with?
>
> R: The confidence issues, and I don't think she had any idea of what graduate school was. She wouldn't have entered into going to graduate school unless she knew exactly what she wanted to do and exactly where she wanted to be. This way she saw, "Well gee, I can do a lot of things, and there are a lot of places I can go."

Most mentors expressed that they liked that students had the opportunity to experience graduate school life in a new setting. By being at another university, students were able to get a different perspective of graduate school.

> R: Basically that they should view it as an opportunity to do something different, to find out about what graduate school is about, and possibly have an opportunity to check out a graduate school that they might want to go to -- although that was not the case with either of the students here. ... I would say that it is a good opportunity and that students should take advantage of any of those kinds of opportunities that come their way and that they are better off if they are someplace other than their home college.
>
> I: Why is that?
>
> R: Because it's a different experience, it's a new environment, and it would give them more breadth of experience.

Many mentors stated that the DMP is particularly important for students from small, liberal arts colleges in order to give them an introduction to graduate school life.

> I would recommend them highly to apply to such a program, that's one thing. Secondly is that if the student is coming from a four-year liberal arts college, they definitely should look for somebody where research is active, so they can have a feel of what graduate student life is, what research is about.

I.B.1.b. Learning about academic research

In our interviews, many mentors noted that a significant component of the DMP was that it introduced students to academic research in CS&E. Many felt that most undergraduates had little or no experience with research, and a program that focused specifically on research was an important part of influencing students to consider graduate studies in CS&E. These mentors expressed that when students are involved in a "hands-on" research project, they develop an understanding of the nature of research that they could not acquire in the traditional classroom setting or through discussions with advisors and thus can make more informed decisions about

whether to attend graduate school.

What stands out about the program? I guess I think that the single best thing you can do for undergraduates, male or female, to get them interested in the field is to let them do research and to let them find out what that is like. And I think that undergraduates don't understand what research is like. And so a lot of really talented people decide not to get involved just because they don't know what it's like. So I think it's really a good thing to do for undergraduates to get them involved in research. Now some of these undergraduates may decide they don't like it anyway and that's okay. But I think a lot of undergraduates who get the opportunity, decide they do like it. And so I think that in general working with undergraduates in your research program is a good idea.

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I thought it would be good to not just for the gender portion of it but also just a chance to involve some undergraduates in research. Because I didn't have any idea what that was about when I started my Master's degree and part of the reason why I didn't go directly for a Ph.D. was that I wanted to have a chance to find out what it was about. So I think these kinds of programs that let undergrads get exposure to research can only help them in terms of making decisions about their careers and whether they want to get a Ph.D. or not or when they want to get a Ph.D.

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I also felt that this is a very positive way to try and help women by giving them an opportunity to see whether or not they are going to enjoy research and whether they're going to be good at it. And I like this kind of affirmative action as opposed to changing standards and things like that. I think it's much better for the students to give them an opportunity like this and for them to decide whether they are going to be able to succeed.

Most mentors emphasized that by doing research, students developed a sense of confidence about their abilities to succeed in a graduate research environment.

[My student] was quite diffident at the beginning and she had talked about graduate school somewhat vaguely. I think we were able to sort of reinforce that motivation. She knew she could do it, but it was just that she had never tried. And it seemed that such an experience really helped her to say, "Okay, I can do it also. It's not such a big deal. I can do it without help. I can do it without feeling scared or feeling sort of not sure about what to expect."

Virtually all mentors stated that involving students in research also better prepared them for graduate school. These mentors expressed that their student had an advantage over most

incoming graduate students because she had experience with research and in some cases had chosen an area of specialization.

> I think that she will be very successful in graduate school. She has experience writing papers, she has experience doing experiments. All these kind of things. And because she's working on these two different projects she wasn't quite sure which area she wanted to go into between the two. And so now she'll get to do a little bit of work in both. And then make a decision. And so when she gets into graduate school she'll probably be pretty far ahead of some of the other incoming graduate students who don't really know what they want to work in.

I.B.2. Matching students and mentors "plugged" students into a network of CS&E professionals

Most mentors that we interviewed commented that a positive outcome of the DMP was that it matched students and mentors from different universities. Given the low numbers of women in many areas of CS&E, many mentors viewed the matching as a good way to create connections between female CS&E professionals and to provide role models for undergraduates that they may not have access to at their own institution.

> I think it's just a great opportunity to get people mixed up. The matching that's done of students from one set of locations to another set of locations is beneficial on both sides for getting new perspectives.

> * * * * * * * * * * * *

> I think having a broader network than just a single mentor is useful and I saw one of my responsibilities as trying to help someone get plugged into this.

Because being "plugged in" to a network gives students access to more information and opportunities, the mentors stated that it was important for these female undergraduates to be a part of a network of CS&E professionals. In this section we will discuss why the mentors felt it is important, particularly for women, to interact with other female CS&E professionals.

I.B.2.a. Creating professional connections

Because of the lack of females in CS&E, many mentors commented that female undergraduates generally did not have a network of other females in the discipline to interact with and learn from. The following mentor commented that the lack of role models for women in CS&E was a factor in her participation in the DMP.

I: Why did you get involved?

R: Well, I like working with students. I think that was part of it. I never really consciously thought about being a mentor purposefully. If I did any mentoring, it was just in the course of things I felt like I should do for students. I never thought really too much about my experiences as a female when I was in graduate school. There were like 1 or 2 of us in the full graduate program, and there were 60 guys. I started slowly thinking that it would have been nice to have other people to talk to. Experiences that I had to learn -- the right way or the wrong way to approach someone to ask for something, or where would I find out how to get this information. So I started thinking [that] I'm in a position where I can help students do this now.

Many mentors commented that female CS&E professionals do not have the same network in place that is available for men and saw the DMP as a way to increase the number of women in the network as well as making connections between female CS&E professionals.

I can remember way back that a lot of men went to IBM over the summer, and none of the women that I knew went, so I just think that there are already opportunities that exist for them, and there are already men out there who will mentor them without thinking of the word "mentor." They won't think of it as mentoring, they'll just think of it as, "Oh, we're bringing in an undergraduate that I knew from a friend of mine at another university." So there's already kind of an establishment there, that men will pick out the brightest men and will try to get them into the best summer programs or the best jobs or whatever. I'm not so sure that we women are as good at that as the men are, or that we even have a network. [My DMP student], when she was here, I did a lot of research for some opportunities. I actively helped her get a summer position somewhere, but it was difficult for me. I couldn't just call up Nancy Levinson on the phone. I mean, I've met the woman, but I don't know her. I couldn't say, "I have this really great woman here, do you have a position open in the summer?" I think that men already have that kind of network established that we don't have, so I think it's very important to give at least one more opportunity to undergraduate women.

This mentor continued by commenting why she applied to be in the DMP:

I: What stands out about the program for you when you just first think about it?

R: I think the opportunity that it affords to these women. I mean, even if they don't get anything out of it, at least they got to hopefully go somewhere different, meet another woman to set up a network with, maybe meet some other students.

Some mentors commented that their student was able to use the connection they developed in the DMP to participate in other programs and jobs.

R: Where as with a program like this you're giving people an opportunity to either catch up or get ahead or something like that which is going to allow them to be more successful in graduate school hopefully.

I: Did you see that happening with [your DMP students]?

R: Yeah, I think so. Certainly in [student A]'s case. [Student A] actually working with another faculty member here on another research project this fall. And has a temporary position and then she's applying to graduate school. And I don't think she probably would have gotten that second position had she not worked with me over the summer. Just because I could then give her a recommendation that she would be a good person, that she was productive and things like that.

I.B.2.b. The female mentor as role model and a guide

Virtually all mentors commented on the current situation in academia in which there are a lack of female CS&E faculty members. As a result, these mentors expressed that many of the DMP students may not have access to a female professor in the discipline. These mentors emphasized that this lack of role models may hinder women from considering a research career in CS&E and commented that the pairing of a female undergraduate and female mentor would give the student a role model and guide. They commented that a female role model provides motivation and encouragement for female undergraduates by demonstrating that women can have successful careers in which they contribute valuable results to the field.

I think [working with a female faculty member] makes them understand that they can do these things. That the stereotypes of women in science is having to give up their whole lives and do nothing but science or that it's too hard for women or that women can't be successful. I think they have a lot of these stereotypes and by actually interacting [with women] who have been successful professionally, it gets rid of those stereotypes.

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If you meet enough people then you can find somebody that you say "Well, I could imagine myself doing that." And then decide whether or not that's what you want to do. But I think it's important to see a lot of different types of personalities and you know, role models so you can get an idea whether you need to have a certain personality trait in order to succeed in the field.

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I: What stands out about the program for you?

R: I think the idea of mentoring a female student at this stage is just wonderful. I think that it should be encouraged. It's not an easy profession for a female, so it's more important for females to see that there are actually other female professionals who succeed. And going through it themselves and encouraging them at this stage, rather than too late. I think that's what really attracted me, and I think that's also the reason I would wholly support the continuation of the project.

I think [female undergraduates in CS&E] don't think of themselves as contributors in the sense that we're using the technology. Again this is all colored by my experiences. It just seemed to me that there is this other aspect of a technical career. It is that you change some of these things written in the text book. I think that it is more important for women to realize that they can contribute to research because there are so few of us in the research track. I mean, when we go to technical conferences, it would be like 95% would be men and 5% would be women. The research component seems to be the place where women don't seem to exist in some fields. That is what we need to push to show them that this is another possibility.

Evaluator Point of View

While the goal of the DMP is to increase the number of women entering into graduate school and research careers in CS&E, the program may also function to increase students' success in graduate school. As a result of their experience in the DMP, students became more sophisticated about the field through: developing their networking skills, making connections with professionals in CS&E, realizing possible areas of specialization, and increasing confidence about their abilities.

II. The Mentors' View of the DMP Students

In this section we will discuss the mentors' views of the DMP students following their participation in the program.

II.A. Mentors needed to invest time preparing and guiding their students in their research projects

Most mentors commented that they expected to spend time introducing their DMP student to the research topic due to the fact that undergraduates have limited background and experience in CS&E. When mentors were asked to give advice to faculty considering participating in the program, many commented that the faculty member should be prepared to invest time in the program.

> Well, I think they have to be prepared to invest time. You know, in the summer people often have other things that they want to do. You have to be around, or someone has to be around.

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> The second thing is that the mentor should be prepared that she is going to [spend] quite a bit of time teaching the students at the beginning.

Virtually all mentors stated that their DMP students were accustomed to a more passive mode of learning in which she absorbed information from instructors and textbooks, rather than actively creating information through research. As a result, the mentors emphasized that the students needed more direction and guidance throughout their projects.

> Again it comes back to the fact that most undergraduate students have the experience of this absorbing knowledge that the professors give them and do not really contribute to the research. And it seems to me that this was an experience that was different from her class experience. I think that a lot of students that go into graduate school do so because they of course want to get advanced courses, but often miss this aspect and this is what I really wanted to focus on.

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> R: Undergraduates aren't really prepared to do research, so they need a lot of hands- on help. And most undergraduates can help with some pieces of doing research, but they can't really do research on their own.
>
> I: Why?
>
> R: I don't think they have the preparation. And they're not kind of thinking in the right way you know, they're thinking in terms of doing assignments kind of thing rather than sort of thinking open ended about problems.
>
> I: Just because they haven't been exposed to that type of area?

R: Yeah, I think it takes some time to kind of learn how to do research. And I think most undergraduates haven't learned that.

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R: Because [undergraduates] are not sure what they want to do, and their background is a lot more limited, it's a lot of hand-holding. It's more of directing them what to read and motivating them. And basically *teaching* them. Whereas for graduate students, they know what they want, and they have the background, and you can discuss ideas and things with them and bounce ideas off each other, so it's very different. With undergrads, it's more of a one-way street, with a graduate student it's two-way.

Evaluator Point of View

Many mentors we interviewed had little or no experience working with undergraduates in a research-oriented setting such as that of the DMP. In many cases, the mentor needed to provide their DMP students with more guidance and teaching than a graduate student. Therefore, although it is important to treat the DMP student "like a graduate student," there are times when this is not appropriate. Most undergraduates are unable to perform graduate level research in a ten week program and thus it is necessary for the mentors to balance the needs of the student as an undergraduate and her capabilities to do research like a graduate student.

II.B. Mentors were impressed with their students' initiative and capabilities

In spite of the students' low level of background as undergraduates in CS&E, many mentors described their student as extremely motivated and capable of completing a project in the ten weeks of the program.

I was concerned that maybe the tight time frame would not allow anything substantive to be done, but I think in both of these cases we were able to identify something that could be done, and since both of the students sponsored by this program they had excellent backgrounds, very highly motivated, very capable. There was no problem with them sort of getting something substantive done.

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I: What did you think of the work your students did?

R: It was very good. We were very happy with the things that they did. They showed a lot of initiative and a lot of independence. Some of the results that they came up with will hopefully - there was a lot of rush at the end before everybody left to get a whole bunch of simulations done, and that data will probably be incorporated

into a paper. We had some theory results and we needed some quantitative studies, so they were doing that.

<center>* * * * * * * * * * * *</center>

I: Okay, and how did [the DMP] go?

R: Good! It went really well. ... We had good people. ... They came in, they just dove into the problem. They learned an awful lot, they actually accomplished some things that were beneficial to us. They came up with ideas we never thought of, so I think all in all it was fun to be with them. All in all it worked well.

II.C. Lack of background and motivation of DMP students could inhibit a positive experience

II.C.1. Students who lack basic skills in CS&E may be unable to do research

Some mentors stated that their student lacked the background necessary to do a research project that would be interesting and productive to either the student or the mentor. Some mentors felt that their student's lack of basic skills prevented her from doing research in the time frame of the program.

She said she didn't have a formal class in C. She was just kind of expected to pick that up on her own [by her home institution], or maybe she had one quarter but hadn't done anything elaborate with it. Anyway, her skills were just really poor, and so you give her something that should take a couple hours and it would be like days later before you'd get it. So, she's like, "Oh, this is what we're dealing with!" She just wasn't prepared. For what I needed her for, this programming had to be just a tool that she used. She had to really get a new idea, a new concept, and get the research plan down, and she was so concerned with the low level details that she just didn't do very well.

In fact, some mentors commented that sophomore-level students may not have the necessary background and sophistication to do research in the ten-week time frame of the program. These mentors expressed that only junior level students should be admitted into the program, because they would have taken upper-division classes that would give them the background and sophistication to do projects that could interest both the mentor and the student.

I: Would you want to see that changed? I mean for students coming in, to see them have more background?

R: I think it helps to have them at least at the junior level, that they finish their junior year, that they've had more Computer Science classes. I think last year was after their sophomore year and they just didn't have enough Computer Science classes yet. I think it's a lot more beneficial to them and to the mentor if they have had more background.

I: Is this something you'd like to see changed about the program?

R: Yeah I think, well I think it is more beneficial if they do it between their junior and senior year. I think you can give them better projects, more interesting projects and they get a better experience, they're doing a lot more of it on their own. I think that's better, for their sake. I mean they're learning to do more of independent work, which they probably don't get much of in their regular class work, they're told exactly what to do step by step probably...Well I think I mean the difference between research and course work is that you're kind of given more freedom to do things, you're supposed to be a lot more independent in your thinking and your work. And you can only do that if you have adequate background to do it. And I think between the junior and senior year you have a lot, you've done a lot your junior year in terms of your major requirements to be able to do that.

Evaluator Point of View

This section indicates that a successful DMP experience for the student may depend upon her background level. If a student lacks the basic skills in CS&E, she may be unable to conduct research. As stated in the student section, students felt more positively about their experience when they could contribute to their mentor's research program. If, because of a lack of background, a student is only able to participate in small peripheral projects that have no impact on the mentor's research, it may negatively affect her view of academic research and may impede the goals of the program.

Evaluator Question

Should there be a minimal background requirement for the students?

II.C.2. Mentors who perceived their student as unmotivated viewed their participation in the DMP as a "waste of time"

A few mentors stated that their student was unmotivated and applied minimal effort toward her research project. When mentors perceived their student to be unmotivated, they viewed their experience in the DMP as a "waste of time" and as not being beneficial to either the student or the mentor.

I hate to say anything that makes the project look like a bad idea 'cause I think it's a wonderful idea. I just got one of the losers. That's really what I got. I just got someone that wasn't mature enough to handle it, didn't have the background, and didn't have the right attitude. So it was just a lose, lose situation.

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R: I think [the second year the DMP] involved a lot of my time and it wasn't clear to me that there was any payoff at all.

I: In terms of research for you and for the students?
R: In terms of I didn't feel at the end of the summer that I had spent this time productively. I

didn't feel like they had gotten anything out of the program and so it wasn't clear to me that that was the useful thing to do with my time. The first year I felt that both of the students had gotten a lot out of the program and so I could justify having spent all that time on it.

Virtually all mentors who characterized their students as unmotivated commented that a positive experience in the DMP depended upon both the mentor and the student contributing fully to the research process. The following mentor stated that when she perceived that the student was not motivated to work, the mentor "stepped back" because she did not see any value in investing time in a student who was not applying herself.

> I think what happens is when you realize that you've got someone that just isn't quite what you wanted or just doesn't have the background, then you kind of slack off and you're going, "Gosh, it takes too much time to get anything out of this person." They're only going to be here for 10 or 12 weeks. If I have to hold their hand through the whole thing...And especially with the [DMP] there was no faculty compensation at all, so it was like, you've got to pretty much be a self-starter 'cause I can't hold your hand every day for 12 weeks, you've got to do your own thing. Part of it, I think, is that the faculty member themselves sort of pulls back and says, "Well, we've got a loser here!" Not that you mean to do that, but you can only afford to meet them halfway, and if they're not going to meet you halfway then you just kind of go, "We'll chalk this one up to experience." And you try to get them to do the best they can, but really this is an independent thing. They have got to do it on their own. You just couldn't hold their hand through it. Some people are self-starters, and some people aren't.

These mentors felt that they lacked the resources to motivate their student to work during the ten week period of the DMP because the students were paid directly by the CRA.

> But the attitude thing, I don't think you really know that about a person until you get them 'cause it really is an ideal situation. You're not punching a clock, even though I tried to sort of pretend she was. She knew she wasn't. In fact, the last couple of days of the whole thing, she just didn't show up...That's just the sort of the attitude -- "I'm just doing what I need to do, and I hope you can deal with what time I can get here."

One mentor suggested that the CRA have the student payment commensurate with the work they accomplished during the program.

> Maybe that's what I would change about it. There ought to be some way where we rank them on a scale of 1 to 10 at the end. They all get $3,000, say, but only the 10's get $5,000 - you know what I'm saying? - so that they've got a motivation to excel. That's really the problem, is because she knew that she had her $5,000, or whatever it was, just for showing up every day. There was no motivation to do really well. There was no concern with punching a clock or anything even though I would say, "I want to know how

many hours you're putting in each day." But it was hard to control because we're not set up to punch clocks here. But that's the only thing I would try and do.

Evaluator Point of View

Inevitably there are students who experience difficulties in any program. In some cases these problems result from personal issues and little can be done to alter the student's experience in the program. However, in some situations the problems may result from circumstances involving program implementation. As discussed in this section of the report, a few mentors described their students as unmotivated. Our interviews indicated that there was a disjuncture between the student and mentor perceptions of the student's intentions. While mentors characterized their student as unmotivated, the students expressed that they wanted to contribute, but felt lost and without direction. These students lacked the confidence to assert themselves and felt shy about asking "basic" or "obvious" questions of the mentor. The students thus retreated from interaction with the mentor and this was misinterpreted as a lack of motivation and interest in working on the research project. We came to realize that initially these students may need more structure and guidance from the mentors in order to proceed in the research and develop confidence. Through gaining knowledge and experience in programs such as the DMP these students can develop independence and goal orientation.

Evaluator Suggestion

One possible way to solve such a problem is to directly address this issue with the student and/or suggest that the student fill out a mid-program evaluation.

III. Receiving assistance in their research:
Two different mentor expectations of the DMP

There were two differing opinions among the mentors when discussing the importance of receiving some research benefit from the student while participating in the DMP. Many mentors participated in the DMP with the intention of volunteering their time to help an undergraduate and viewed any contribution to their research as a bonus. Some mentors viewed the experience in the DMP as an investment of time and felt that some assistance from the student on their research program was a critical part of their participation in the program. In this section, we will discuss these two mentor views.

III.A. The "best of both worlds:" Assisting an undergraduate and receiving extra help

While most mentors participated in the DMP with the intention of volunteering their time to help a female undergraduate, many did expect to derive some benefit from their experience in the DMP. However, it was not a necessary condition of their participation in the program. Most mentors described the DMP as the "best of both worlds," because they could encourage and help an undergraduate while also receiving assistance on their own research.

I: What did you expect to get out of your experience in the mentoring program?

R: What did I expect to get out of it? Well, I guess some satisfaction that I was able to help a student in some way or another. Also, I guess on the side it was very nice that they both did work that was very useful for our research project. I'd take a guess it was more kind of a sort of a combination of the two of them.

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I: What did you expect to get out of your experience in the mentoring program?

R: I was expecting to have the opportunity to help an undergraduate complete a research project which would facilitate in some ways my own research program and would assist her in her career progression and that might or might not end up as a published paper or presentation.

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I: It sounds like your reasons for applying were more focused on getting the student involved in research?

R: To be honest, it was sort of half and half. Getting a student involved, showing a student what it would be like to do research, giving them an opportunity to do that, and also needing some help on our project as well. This is a way to get some more help involved.

Many of the mentors we interviewed commented that although they were pleased when the student did contribute to their research, it was important to keep the students' interest at the forefront.

I: Is there anything good that comes out for the mentors?

R: I think if you design your projects correctly you can get something out of it in terms of some kind of a contribution that you can use in your research. I don't think you should go into it thinking that is you main goal though. I think you have to go into it thinking you're doing this for the student.

I: Why is that important?

R: Because I think you'll have, you might be disappointed in terms of what comes out of it. If you're used to working with graduate students there's a big difference and I think if that's the only reason you're doing it is for the research project I think you're doing it for the wrong reason.

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I guess I wasn't so much thinking about what I would get out of it as much as what I would hope that they would get out of it. I would say that I was actually quite pleased with the work that was done although I didn't know what to expect about the quality would be of the work that they would do. So that's actually been I guess a pleasant surprise that in addition to the fact that they have the experience about finding out something about research and interacting with female faculty, they also do a good job, so I was pleased about that but it wasn't necessarily an expectation.

Thus, while most mentors expected to receive some research benefit from their experience in the DMP, many of these mentors viewed the research benefit as a bonus, rather than a necessary component of the program. For these mentors, the critical aspect of the program was assisting the student.

III.B. A necessary component of the DMP was for the mentors to receive research help from the student

III.B.1. Mentors viewed their participation in the DMP as an investment of time that should return some research benefit

Some mentors viewed their participation in the DMP as an investment of time that should return some research benefit. These mentors expressed that the summer is an important time to spend on research and felt that being responsible for an undergraduate for ten weeks required a significant amount of time. When they did not receive any research benefit from their student, they described their investment of time as "lost."

I have to admit, I was looking for free labor, and found some good free labor. If it had been just an education for them, I've done that as far as *our* students -- an independent project. But for 40 hours a week, it's a little bit more than an independent project, and it does take a lot of effort on your part. So if you're not at least getting good work out, then yeah, you've lost.

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It varied, but [I spent] a lot of time [with the student]. I mean, it was like an hour a day. Probably 20 minutes to an hour every day, and I was here every day all through the summer without any reimbursement of my time, no money for my time, and I got nothing out of her, so it was just a sink for me. I put time into her [and] didn't really get anything out of her at all.

In fact, some mentors initially hesitated to participate in the DMP because they felt that it could not guarantee a research benefit for the time they invested.

R: I would never go out of my way to do [the DMP].

I: And why is that?

R: To me it's a terrific time and energy commitment and I know that if I worked by myself all summer that I'd be productive. If I spend, you know five hours a week with a student, I have no guarantee that they're gonna be worth my time.

I: Right, and it sounds like what you're thinking is that in these two cases it was, in some ways very productive but it might not happen again.

R: That's right. I don't know that I'd be willing to take the chance.

III.B.2. Mentors wanted more input in the student selection process to ensure some research benefit

Some mentors expressed that their student lacked the basic skills to do her research project, and their research suffered because they needed to spend extra time teaching and orienting her. These mentors stated that they would only participate in the DMP if they personally knew the student's skills and background were sufficient to do the project.

I: Would you participate again in this program?

R: I probably will. ... The reason I have to think twice is: one, I have to look at the timing, availability for myself. I find that because of a lot of time that I have to spend with the student, teaching her the stuff, it ended up that my research project has to suffer a little. So, I mean, there are certainly advantages in there, but there are certainly things that I have to give up, and that's something that I have to weigh again. Put it this way: if I can pick my own student, or if I have a student in mind that I would like to have, then I will apply. But I would not apply and expect to have a student assigned to me.

I: And is the only reason [to guarantee a certain] level of preparation for the student in terms of research, or are there other-?

R: Yeah, I think it's more for research, because I think that the program should be carried on so that it's beneficial to both sides. And from what I see, from my experience, the last summer that I [participated], I think it's more beneficial to the students than to myself.

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I: Would you do this program again, given that experience?

R: If I could pick a student from [my institution] that I already knew and was already familiar with the course work, I would because it would be such a good experience for them. But there almost has to be something in it for me before I would do it. And because the losses can potentially be so great, I probably wouldn't unless there was something - I don't know...It's really hard to pull somebody in for 12 weeks and have them just work at that level because I've got graduate student that work for free too. If they don't have assistantship, that's just what they're expected to do, and they're just a whole lot more productive because I can keep them around and interact with them later. So I would probably have to have a graduate student, maybe who's getting some money out of it, and then I would. I'd be happy to be involved that way, but I don't think I would at this cause it was just really nothing in it for me and a whole lot that I lost, and a lot of frustration.

Many of these mentors stated that they would like to be able to participate in the process of matching the students and the mentors. By participating in the matching process, these mentors felt that they would better be able to guarantee that they would work with the students with the appropriate background that was necessary to complete their project.

I: You also mentioned the "better matching of students" -- what did you mean by that?

R: The student applicants, some of them have strong mathematical backgrounds, some of them may not, some of them have good programming skills. If the mentor can actually take a look at the student applicants, and say, "Well, these are the students that will fit my program better." That may help a lot more than just having the program director send, you know, try to match the mentor with the student.

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I don't know how you could do a better job of matching other than maybe letting the people talk over the phone. Because I do think if I'd have gotten a chance to look at four or five resumes, I probably could have said, "Oooh, I really like these." And, "Hey, these guys aren't going to work for me." So the fact that I was totally removed from the selection of my student ... I'm not saying I want to select everybody's, but if somebody said, "Hey, these are 20 that I've got." And even a 2 or 3 line summary of what their things were. Sometimes you can pick out something, like they've had a class in scheduling or they've had a parallel class, or they've done genetic algorithms. Sometimes there's a one line thing in the resume that you can go, "Hey, hey, we didn't expect anyone to have this, but boy, if they do, I can sure use it!" So

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that's the only thing I can think that maybe would have helped, is if I would have been able to look at the resume. At least that way I could have picked someone that was more suited to what I needed.

Evaluator Point of View

These mentors expressed that they wanted more input in selecting their mentees to ensure a proper match. Through trying to ensure that the students have the proper background needed to conduct research in the mentor's area of expertise, the mentors are attempting to create an experience that may be beneficial for both mentor and student. However, this could be problematic. As noted in the student section of this document, students entered into the DMP with the intention of making decisions about future career paths. Thus, many viewed the DMP as more than a research experience; they viewed it as a way to learn about graduate school and academic life. In fact, through their experience in the DMP, many students were able to decide if a career in academic CS&E was "right" for them. If the selection process is defined solely by student background, this may prevent the program from reaching students who are at a critical juncture in a career decision and would benefit from a valuable experience such as the DMP.

Evaluator Suggestion

Mentors are encouraged to take advantage of the space on the application form where they can indicated requirements for the student.

Evaluator Questions:

1. How important is the student academic background to the success of the DMP for the student? for the mentor?

2. Would allowing mentors to participate in the selection process fit with the goal of the program?

IV. The Role of the Mentor in the DMP

In this section we will discuss the roles that the mentors indicated they performed while participating in the DMP. In our interviews, we asked the mentors about their own definitions of "mentoring." Many responded by describing "mentoring" as a process of assessing the individual needs of the mentee and then attempting to provide for those needs. As a result, we came to understand that the role of the mentor was multifaceted and dependent upon the individual student. The following quote demonstrates the multifaceted nature of the mentoring role.

I: Can you define what you think mentoring is?

R: Gee, that's a hard question. I guess it's a combination to me of being sort of like a mom and a friend and trying to share with the students the sort of good and bad experiences I've had and to guide them to try not to repeat some of the mistakes I've made. An equal part of it is really, I think, opening up to them areas that they haven't studied in computer science, how to work on their own, how to work with groups, really trying to give them a sense of confidence in many cases, and also to let them know that there are a lot of people out there that can help them when they decide they need some help, whether it be for a job or getting more information about a subject.

As discussed in the student section, the undergraduates entered into the DMP with little understanding of graduate school, the nature of research or how to conduct it, the academic community in CS&E and the life of a female faculty in CS&E. Our interviews with the mentors indicated that the main roles they discussed paralleled the students' needs: being a role model, providing professional guidance, and guiding students in their research project.

IV.A. Being a role model: Providing an example of a successful woman in CS&E

Most mentors expressed that part of their role in the DMP was to provide a model of a "real life" example of a CS&E female faculty member. Many commented that this modelling took two different forms: students could observe the mentor in her daily activities, and the mentor could explicitly discuss and provide guidance about the types of experiences she encountered as a female in CS&E. Many mentors mentioned that, although a discussion of their experiences was beneficial to the student, the largest impact on the student occurred by observing the mentor on a day-to-day basis.

I: Did you talk to [your DMP student] a lot about being a female in computer science, and all of that?

R: Not really. Not so much about females. But she did observe, because I also talked to her and my family also interacted with her. Not on a daily basis, but we went out to dinner and so forth. But she also met my family, so she was opened up to see that there are other aspects of a female professional -- there's the family life too. And

there's constant juggling between the two. So she can observe this through me, but we didn't really sit down and talk at great depth.

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I mean I don't sit around and talk about my family or anything but they can see every once in a while I have to schedule an appointment around one of my children's doctor visits. Or every once in a while I'll have to bring my child to a meeting or something. So that's, it's very peripheral from what we do but they see you don't have to feel that it's unprofessional to consider the interests of your family when you're making out your daily schedule.

IV.B. Guiding students in their professional development

Virtually all mentors stated that an important aspect of their role was to guide their student in her professional development. This included providing guidance for the student in her career decisions and also introducing the student to the culture of an academic environment in CS&E.

IV.B.1. Guiding the student in her career choices

Most mentors commented that guiding their student in her career choices was a central part of their role. For many mentors, guidance involved introducing the student to new opportunities and encouraging her to take advantage of them. Many mentors commented that students were not always aware of their options or, if they were aware of them, did not have the confidence to take advantage of them.

> I think once you have a student who has a goal that there is a great deal that you can do in terms of just getting them information and making them feel okay about themselves. Some of the students will cut off their options simply because they don't think that it's them. And mentoring can help get people over that kind of response to the options that they are presented with and can just present them with options. And I guess I see that's the primary role of mentoring at this point. How many options you have to present and whether we have to dig for them or just point them in the right direction. That depends on the student.

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Well, I think mentoring starts with encouragement, sort of recognizing that the student, male or female, has good qualities that you can enhance - and unfortunately not all student have that - and then start by encouraging them and finding out about their likes, their interests, just kind of their personality. ... So I think mentoring begins by like a one-on-one attention, and then from there, not all students are going to want to do graduate school. Some want to do jobs. ... I think it's just kind of giving them attention and giving them help where they need it. That's my definition.

I think the biggest problem is that these women, either they think that they're not good enough to apply, or they think the opportunity of going somewhere over the summer is not going to help them, or they're too shy to do something like that.

The following mentor commented that one of her DMP students was struggling with deciding between graduate school and teaching high school. The mentor then gave the student examples from both careers so that she could make an informed decision.

I: What has been your experience in mentoring undergraduates?

R: Okay. I would say quite variable. It depends on the individual person. People are interested in different things, they need different things. For example, for the Distributive Mentoring Program, [my student] was at a period where she was very uncertain as to what she wanted to do when she graduated from college, whether she wanted to go to graduate school or whether she wanted to go into the teaching profession, all high school. What she was interested in was seeing what this research thing is all about and just having an opportunity to think about which way she wanted to go. So I introduced here to a former colleague of mine who had taught in high school as well as taught in college and had done a small amount of research. 'Cause she has a background different from mine it would be useful for [this student] to talk to her as well as to me. (pause) She also wanted a fair amount of direction. She wanted to work on one of my projects, so we sort of pinned down a topic and she then was able to sort of carry the ball from there. A lot of what she did was based on her own initiative, her own ideas, and she did an excellent job on that. I think she had the opportunity to see, "This is what someone doing research does," and had an opportunity to do it herself.

Thus, most mentors considered it part of their role to identify the student's interests and provide career guidance based upon those interests. Many mentors provided guidance by discussing with students their options and providing encouragement, as well as providing examples of successful people in their career.

IV.B.2. Introducing students to the culture of an academic career in CS&E

Almost all mentors considered an important component of their role to be introducing students to the various aspects of an academic career in CS&E. This included teaching the students about the entire research process as well as introducing the student to the professional culture of the academic field of CS&E.

IV.B.2.a. Introducing students to the research process

Many mentors realized that their students had little or no conception of what research was about and, as part of their role, discussed with their student the nature of the research process.

In the following two interview excerpts, the mentors discussed their role in teaching their students about the research process.

I look at [mentoring] as trying to teach somebody more of a step-by-step process. You're not really trying to teach them the technical content of anything. You're really trying to teach them a process of doing science. I look at my advisor and I say, "Okay. Somehow or another she taught me how to write, somehow or another she taught me how to make presentations. And what does it take to be successful in this kind of a career." And I think a lot of it is just by example, they watch what you're doing.

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I: How would you define mentoring?

R: Well, I guess it's sort of a guiding in not just the technical area but the culture surrounding it. So you want to show them how to do research, the technical details involved. You want to show them the context for that research. You want to teach them the etiquette of that field like about giving credit to other people for their work. In certain areas when you write a paper names are alphabetical, other areas it's like who's the most senior. And you sort of make them aware of these things and what it is in different areas. What conferences cover the area that you're working in. What kind of job would you get in this area. So just the whole context for research and the research area.

As these mentors explained, this immersion involved introducing students to the day-to-day process of "doing" research, providing them with the context of how their area of interest fits into the larger body of current research, introducing students to other people who can assist them, and giving them names of journals to which they can submit their research. In other words, the mentors felt it was an important part of their role to introduce the student to the entire spectrum of issues and processes involved in academic research. The following quotes addressed each of these aspects.

Just to kind of show them the excitement of research, that you find in the research. They can see, when they do something how you get all excited about it and they can see what kind of questions you ask, what you'd want to do next and I think that they can start to get a feeling if this is something that they would want to do. Just you know the excitement of research, the methodology, the tediousness of it sometimes.

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[My second DMP student] doesn't know a lot about the context of the area so I spent more time like giving her things to read, like biographical things about some of the researchers we were studying. And I really felt that she sort of had no idea of the culture, no idea what a researcher really does. I mean even if she could do research, she didn't really know what the life was like or how that was different from industry.

So I was more doing things like giving her other things to read, trying to describe some things to her about what I liked about research.

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[My second DMP student] was sort of in a different personal situation because she had already made a firm decision that she definitely wanted to go to graduate school. A very independent person, somewhat of a loner in terms of work style, and what she needed was not really someone to work closely with, but someone to provide a supportive environment and a lot of contacts, like, "You really should talk to the lab people about designing your experiment because they have expertise that neither of us has." So I was able to provide feedback on what she was doing and provide all sorts of appropriate contacts here, suggestions for, "Here is a conference where it might be appropriate for you to submit a paper based on your work." Basically I think there I was providing contacts and information and sort of pointing her in the right direction more than working closely and bouncing ideas back and forth a whole lot.

IV.B.2.b. Introducing students to the academic environment

In addition to giving students an idea of the research process, almost all mentors we interviewed said that they spent time orienting students to the professional culture of academic CS&E. Some mentors took their students to conferences and remarked that this was a way for the students to interact on a professional and social level with other CS&E professionals.

The first [DMP student] I was able to take her to a conference and so she really got to experience a lot of the things first hand and things that come up at the conference that we could talk about. I could point out who some of the famous people were. I could tell her what kind of talks to go to. I could tell her, "See how this person gives a talk." And things like that. To tell her how to participate in discussion...You don't want to just talk about the latest movie or something.

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I think they really felt that all these people that write books, and write the books that they're studying from and also write the papers that we were looking at, we went to a conference, and we were sort of thrown into the middle of all these people, and they just realized that they were one of them.

I: They were engaging in dialogue with these people?

R: Yeah, they were engaging in dialogue, and even just socializing. Everybody was just assuming that they were a grad student.

One mentor commented that taking her DMP student to a conference had a significant influence on the student. She felt that since most of her DMP student's friends planned to

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work at industry jobs after graduation, this experience at a conference would provide her with insight about another type of option she may not have been considering.

> But I also sensed for her that she was not sure whether she wanted to go to grad school. Or, I think she knew she did but just because of her particular situation I felt like if she went to a conference she would love it and that it would really sort of confirm that she wanted to continue along that path, the research path.

IV.C. Setting up a framework for the student's research

In this section we will discuss the role of the mentor in working with the student on her research project. This role included preparing for her student's arrival, arranging meetings with the student to discuss her project, and guiding her student in her research.

IV.C.1. Preparing for the student's arrival

Many mentors prepared for their student's arrival by setting up accounts for her on the local system, getting an office for her, and helping her to find housing. The following is one mentor's experience.

> I: Did they ask you to arrange the housing or was that something you just considered as part of your role?

> R: Well, it kind of felt like I had to do that the first year. I guess I felt like I had to do everything. I took them around campus and got them their ID's and everything. I mean I spent probably two days just getting everything set up for them 'cause I felt like I should do that. When I look back on it I probably could have left them and they would of done fine.

> I: Why did you feel that you had to do everything?

> R: I guess I felt like I was their host here and I was the only person they knew and that I should at least get them set up. ... I kind of learned a lot from last summer in terms of what to expect and what I would get and what they would get and what to you know, how to set things up and all.

A few mentors suggested that the DMP provide a list of instructions of what should be done to prepare for a student's arrival.

> I guess it will be helpful for next time we get instruction list so we can check what we can do before we start it so we know. Because everybody's so busy, and we may just look over something.

IV.C.2. Arranging meetings with the student

Our interviews and survey results indicated that most of the mentors met with their student at least once a week and many mentors met with their student more than once a week. In this section we will discuss the frequency and format of the meetings.

IV.C.2.a. Some mentors met with their students on a casual, informal basis

All of the mentors we interviewed placed their student in an office in their building so the mentors could easily stop by the student's office. Many mentors commented that they did not have a set meeting time with their student, but made sure that they were in contact with their student at least a few times a week.

   I: How often a week did you meet the students?

   R: Sort of as needed. I did not set up formal meetings with any of the students. In other words, "Let's meet once a week or once a day." They all had sort of offices in the same building, fairly close, so they could come by my office if they wanted to see me. I would go by their office to sort of see how they were doing, and then we would sometimes set up more formal meetings, say, "Let's sit down for a couple of hours and discuss this." So a lot of the interaction was unscheduled and informal, and that was facilitated because they had offices in the building. In fact, it was sort of in graduate student offices.

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   R: I met them on an as needed basis always. I always made sure that they were here. So that somebody was looking out to make sure that they weren't in an accident, or whatever. I always met them, made sure to say, "Hello." Did they have any questions? Did they have any problems?   That was every day that I was here. But we didn't have a scheduled time per week because usually I'm sure I would see them two or three times a week on an as-needed basis.

These mentors felt that the almost day-to-day interaction precluded the need for weekly meetings because they could provide guidance as it was needed.

IV.C.2.b. Some mentors set up weekly formal meetings

Either in addition to casual meetings or by itself, many mentors set up weekly meetings for their student. Many of these mentors commented that the structure of weekly meetings provided a framework and guidance for the student learning and motivated the students to work on the project.

   I: What if you had not met with them but once a month. What would have happened?

   R: That would not work, no. They needed a deadline, I think. And then they also needed somebody to say - If they say, "Well, I've pushed this as far as I can." Then I could say, "Well, push a little bit in this direction. Or, well, let's forget about this and concentrate on this stuff."

I think it was necessary for them to meet with me so I could help them see where to focus their efforts.

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We had formal meetings for the first week and a half. It seemed that way at least. And then after that we met them formally at least once a week, perhaps more than that. And then we were always drifting into the lab and you know, they always had something that they were half in the middle of, and we would interact that way.

Some mentors commented that weekly meetings helped to ensure that their student was enjoying her project and was also working hard on it.

R: [It is a key element of success of the DMP that] on the part of the students them to be very, very strongly motivated. They were very strongly motivated, and then on my part, I feel like if I agreed to do this, that I want it to be productive for both of us. I guess I also feel like I want to make sure they're not taking advantage of the program.

I: How is that?

R: That they're just not going to take $5000 and sit back and relax for the summer. Not for any good reason, but just it would irk me to be a party to that. I guess on my part, having very clear goals, and making sure that I keep them working hard but on something they're interested in. I guess for me the structure was very important, to sort of check in weekly, to make sure that we're both working really hard, that we're getting somewhere, and we know where we're going.

Evaluator Point of View

This section indicates that both students and mentors can have a positive experience with casual or formal meetings. Regardless of the configuration, it is important to note that the mentor needs to clearly define at the beginning of the program the frequency and nature of their interactions.

IV.C.3. Guiding the student in her research

All the mentors guided the student in her research project by providing direction throughout the ten weeks. In this section we will discuss the ways in which the mentors guided their student in her research project.

IV.C.3.a. Providing guidance and direction

Almost all mentors stated that undergraduates did not have enough experience with research to be able to independently choose a research topic and direct their own research. Thus, all mentors provided the direction for their student's research in the form of defining a problem for them to solve, or giving them ideas for a future topic to explore. The following interview excerpt typifies the attitude the mentors had toward undergraduates and research.

I came up with the direction and the project. Well, I think that's asking too much for them to come up with their own direction. I get them journal papers to read, and sort of limit the amount of information they have to learn in order to do a project, otherwise they could just spend their whole time learning. So I'm afraid if I tell them to come up with a research direction, I don't know. That would almost be too challenging, too overwhelming.

While defining the structure of the project and providing overall guidance, most mentors expressed that they encouraged their students "work out the details" of the project. These mentors expressed that it was important for the students to have freedom to explore solutions within the framework of the project in order to get some experience with research.

I think that giving people as much lee-way as possible you know to make decisions about how to accomplish the goals. As long as the goals get accomplished. I think it's a lot more fun if you're able to make more of the decisions yourself. I think it's, provided that they're up to it, probably a lot better than if I try to micromanage how it ends up being accomplished.

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I let her take the lead very often because I thought that was going to be more important for her, but I worked very closely with her so we had, we met like every week for at least, at least twice. Her office was just down the hall from me, so you know I could just walk into her office if I wanted to and she could do the same. So we worked quite closely, but I wanted her to work out the details, or work out the ideas herself. So I was there to help her anytime she needed it. Anytime she had a question I was right there and I gave her a lot of the background material that she needed to have to be able to do the project successfully. But I sort of sometimes stayed in the background and waited for her to push the project ahead.

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Then I said, "These look like things that keep recurring. Which one of these problems do you want to work on?" And these were problems my system can't handle and so she said, "I want to handle this thing." And then I said, "Okay, now how would you handle it?" And then she had to go out and do some research. So she sort of developed it on her own.

Many mentors struggled to find the balance between guiding the student and letting the student struggle on her own. Many emphasized that they wanted the student to be challenged by the project, but not get so frustrated that she would give up.

I would ask her questions [to guide her]. But I also didn't want her to get too frustrated, so I would let her go for a couple of days and then I would start to ask more pointed

questions and help guide her. I think if anything I erred in the side of not letting her do enough research because I didn't want her to get frustrated.

IV.C.3.b. The role of the graduate student in assisting the students in their research

The mentors who had graduate students working with the DMP students mentioned that their roles differed from the graduate student. While the graduate student answered the day-to-day technical details of the project, the mentor provided the global picture of where the project was headed and the context of how the project fit with other research either in the department or in the research community at large. The following two excerpts relate to this issue.

R: The graduate student and I kind of designed a project together and then she would come to him for real specifics on- he was the one generating the output that she was using as input. So she would go to him for problems with, "Does this graph look like it's supposed to look?" 'Cause she wasn't familiar enough with what it was supposed to look like. And he would help her out. And then [with] design questions she was usually coming to me with, in terms of, we were kind of designing what things should look like as we went.

I: Oh, designing the graphs?

R: Yeah, designing what the tools should be doing and some of the, what kind of buttons should it have on it and that kind of thing and she'd come to me with those kinds of questions. She met with me about once a week or more, yeah. She probably saw me more like three or four times a week. I think she probably saw him every day.

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I: Okay, so how did [the graduate student supervisor's] role differ from what you did that summer?

R: Well, she was there all the time, so she was in the lab with [the DMP student]. She had a twenty hour a week appointment. And she was with [the DMP student] the whole time. She really is the mothering type. She really loved teaching and tutoring and she taught [the DMP student] a lot and I was off doing other things. We always saw them, most likely once a day, if not more, and had several meetings a week, but we weren't there eight hours, four hours a day.

I: Right. So her discussions with [the DMP student] would be more technical?

R: Yeah, more like, I can't get this loop to work. I can't get this program to work, can you find the bug? And they'd work through the bug.

I: Right, and then your role was more over-arching.

R: Yeah, more "This is what we want to do on the global, even more the global approach, trying to work on some of the algorithms with them, but not the nitty-gritty details of the algorithms. It's sort of sketching out the proof, but not filling in the details of the proof.

IV.C.3.c. Defining the nature of interaction in the meetings

The degree of collaboration between the mentors and the students in the meetings varied among mentors. Many mentors did not consider their relationship with their student as collaborative. These mentors said that their meetings with the student were a way to discuss the student' results and provide guidance on her project, but they viewed the student's work as an independent project.

I: You met weekly, so in that [meeting] you were able to supervise where the direction would go?

R: Oh, yeah. We would review what she had accomplished and talked about what the next steps were. Occasionally she wouldn't have gotten accomplished what we thought she could and some times she would do more. It varied.

I: So your role in the research was mainly to guide her? Did you work together on certain things?

R: She had some programming problems at one point and I helped her out with those. I think I also wrote some code for her because she didn't know the language she was using to go into it. But there wasn't any side-by-side, "Let's work on this program together," the way one might do as a class project. It was mostly set up as an independent project.

Other mentors described their relationship as fairly collaborative. The following two mentors stated that in their meetings they treated their students as graduate students.

I: Now you said that there were things that she was supposed to do and then things you were supposed to do. What were those things you were doing? I mean the reason I'm asking that is it sounds like it was quite collaborative then.

R: Very much, very much. So every time she had a new idea I could usually figure out how to manipulate it or transform it to push even a little bit further. Or else I would just maybe have to go back and think about it and see what the implications were and what we should do next or to look up maybe a book somewhere or to contact somebody to see if this was known or something like that. But frequently it was, there were technical things that I had to do.

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I: How did you guide them in their research? Did you give them problems, and then they would work on their own and come back, or did you work on problems together?

R: A little bit of both. I would give them projects and ask them to see what they would come up with. Then I would work through them with those projects, you know, do the board or whatever, and then send them off again. That's how I conduct all my research with all my graduate students, so I pretty much treated them like a graduate student.

V. Strategies in creating a successful DMP experience

In section II, we discussed the roles that the mentor. In this section, we will discuss the strategies that the mentors employed in order to create an atmosphere conducive to their student having a positive experience in the program. It is interesting to note that in this section, each of the strategies helped to create a positive experience for both the student and the mentor.

V.A. Creating a well-defined and "doable" project that challenged the student and was part of the mentor's research program

Most of the mentors we interviewed commented that having a well-defined and doable project that challenged the student and was part of the mentor's research program was essential to having a successful DMP experience for both the student and mentor. In fact, some mentors commented having a well-defined project was so important to the success of the program, that if they didn't have such a project, they would not feel comfortable participating as a mentor in the program.

> If I had a project that I felt was the right size for a summer project, absolutely [I would do the DMP again]. I didn't this year because I didn't have a project that I thought could be done in that period of time by an undergraduate. For myself, I wouldn't want to bring in a student onto an ongoing project and have them just hang around on the periphery for eight weeks or whatever it was over the summer. I don't think that they would get much of a feeling of accomplishment from that. So I would prefer to have something self-contained that was theirs before I did it again.

V.A.1. Tailoring the project around the student's background and abilities helped to ensure completion of the project

Many mentors framed the project around their students' background and abilities and attempted to create a project that was challenging enough for the student to be interested, yet not too difficult that she would get overly frustrated.

> I think you have to be prepared to think about what you're going to ask the mentee to do and make sure it's within their abilities and not something that's just going to drive them crazy and have them come out with a negative experience. I think, you know, it can be a very, very positive experience if you go into it with the right preparation.

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> I think the only thing that I was concerned about [was] how to treat an undergraduate student who you are giving a slightly advanced problem such that they don't get intimidated by it. I mean, there is some line about making a problem so difficult that you don't get anything out of it, it was just too hard. And if you make it too easy then it seems like it's just a course project, so I wanted it to be somewhere in between. I wanted the student to be able to contribute to the research as well as get some implementation experience and some real world experience so that they could go and use it in a job or even their graduate studies. I just wanted to sort of make sure that I made the student feel comfortable trying to solve this advanced problem, definitely

more advanced than what they had seen in courses, but at the same time, feeling that this was something that they could battle.

Many mentors commented that it was important to have a clear goal and outline for the project since their student did not have experience with an open-ended research process and were likely to get frustrated with too little direction.

I think defining a good project is really key and this is something that I've learned, maybe it seems obvious in retrospect. But in the past two years of supervising students, it depends on the student, but a project that's clearly defined -- where all the pieces that the students will need [are in place] in order to accomplish the project and understand what it is that they're supposed to do. The more that can be in place the much more likely it is that the project will be successful especially when students are less experienced. They do best with a very well defined project.

Many mentors stated that, given the short time frame of the program, it was important to be able to assess their student's background accurately so that the student can work on a project without a large degree of initial preparation time. Some mentors commented that their student was unable to finish her project because they had overestimated her background knowledge and needed to spend time at the beginning of the program providing information. These mentors expressed that they should have contacted their student before she arrived to determine her background in order to frame a project more suited to her needs.

R: It seemed to me that it might have been better if she had seen the projects before hand or [if] we could have talked before to figure out that this is what she wanted. I know that there is no easy way to do this because everybody has limited time, but I think that this might have helped. And also, from her resume, I knew the courses she had taken, but I did not know the skill level. And I think she got A's in everything, but it's hard to gauge. If I had known a little bit more about her before, or if I had talked to her before to get an idea of what was her, I could have asked her, "What was the longest C-program you ever wrote?" And then maybe I could have tailored the assignment such that it would have made her more comfortable. So, we did all of that in the first few weeks that she was here, but it might have helped if we had done it earlier.

I: Because you could have saved time?

R: Because we could have saved time. Because then I would have known exactly where to start off from. I assumed that she didn't have any problems with C, but it was only later on in the project that we realized that she needed to brush up on C a little bit more. And maybe it was a while back since she took the course. And I think

I would have encouraged her right from the beginning, or at least sat down with her and discussed it a little more if I would have known about it.

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I guess the other thing is that it might have been useful if I had more information about the students before they arrived. And I probably should have called [my DMP student] and talked to her since she wasn't at [at my university] -- You know, called and talked to her quite a bit about what she might work on. So that [then] I could have picked a project in advance and made sure that everything was set up so that she could work on that. As opposed to when she showed up, deciding that she needed to work on something and then we had to go and find the right graduate student who could advise her on that.

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I guess my advice would be to maybe even talk to the students before they came. I haven't done that, but I think I would in the future just to make sure that kind of your understanding of what the summer was going to be like meshed with theirs.

V.A.2. The completion of a project that contributes to the mentor's research increased students' confidence and gave them a sense of accomplishment

Most mentors stated that by successfully completing a difficult research project, students felt a sense of accomplishment, developed more confidence about their ability to do research, and also came to realize that they could contribute something of interest to the research community.

Think carefully about the project and make sure that it is something that an undergrad is likely to have the skills for and that it's contained in the sense that at the end of the summer, assuming everything goes reasonably well, the student can look back and see that they've really accomplished something that seems like it was worthwhile. I think it's nice if it can have a place in a bigger research project because then it seems more clear that it's important if it's not just a stand alone thing but it's going to contribute in some other bigger project that's going to continue after you've left.

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[For] the project itself, concentrate on something tangible that they can take with them, because I think that was something important to [my DMP student] that she could take this and say, "I wrote this." Or, "I did this, and this was a research project." Rather than [if] it was implementing some little module in a huge program, and she could do that, but I don't think that would be as interesting or as fulfilling.

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Pick a project that a student can easily do in the time allotted. And to not either over expect or under expect for them. I mean try to give them something that's going to make them feel good about themselves by the end.

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R: Well that was real important to me [to have a project formed that could be done by a student during the program]. Whatever area they picked to work on I wanted them to be able to pose a question and have as their goal to answer it by the end of the summer. Or you know to make some progress on it by the end of the summer that would be tangible that you could write a report on. Not just to write a report, I mean I wanted it to be an important question that other researchers in the area would be interested in. So maybe they couldn't answer the whole question but maybe they could get some new data that nobody had seen before that would help to answer the question eventually.

I: Why did you think that was an important thing for them?

R: Well I guess I feel like research is a lot more fun if you solve your problem or if something comes of it, you know if you feel like you've made a contribution somehow.

In the student section we discussed that students derived satisfaction from contributing to the mentor's research. In fact, many mentors themselves discussed that the students wanted to feel their project was useful to others in the research community.

R: Because both of [my DMP students], I found, if they didn't have something solid by sort of midway through that they could say, "Wow, this is what I did." Both of them were like, "Gee, I feel like I haven't done anything." So I didn't want them to go away with that feeling.

I: What did you do? Did they bring that up with you?

R: ... I'd give them some training materials and met with them, and then after like four weeks she didn't like what I had given her. She did the work, and then she decided, "If I had something else it would be better." So I switched her project over, and she wanted something in a little bit different area and more solid. So they really did want to contribute. They didn't want to just kind of sit around and play on the machines all summer.

V.A.3. Multiple projects provided relief when students were bored, frustrated or had technical difficulties

In addition, many mentors suggested having multiple projects prepared at the beginning of the program. These mentors expressed that the student would be more motivated when she was able to choose a project that interested her.

I: How did you decide what the students would work on?

R: I always have kind of a mental list of problems that I want to work on and for both summers I kind of looked at it and came up with a list of five or six problems that I thought they might be able to make some progress on it for a summers worth of work. So my plan was to start them with say one problem per week until they found one that they made some progress on or that they liked a lot. ... Some of the problems they look at and they write a program maybe to find out something about it but they don't see anything, they don't see any direction to go from there. And maybe I don't either from their preliminary work and maybe they didn't get very excited about it either. So one of the things when you're trying to solve a problem it helps if you really care about what the answers gonna be. So maybe in some of the ones that didn't catch they either felt like they couldn't get anywhere or they weren't very interested or wasn't very much fun to manipulate these particular mathematical objects or something like that.

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I got to know [my first DMP student]. I tried to find out what she wanted to do, what kind of research she thought she might be interested in. And I tried to give her that particular type of research. Like, I didn't peg them into a single project. I made sure that I had a couple of things available that they could do and even switch mid-stream if they decided that they hated it. Which is what happened with [my second DMP student].

These mentors emphasized that having multiple projects would prevent the student from getting too frustrated or bored by one project and allow her to learn different material.

I: What if the [DMP students] e-mailed you and said, "HELP!" How did you deal with that?

R: They never did. I always gave them several things you know to think about from one week to the next. So if they weren't making progress on one they could focus on a different one.

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R: If [the DMP students] wanted to try something else we'd try to think of something else for them.

I: Why did you structure it that way?

R: Well, I think we didn't want to have an experience where someone would come and just hit a brick wall and feel frustrated that they couldn't do the particular thing or this was the task they had to do for the summer and they couldn't do it. I think they wanted to give them flexibility. Everyone is different. There are certain things you like doing or feel more confident doing than other things. We just felt it was good to give people options. In particular, not let them feel like they were having a negative experience and that they hated the whole situation.

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We had some projects for them to do, and I don't know how this happened the first year, but we sort of all knew by the second year that the way to do it was to assign a couple different

projects so that if they got stuck with one or if the computers went down they could look at something else. And so this year we definitely have had about three different projects for them to bounce around in their heads. It just gets boring working on just one.

V.A.4. Having multiple projects benefited the mentor by contributing to her research

In addition to creating a successful experience for the student, most mentors stated that a well-defined and doable project would also benefit the mentor in that it would contribute to their research program. When we asked mentors to give advice to other mentors who were considering participating in the DMP, many commented that having a well-thought out project benefits both the student and mentor.

I: What advice would you give to someone who was considering participating in this program as a mentor?

R: Okay. Two things: first, the mentor should really realize that her project -- that an undergraduate student who does not have much background in it should be able to pick it up easily, so that the mentor can get something out of the work that she put in. That's the major thing.

V.B. Immersing students in a research community

Another strategy for a creating a successful DMP experience was to immerse students in a research community that can include the mentor, graduate students, undergraduate students, and other faculty. Many mentors stated that involving a student in a research community would benefit the student by providing multiple resources and social interaction while also benefiting the mentor by decreasing the time demands of mentoring an undergraduate.

V.B.1. Involving students in a community that included graduate students gave students a more accurate view of graduate school

Given that all of the mentors felt that the purpose of the DMP was to encourage female undergraduates to consider graduate school, many commented that it was important to have a community of graduate students with whom the students could interact. These mentors stated that through observing and interacting with graduate students, their DMP student would develop an understanding of graduate school that she may not receive through her interactions with her mentor alone. Some mentors purposefully chose projects that ensured that students

would interact with graduate students in order to give the DMP students more experience with graduate school life.

R: But I think it's really important that they have an environment and that they feel like they're part of the group as opposed to just sort of coming and being by themselves for the summer and maybe talking to one faculty member. So I think that's really a useful part of what happens here. And that might be harder to set up at a place where you have a smaller graduate program or something like that. But I don't know. That's important.

I: Why is it important?

R: Because I think that is really what gives the students more of a feeling for what graduate school would be like. And I think that's one of the goals of the program is to give them a feeling for what it would be like if they went to graduate school. And if they go in and just work with an individual faculty member, it's not an accurate reflection of what graduate school is like. The graduate students learn a lot from each other you know, probably more than they learn from us because the other students are all very smart and are learning things at the same time, in the same areas. And so I think that interaction is a really important part of graduate school. And if they don't see that I think they will get an inaccurate idea of what it would be like to do research.

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R: Basically I was trying to come up with something that would help my current students. What she did last summer was helping a student that I had then. That student's now graduated so now she's working with a different student. So I wanted her to be able to not just be working with me but also be working with a graduate student. So I try to get the project close enough to that graduate students research that she can communicate with them.

I: Why is it important for her to work with graduate students?

R: Well I thought part of the purpose of the program was for them to get a feel of graduate school so I purposely wanted them to work with a graduate student on a personal basis so they learn a lot just from having that student tell them about graduate school.

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R: I think the graduate students were much better role models than I was.

I: Why would that be?

R: Because they're closer in age and they're closer to the kind of experience they're doing. They kind of were the next step, I mean I did that too when I did what the graduate students do when I was a grad student.

V.B.2. Involving students in a research community gave them a better understanding of the collaborative research process

Many mentors stated that through their interaction with other graduate students and faculty, students not only learned about graduate school life, but also about the nature of a collaborative research process. By participating in meetings and working with other researchers, students were able to observe the ways in which graduate students and faculty interact professionally when discussing their research.

Many mentors commented that their DMP student initially did not feel comfortable providing input at research meetings, preferring to defer her opinion to graduate students and faculty. These mentors stressed to their student that they did not know all of the answers in research and the student was capable of contributing valuable information to research discussions. In the following quote, one mentor explained the benefits of her student participating in their research meetings.

R: The two [DMP] students were in our parallel lab, and there were also graduate students on the same project, so we had weekly meetings, or biweekly meetings, or sometimes it would be three or four people, a couple other students, and sometimes it would just be with them, or one particular undergrad. They saw this interaction going on, and I think that was probably something they had never been able to participate in before.

I: Right, kind of an interaction of ideas as opposed to a one-sided --

R: Yeah, right. They were saying things like, "Oh, well, we're stuck here, what do we do?" And it was okay to say, "We were stuck."-- for faculty or for the advanced grad students to admit that. Or sometimes the grad students were looking for things, or they needed some piece of code or something that the undergraduates had done, so I think they felt good that their stuff was being used, that there were questions coming from other students, not at their own level, but even higher up. The reverse was also true, so it worked out pretty well.

Many mentors commented that when students participated in a research community, they experienced research as an open-ended process in which faculty and graduate students work collaboratively to solve problems. Many faculty stated that they perceived a change in their student's confidence level about her ability to contribute valuable information through these meetings.

Because when I had seen her resume, I mean, she looked really good on paper, but when she first arrived, she seemed to be very very unsure. I think it was an intimidating experience for her initially because she had never done research before, and what we tried to do was we had the project, [and] we knew exactly what needed to be done. But to [give her] a good feeling for what research is, we tried to engage her in research discussion. So we would sort of sit

around and talk about what needed to be done in the project and hoped that she would sort of come up with her own ideas. Initially she was very very shy, and she would speak to me all right, but when we would sit down in a group she would really not say very much. And I think that towards the end that changed a lot. She was speaking up more and she was able to contradict us, which I think is a very good sign, especially in a research environment, and I think that happened. So when she finally left she said that aside from her skills, her programming skills improved, she learned about simulation, she learned more about database systems, and I think all of that will help her in her career, but I think she became a lot more confident, and I think that was the biggest achievement of the ten weeks.

V.B.3. A research community provided multiple resources for the student

Most mentors stated that a community of graduate students, undergraduates and/or faculty members afforded multiple resources for the student that the mentor may be unable to provide by herself. In addition to being a resource for research-related questions, a community could also provide an element of social interaction for these students who often knew no one at their mentor's university.

I mean the one problem I can see that might happen for the program like this is if they assign the mentees to a person who doesn't have grad students working for them or for which there isn't some sort of social environment. Because I'm at a really different place. You know, I'm over 40, I have children. I'm not going out every night and dancing like I think a lot of the undergraduates were interested in doing. But the graduate students were doing that stuff, so they could kind of fill in the social vacuum for them. And I think that if the mentees worked at a place where the social vacuum couldn't be filled in they could of course be with each other and do stuff with each other, but it wouldn't be as good of an experience.

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It is nice that [the DMP students] fit into a group and I know with [one of my students who also participated in the DMP at another university] did the same thing. And there was a group working already of grad students, so you aren't just left alone. And I think that's important, that if you're looking for places for the students to go, the fact that there's a working group there of some form. You know, even if it's a group of grad students that are not working on this project but working through the summer, that they can interact with. I think that that's important.

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I think it also helps if you're in an environment where you either have your own lab or at least have several students working for you so that you are not the only source of inspiration and help for that student. I think it's *very* difficult to take somebody in for a summer and expect that you're going to instantly have a really good one-on-one working relationship. So you have to provide other opportunities to them.

In the following quote, a mentor discussed the multiple resources that a community can provide for the DMP student new to the city and university.

The one awkward part of it was setting up living arrangements for the student. And that was my primary concern going into it is [that] you don't know what the student is going to be like, what they want to do, how aggressive they are in taking care of themselves, whether they need to be hand held, that kind of thing. And if you bring in one student as we did, it can be a little lonely. And we tried to make sure that both of us had graduate students, and I in fact had an undergraduate working for me that summer. So we tried to make sure that she had people to interact with, to ask questions about the area, to go to lunch with, that kind of thing. But those sorts of logistics are something that we don't think about on a daily basis, and that was a concern for both of us when we brought her in. And was she going to feel extremely isolated and was she going to be shy or have difficulty getting around the new environment.

Many mentors noted that by having the students work with or be in close proximity to other graduate students, they were alleviating some of the pressure the student may feel in interacting with a faculty member. These mentors felt that it may be less stressful for the student to be able to ask more technical questions of a graduate student than a faculty member.

I: Did they have grad students that were supervising them or that they were working closely with?

R: Yeah, they had grad students that they were working with. There was one that sort of had finished last year, but she was still around. She, actually last summer, was here full time and helped [my 1994 DMP student] get started. In some ways I think that was a comfortable transition for [this DMP student] because she felt less intimidated talking to [the graduate student] first. ... Plus they were physically located together. They were in the same room, so it was easier for them to talk than to make a trip around and look for [my co-mentor and me] in our offices.

V.B.4. A community decreased the time commitment of the mentor

Many mentors who provided a research community that included graduate students for their DMP student reported that it decreased their time commitment with the student. As stated throughout this document, the students had little experience with research and thus needed a high degree of guidance. This meant that a mentor working without a research community of graduate students may need to spend a considerable amount of time assisting the student. Since many of the mentors had multiple responsibilities which at times made them inaccessible for the student, they felt that a community of graduate students would be more available to answer students' questions. In fact, many mentors stated that since the graduate

students were around more often, they would provide a more consistent resource for the students' day-to-day technical questions.

R: I think it's really important to have a graduate student who is also acting as an advisor or [the students] just won't get enough advice. Sort of supervision, whatever.
I: Because they can't get it all from you?

R: Yeah. Because it's not reasonable for me to assume that I'm going to be here at every time of the day. [That] they can just drop in and talk to me just because even when I'm here I have meetings and meetings with other graduate students. Meetings with faculty. Different kinds of things. So I think it's really important. The graduate students tend to be in town more and they're just more sort of constant sources of information if they need that kind of immediate answers to questions.

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R: I think it would be ideal to set it up so that the student is working very closely with a graduate student and a lot of the questions go to the graduate student and then the faculty member gets involved on maybe a little bit less constant basis. But you know that then depends on having a graduate student who's gonna do a good job of being a mentor and of involving someone else in a project and that's not something that a lot of the graduate students necessarily, you know they're sort of still trying to make their own way in the project that they're working on. And I don't think that every graduate student is necessarily gonna be good at playing that role and being involved in that way.

I: And why would that be ideal to have them working closely with a graduate student?

R: Well I think because they would have a lot more, I mean the graduate students are closer to them in terms of experience and you know, you can quickly forget what it's like to you know to be thinking about research and just starting out with it. And I think that having a graduate student around that a student, an undergrad can work closely with would just provide sort of probably more opportunity for interaction and more frequent interaction than a faculty member can usually provide. Just because of time constraints and you know I think I was fairly accessible but I was probably not as accessible as, you know a grad student working at a nearby desk would have been.

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The amount of time I would have to work with any one person, even the grad students is relatively small and if they're here to spend all their time with me, that can be a potentially discouraging setting. So that's where the grad students being there to be there on the kind of you know, day by day, hour by hour basis really helped [my DMP students] a lot. But in terms of the program is set up as faculty -- undergrads. Unless that's kind of built into it, I think there is some potential for it not working out so well.

Almost all of the mentors who had a graduate student work with the DMP student did not view the graduate student as replacing them in their role as mentor. Rather, these mentors stated that

the graduate student provided a different function: the graduate student answered the day-to-day questions, while the mentor provided assistance on the "big picture." Many mentors felt that the two roles complemented one another and ensured that the student had access to the help she needed.

Evaluator Question

Should the CRA-DMP require that the mentor have a community of graduate students with which the students can work over the summer?

VI. Receiving recognition for their participation in the DMP

In the 1994 and 1995 program years, the mentors received neither monetary nor professional recognition for the participation. However, many mentors commented that they would have preferred to receive some sort of recognition for their participation in the DMP. In this section, we will discuss the various methods the mentors stated that the CRA could use to give the mentors some recognition.

VI.A. A letter to the department chair or the academic Dean

Many mentors commented that the CRA should send their department chair or an academic Dean a letter about their participation in the DMP. These mentors felt that such a letter would serve a dual purpose: it would inform their department of their participation in the DMP and also may assist the student in her interactions with the university.

> R: To address this issue of not being paid, maybe a little bit more recognition for the women who did participate, 'cause if you're young and untenured, every little piece helps. You know what I mean?
>
> I: Right, so what kind of recognition?
>
> R: I don't know. For example, it would have been nice if my Dean received a letter about my participation. When you get a grant, like, the NSF will notify that research office, my research office, provost. They'll notify me, and they'll notify the dean, or the research office will notify the Dean the provost that this grant was received. That kind of sort of formal recognition that this person is participating in this program would be nice.

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> Different people that say the mentors should be paid. I'm not sure that that's needed. One thing that might happen is [if] the department the students were going to, [or] if the head of the department or someplace further up [received a letter of recognition] -- if it were made to seem like more of an award. The way it is now, as far as I know, nobody other than the mentor and the mentee know that this person is coming in, and perhaps if more fanfare could be done at both the home institution and at the student's institution. That might be good even with finding equipment and room for the students. The department also was made aware of this happening. It is an honor. We sell it as an honor.

VI.B. Publicity for their participation in a journal

A few mentors mentioned that it would have been nice to have been honored for their participation in the DMP by having their name listed in some publication, like the *Computing Research News*. These mentors felt that this publicity would benefit the mentor, her institution, and the DMP.

I: How could the program facilitate it better for people getting points, as you said, for doing this through the university? Have you thought of any way that it would help?

R: [Pause] Oh I don't know, Possibly some more publicity in *Computing Research News* or you know some publications of the trade if they sort of highlighted the program and some of the experiences of the mentor pairing. And then you know maybe one university would see one of their faculty members highlighted and they didn't even realize they were doing that and they would look at it as good publicity for their university. Then they could use that as a more tangible tool for recruiting or whatever they wanted to use it for. Maybe even something like writing a letter to the department head describing the program and describing the faculty members contribution to the program.

VI.C. Funding may influence more faculty to participate

Many mentors commented that if the DMP provided some sort of funding, more faculty may be inclined to participate. Many of these mentors stated that the funding would not have to be directed toward the mentor. The funding could be applied to cover expenses of having the student, to the department, or to be a stipend for both the student and mentor to attend a conference.

And there's actually no record at all that have participated in this program as far as far as my department is concerned. So for example, it would have been nice if I had gotten at least the grant or something like that. Or there was some benefit. I mean it actually it costs me money to be involved in the program because I have to pay for the computer account and then the way things are set-up around here, you have to make sure there is a machine available and you have to make sure that they can access the network and the servers and things like that.   So there is a monthly charge I had to pay.   And that was fine because I had enough other grants that it wasn't a problem to pay for that. But somehow it seemed a little bit odd that I was volunteering for this program and it was costing me money to be involved in it.

* * * * * * * * * * *

R: One of the things that I'm supposed to do is I'm supposed to have research grants. If there was something associated with the program that could be classified as a research grant, even if none of the money came to me, it would be personally advantageous - if there was some funds going to the university to provide some compensation for the resources being used.

* * * * * * * * * * *

R: It might help if the faculty member got something out of the program in terms of maybe funding to a conference of you know something small out of it.

I: They receive no remuneration, do they?

R: No they don't get anything at all. And I think if they did it would at least look better probably for their record or something they'd want to show, they got some kind of funding out of it or a trip or some kind of a reward out of it other than the fact that you hope you've helped a student.

I: So would that be of incentive or as a reward or both, I suppose?

R: Probably both, yeah. I think it would give more respect to the program in terms of I've seen some of the notes on the net about, "Oh why would anybody want to do that? It's just charity work."

<center>* * * * * * * * * * * *</center>

R: And it is hard. I mean there's so much pressure at a university to get funding so if I figure that I spent five hours a week on this, it would probably be better spent at my university to spend five hours a week preparing a grant proposal or something like that.

I: OK, so you really have to look at it that way -- that this, you have to look at the time put in and where else it could have been better directed.

R: That's right. And as near as I can tell you don't get any points for doing this at your own university. I don't think that it would really count favorably for anything like a promotion or a raise or course reduction or anything. Whereas if there was some money attached to it, even if it didn't go to the faculty member, if it went to the university somehow you would get points for it with the university.

1995 Student Participant Survey Results

The data presented in this section is from an emailed survey to the 1995 student participants of the CRA-DMP. A total of 22 out of 28 1995 student participants responded to the survey. However, not all students answered all of the questions. Thus, the "N" in each chart refers to the number of respondents for that question.

Primary Reasons for Choosing to Study CS&E (Question 13) -- Top Four Choices

(N = 22)	Number of Responses	Percent
A teacher encouraged me	5	23%
I am good at math and science	15	68%
A relative is in CS&E	3	14%
A friend is in CS&E	2	9%
CS&E is enjoyable and interesting	15	68%
CS&E affords many career opportunities	15	68%
I like the idea of being a computer scientist	5	23%
CS&E is challenging	15	68%
CS & E jobs pay well	4	18%
Other	3	14%

Post-Graduation Plans (Question 14)

(N = 22)	Number of Responses	Percent
Graduate school	14	64%
Job, then graduate school	3	14%
Job	3	14%
Undecided	2	9%

Degree Sought for Students Who Plan to Attend Graduate School (Question

14)

(N = 17)	Number of Responses	Percent
Masters	4	24%
Ph.D.	9	53%
Undecided	4	24%

Most Important Factors for Choosing to Attend Graduate School (Question 15) -- Top Four Choices

(N =19)	Number of Responses	Percent
Influence of family member	8	42%
Experience/mentor during high school years or earlier	2	11%
Work experience	5	26%
Career goals	16	84%
Technical interests	8	42%
Advisor/mentor at undergraduate institution	8	42%
Extra-curricular activity at undergraduate institution	5	26%
Distributed Mentor Project experience	15	79%
Other factors	4	21%

Most Important Factors for Choosing Not to Attend Graduate School (Question 16) -- Top Four Choices

(N = 4)	Number of Responses	Percent
Influence of family member	1	25%
Career goals incompatible with graduate school	0	0%
Distributed Mentor Project experience	2	50%
Undergraduate experience	1	25%
Other personal/family priorities	1	25%

Lack of interest in field	2	50%
Lack of interest in research	1	25%
Don't expect to be admitted in school of interest to me	0	0%
Financial concerns	2	50%
Other factors	1	25%

Commitment to Graduate School in CS&E Before the DMP (Question 31)

(N = 21)	Number of Responses	Percent
Not considering	1	5%
Considering the possibility	6	29%
Tentatively committed	8	38%
Committed	5	24%
Certain that CS & E is right	1	5%

Commitment to Graduate School in CS&E After the DMP (Question 32)

(N = 21)	Number of Responses	Percent
Not considering[2]	3	14%
Considering the possibility	3	14%
Tentatively committed	4	19%
Committed	5	24%
Certain that CS & E is right	6	29%

Overall Satisfaction With the DMP (Question 47)

(N = 20)	Number of Responses	Percent
Not at all satisfied	1	5%
Not very satisfied	0	0%
Somewhat satisfied	2	10%

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[2]Two of the students who selected this answer stated that although they did not want to attend graduate school immediately following graduation, they might consider it in the future.

	Number of Responses	Percent
Satisfied	8	40%
Very satisfied	9	45%

Rating the Value of the Research Experience (Question 35)

(N = 21)	Number of Responses	Percent
Not at all valuable	0	0%
Not very valuable	1	5%
Somewhat valuable	5	24%
Valuable	6	29%
Very valuable	9	43%

Rating the Value of the Mentor Experience (Question 36)

(N = 21)	Number of Responses	Percent
Not at all valuable	1	5%
Not very valuable	3	14%
Somewhat valuable	2	10%
Valuable	4	19%
Very valuable	11	52%

Rating the Importance of Having a Female Mentor (Question 37)

(N = 21)	Number of Responses	Percent
Not at all important	0	0%
Not very important	2	10%
Somewhat important	7	33%
Important	6	29%
Very important	6	29%

Degree of Mentor-Student Contact (Question 43)

(N = 21)	Number of Responses	Percent
Less than once a week	1	5%

Once or twice a week	8	38%
Three times a week	1	5%
Almost daily	11	52%

Satisfaction With Frequency of Mentor Contact (Question 45)

(N = 21)	Number of Responses	Percent
Would have liked more contact	6	29%
Would have liked less contact	1	5%
Satisfied with amount of contact	14	67%

Satisfaction With Mentor Match (Question 46)

(N = 21)	Number of Responses	Percent
Not at all satisfied	0	0%
Not very satisfied	1	5%
Somewhat satisfied	1	5%
Satisfied	7	33%
Very satisfied	10	48%
No Answer[3]	2	10%

Type of Interaction with Graduate Students

(N = 21)	Number of Responses	Percent
Worked with graduate students on project	11	52%
Interacted with graduate students outside of project	13	62%

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[3]Two students did not give a numerical response. One stated that she did not meet with her mentor frequently enough to decide if there was a match.

The Role of Graduate Students (if worked with them) (Question 39)

(N = 11)	Number of Responses	Percent
Answered questions	3	27%
Directly supervised	4	36%
Worked as a team	4	36%

Rating How Graduate Students Carried Out Their Role (Question 40)

(N = 10)	Number of Responses	Percent
Not at all satisfied	0	0%
Not very satisfied	0	0%
Somewhat satisfied	1	10%
Satisfied	5	50%
Very satisfied	4	40%

Overall Satisfaction of Interactions with Graduate Students (Question 42)

(N = 21)	Number of Responses	Percent
Not at all satisfied	0	0%
Not very satisfied	0	0%
Somewhat satisfied	4	19%
Satisfied	8	38%
Very satisfied	7	33%
Not Applicable	2	10%

Satisfaction with Quality of Teaching at Undergraduate Institution (Question 23)

(N = 22)	Number of Responses	Percent
Not at all satisfied	0	0%
Not very satisfied	1	5%
Somewhat satisfied	4	18%

Satisfied	7	32%
Very satisfied	9	41%
Not Applicable	1	5%

Satisfaction with Quality of Academic Advising at Undergraduate Institution (Question 23)

(N = 22)	Number of Responses	Percent
Not at all satisfied	1	5%
Not very satisfied	3	14%
Somewhat satisfied	5	23%
Satisfied	8	36%
Very satisfied	4	18%
Not Applicable	1	5%

Satisfaction with Degree of Interaction with Faculty at Undergraduate Institution (Question 23)

(N = 22)	Number of Responses	Percent
Not at all satisfied	0	0%
Not very satisfied	2	9%
Somewhat satisfied	4	18%
Satisfied	5	23%
Very satisfied	10	45%
Not Applicable	1	5%

Satisfaction with Availability of Extracurricular Activities at Undergraduate Institution (Question 23)

(N = 22)	Number of Responses	Percent
Not at all satisfied	4	18%
Not very satisfied	4	18%
Somewhat satisfied	5	23%
Satisfied	7	32%
Very satisfied	0	0%

| Not Applicable | 2 | 9% |

Satisfaction with Departmental Climate at Undergraduate Institution (Question 23)

(N = 22)	Number of Responses	Percent
Not at all satisfied	1	5%
Not very satisfied	2	9%
Somewhat satisfied	7	32%
Satisfied	6	27%
Very satisfied	4	18%
Not Applicable	2	9%

Overall Satisfaction with the Department at Undergraduate Institution (Question 23)

(N = 22)	Number of Responses	Percent
Not at all satisfied	1	5%
Not very satisfied	1	5%
Somewhat satisfied	6	27%
Satisfied	9	41%
Very satisfied	4	18%
Not Applicable	1	5%

1994 and 1995 Mentor Survey Results

The data presented in this section is from an emailed survey sent to the 1994 and 1995 mentors of the CRA-DMP. Out of the 38 mentors who participated in 1994 and/or 1995, 21 responded. Ten of the mentors who responded had one student throughout their participation in the program. The remainder (11) had two or more throughout their participation. Associated with the 21 mentors who responded were the 34 students who they mentored.

This section is broken down into two categories. In the first, we will present the results which do not deal specifically with the students. These are tallied by the number (21) of mentors that responded. In the second section we will present the results of the questions in the survey which specifically ask about the student. Since there were 34 total students associated with the number of mentors who responded, the tally in this section is 34.

Importance of Matching Mentor and Student Interests (Question 17)

21	Number of Responses	Percent
Extremely Important	8	38%
Important	6	29%
Important to the extent that the undergraduate has definite interests	5	24%
Not Important	0	0%
If students motivated enough, it doesn't matter	2	10%

Expectations of Student Contribution to Mentor's Research (Question 18)

21	Number of Responses	Percent
None at all	2	10%
Very little	3	14%
Somewhat	10	48%
A fair amount	3	14%
A lot	3	14%

Overall Satisfaction with Program (Question 25)

21	Number of Responses	Percent
Not at all satisfied	1	5%
Not very satisfied	1	5%
Somewhat satisfied	3	14%
Satisfied	13	62%
Very satisfied	3	14%

Issues Discussed with Student (Question 13)

34	Number of Responses	Percent
Selecting a graduate school	27	79%
Research opportunities	27	79%
Succeeding in graduate school	28	82%
Selecting thesis/research topic	16	47%
Study skills	21	62%
Application to graduate school	21	62%
Career opportunities and options	32	94%
Fellowship opportunities	11	32%
Interviewing advice	4	12%
Job applications	3	9%
Letter of reference	26	76%
Resume development	8	24%
Balancing family and work	13	38%
Crisis intervention	1	3%
Departmental politics	6	18%
Networking/professional contacts	9	26%
Advice re: publishing, etc.	18	53%
Advice re: minority status	2	6%
Sexual harassment	7	21%
Self-image and selfconfidence	21	62%
Time management	15	44%
Other	7	21%

Student was in Area of Scientific Interest (Question 14)

34	Number of Responses	Percent
Yes	21	62%
No	8	24%
Undergraduates lack the knowledge to have definite area of interest	5	15%

Satisfaction with Mentor-Student Match (Question 16)

34	Number of Responses	Percent
Not at all satisfied	3	9%
Not very satisfied	0	0%
Somewhat satisfied	5	15%
Satisfied	7	21%
Very satisfied	17	50%
Not applicable, picked students herself	2	6%

Satisfaction with Student's Technical Abilities (Question 17)

34	Number of Responses	Percent
Not at all satisfied	3	9%
Not very satisfied	4	12%
Somewhat satisfied	0	0%
Satisfied	13	38%
Very satisfied	14	41%

Student Contribution to Mentor's Research (Question 19)

34	Number of Responses	Percent
Much less than expected	4	12%
Less than expected	3	9%
What expected	10	29%
More than expected	12	35%
Much more than expected	5	15%

**Overall Satisfaction with
Student (Question 20)**

34	Number of Responses	Percent
Not at all satisfied	3	9%
Not very satisfied	1	3%
Somewhat satisfied	2	6%
Satisfied	8	24%
Very satisfied	20	59%

**Degree Which Participation
Has Taken Away From
Mentor's Research Progress
(Question 21)**

34	Number of Responses	Percent
None at all	7	21%
Very little	12	35%
Somewhat	11	32%
A fair amount	2	6%
Too much	2	6%

**Rating of How Closely
Expectations of Amount of
Time Spent with Student
were Met (Question 22)**

34	Number of Responses	Percent
Much less than expected	1	3%
Less than expected	5	15%
What expected	21	62%
More than expected	4	12%
Much more than expected	3	9%

Views Toward Amount of
Time Spent with Student
(Question 23)

34	Number of Responses	Percent
Didn't feel like spent any time	0	0%
Didn't feel like spent enough time	15	44%
Spent the right amount of time	15	44%
Spent too much time	2	6%
Spent way too much time	2	6%

Rating the Effectiveness of
the Mentor Experience
(Question 26)

34	Number of Responses	Percent
Not at all effective	3	9%
Somewhat effective	4	12%
Effective	20	59%
Very effective	7	21%

Breakdown of the 1994 Students
Attending or Considering Attending
Graduate School

Fifteen of these students were expected to have graduated before fall, 1995. The breakdown of their attendance in graduate school is as follows:

- We have been unable to contact four participants and do not know if they are currently attending graduate school.
- Four are currently in graduate school.
- Six have plans to attend graduate school -- One specifically for her MBA.
- One has no plans to attend graduate school.

Ten of the students had not graduated before fall, 1995. All of these student plan to pursue graduate studies -- one specifically for her MBA.

Appendix A:
Interview Protocols for Student Participants and Mentors

FIRST INTERVIEW QUESTIONS FOR 1995 STUDENT PARTICIPANTS
DISTRIBUTED MENTOR PROJECT (edited 6/23/95)

BACKGROUND QUESTIONS

1. Can you start by telling me a little bit about yourself?
    [Where they are from, size of high school, etc.]

2. A. What year in school are you? [If we don't already know.]

    B. When do you expect to graduate?

QUESTIONS ABOUT SPECIFIC MAJOR/AREA

3. What is your major? Are you concentrating in a particular area?

4. What things played a role in your decision to go into that major/area?

5. What interests you the most about your major/area?

6. Do you have any concerns about going into this major/area?

7. Is there a graduate program in your area at your school?

FAMILY SUPPORT

8.   Is there anyone or anything that has been particularly influential in your choice of major?

9. How does your family feel about your career choices?

10.   What do the people in your family do?
    (parents, siblings, grandparents - whoever has an influence) [Family support issues, and also degree of education of parents].

PREVIOUS RESEARCH AND TEAMWORK EXPERIENCES

11.   How is research conducted in your field?

12. What is the value of research in your field?
    [PROBE: Do they think that there is any value?]

13. A. Have you had any previous experiences with research?

    B. What did you think of those experiences?

14. A. Have you ever worked as part of a team on a project?

    B. What did you think of those experiences?

OTHER MENTORS

15. How have you gotten advice about your major - your classes, etc?

16. A. If you had to have someone give you a reference or write you a letter of recommendation, who would it be?

    B. Why would you ask that person?

    C. What if you needed other references or letters of   recommendation?

17. Are there any people in your field that you particularly respect? What stands out about those people?

DEPARTMENT ATMOSPHERE

18. Do you feel like you are a part of the department?

19. A. Do you know many faculty in your department?

    B. How did you get to know them?

20. A. Do you know many undergraduates in your department?

    B. How did you get to know them?

    C. Are most of your friends in school in your department?

21. A. Are there many women in your department?

    B. How do you feel about this?

FUTURE PLANS

22. At this point, what are you planning to do during after you graduate? [Immediately and long

term]

23. What kinds of things are important to you in making that   decision? [What factors are playing a role in this decision?]

{If they are planning to go to graduate school at some point...}

24. How will you find out about different graduate schools?

25. What kinds of things are important to you in a school?

26. What area are you planning to go into?

27. What degree are you planning to get?

28. What aspects of graduate school appeal to you?

29. Do you have any concerns about graduate school?

30. What are you hoping to get out of graduate school?

31. Is there anything that has helped prepare you for graduate school?

{If they are planning to get a job...}

32. What kinds of things are important to you in a job?

33. How will you find out about different jobs?

34. What aspects of {whatever they're planning to do} appeal to you?

35. Do you have any concerns about {whatever}?

36. What are you hoping to get out of your job?

37. Is there anything that has helped prepare you for {whatever}?

Ask all interviewees

38. A. Are there benefits to working for a Master's Degree in your field?

    B. Are there disadvantages?

39. A. Are there benefits to working for a PhD in your field?

    B. Are there disadvantages?

40. A. Do you know any graduate students in your specific area?

    B. What do you think of their experiences?

41. A. Do you know any other students in your area who did not go on to graduate school?

    B. What do you think of their experiences?

PROGRAM INFORMATION

42. How did you hear about the mentoring program?

43. What aspects of the program interested you?

44. A. What are you hoping to get out of your experience this summer?

    B. Why are those things important to you?
    [PROBE: research, mentor, university culture]

45. Do you have any concerns about being in this program?

46. A. Why do you think that all of the mentors are women?

    B. How do you feel about that?

47. A. Why do you think that the program is only offered to women?

    B. How do you feel about that?

48. What would you have done this summer if you had not been in this program?
    [Note: this will provide some basis of comparison for the control group.]

**SECOND INTERVIEW QUESTIONS FOR 1995 STUDENT PARTICIPANTS
DISTRIBUTED MENTOR PROJECT** (edited 8/08/95)

OVERVIEW

1. Overall, what stands out about the program for you?
    [Probe, and get specifics.]

2. Did this program turn out to be what you had expected?
    [Probe]

RESEARCH ASPECT

3. What kind of research does your mentor do?

4. Tell me about the project that you worked on.
    [Probe for how much time they had to spend preparing to work on a project.]

5. A. Who decided what you would work on?

    B. Did you work on a single project throughout the summer?

    C. Was your research part of a larger project?

6. Did you work on your own, or with other people?

7. What was the role of your mentor in the research project?

8. A. When you had questions about the project, who did you turn to?

    B. How available was that person to you?

9. Did you finish the project this summer?

10.   What will you do with your research result for this project?

  A. Will the results of your research be published, either on its own or as part of a larger
     project?

  B. Before the program started, did you expect that you might end up with a publication?

11.   Do you feel that the work that you did this summer was important?

12.   Did you learn anything new about the process of doing research? [If so, what? If not,
    why?]

13. Now that you've completed the summer, what are your feelings about research?
[Probe about whether this is what she expected.]

MENTOR ASPECT

14. A. Tell me about your relationship with your mentor.

    B. Was this what you expected?

15. How often did you see your mentor?
[Probe for the contexts in which she saw her mentor: in a group once a week, socially, etc.]

16. Did you talk to your mentor about her own experiences in graduate school and in her career?

    [If yes, was talking to her about those kinds of things an important part of the program for you?]

    [If no, would you have liked to have talked about these kinds of things with your mentor?]

17. Would you want to be like your mentor?

18. Was having a female mentor important to you?
[If so, why? If not, why not?]

UNIVERSITY ASPECT

19. A. Where are you living during the program?

    B. Who arranged the housing?

    C. Do you live with graduate students?

    D. If yes, then are any of them in your area?

20. What do you think of the housing arrangements?

21. A. Did you meet many graduate students? How?

    B. What did you think of them?

    C. What did you think of their experiences at the university?

22.　A. Did you meet many faculty members? How?

　　　B. What did you think of them?

23.　What is your impression of graduate school?

24.　Has participating in this program changed your view of graduate school at all?

25.　What do you think of {this university} as a place to go to graduate school?

OVERALL PROGRAM

26.　Is there anything that would have made the program better for you?

27.　Is there anything that you wish you had known about the program before you started?

28.　Did this program affect your future career plans?
　　　[If so, how? If not, why?]

29.　Do you feel you can succeed in grad school? [PROBE]

**INTERVIEW QUESTIONS FOR 1994 STUDENT PARTICIPANTS
(edited 8/17/95)**

BACKGROUND QUESTIONS

1. Can you start by telling me a little bit about yourself?
    [Where they are from, size of high school, etc.]

2. A. What year in school are you? [If we don't already know.]

    B. When do you expect to graduate?

QUESTIONS ABOUT SPECIFIC MAJOR/AREA

3. What is your major? Are you concentrating in a particular area?

4. What things played a role in your decision to go into that major/area?

5. What interests you the most about your major/area?

6. Do you have any concerns about going into this major/area?
    [Concerns about the area or about going into it? Rephrase?]

7. Is there a graduate program in your area at your school?

FAMILY SUPPORT

8.   Is there anyone or anything that has been particularly influential in your choice of major?

9. How does your family feel about your career choices?

10.   What do the people in your family do?
    (parents, siblings, grandparents - whoever has an influence) [Family support issues, and also
    degree of education of parents].

PREVIOUS RESEARCH AND TEAMWORK EXPERIENCES

11.   A. Other than the program, have you had any experiences with research?

    B. What did you think of those experiences?

12.   A. Have you ever worked as part of a team on a project?

B. What did you think of those experiences?

MENTORS

13.   How have you gotten advice about your major - your classes, etc?

14.   A. If you had to have someone give you a reference or write you a letter of recommendation, who would it be?

B. Why would you ask that person?

C. What if you needed other references or letters of   recommendation?

15.   Are there any people in your field that you particularly respect? What stands out about those people?

DEPARTMENT ATMOSPHERE

16. Do you feel like you are a part of the department?

17.   A. Do you know many faculty in your department?

B. How did you get to know them?

18.   A. Do you know many undergraduates in your department?

B. How did you get to know them?

C. Are most of your friends in school in your department?

19.   A. Are there many women in your department?

B. How do you feel about this?

FUTURE PLANS

20.   At this point, what are you planning to do during after you graduate? [Immediately and long term]

21.   What kinds of things are important to you in making that   decision? [What factors are playing a role in this decision?]

{If they are planning to go to graduate school at some point...}

22.   How will you find out about different graduate schools?

23. What kinds of things are important to you in a school?

24. What area are you planning to go into?

25. What degree are you planning to get?

26. What aspects of graduate school appeal to you?

27. Do you have any concerns about graduate school?

28. What are you hoping to get out of graduate school?

29. Is there anything that has helped prepare you for graduate school?

{If they are planning to get a job...}

30. What kinds of things are important to you in a job?

31. How will you find out about different jobs?

32. What aspects of {whatever they're planning to do} appeal to you?

33. Do you have any concerns about {whatever}?

34. What are you hoping to get out of your job?

35. Is there anything that has helped prepare you for {whatever}?

Ask all interviewees

36. A. Are there benefits to working for a Master's Degree in your field?

     B. Are there disadvantages?

37. A. Are there benefits to working for a PhD in your field?

     B. Are there disadvantages?

38. A. Do you know any graduate students in your specific area?

     B. What do you think of their experiences?

39. A. Do you know any other students in your area who did not go on to graduate school?

B. What do you think of their experiences?

PROGRAM INFORMATION

40. How did you hear about the mentoring program?

41. What aspects of the program interested you?

42. A. What did you expect to get out of your experience?

    B.. Why were those things important to you?

43. Did you have any concerns about being in this program?

44. Tell me about that summer.
    [Probe: daily schedule]

RESEARCH ASPECT OF PROGRAM

45. What did you work on over the summer?
    [Probe: was there one project or several?]

46. Who decided what you would do?

47. Did you work on your own, or with someone else?

48. Had you ever done anything like this before?

49. What did you think of the research?

MENTOR ASPECT OF PROGRAM

50. Did you know your mentor before the program?

51. How did you first get in touch with each other?

52. What did your mentor do over the summer?
    [Probe: How often did they meet? Did she work on the project at all?]

53. What did you think of having a mentor?

54. A. Why do you think that all of the mentors are women?

    B. How do you feel about that?

55. A. Why do you think that the program is only offered to women?

B. How do you feel about that?

UNIVERSITY ASPECT OF PROGRAM

56. A. Where did you live during the program?

B. Who arranged the housing?

C. Did you live with graduate students?

D. What did you think of the housing arrangements?

57. A. Did you meet many graduate at the university?

B. How did you meet them?

C. What did you think of them?

D. What did you think of their experiences at the university?

58. A. Did you meet many faculty at the university?

B. How did you meet them?

C. What did you think of them?

59. A. Why do you think the summer program takes place at a university?

B. What do you think of that?

OVERALL PROGRAM

60. What were the most positive aspects of the program for you?

61. What were the most negative aspects of the program for you?

62. A. Would you participate again?

B. If you did the program again, would you want to change anything?

63. What advice would you give to someone who was considering participating in this program?

64. What would you have done that summer if you had not been in this program?
     [Note: this will provide some basis of comparison for the control group.]

65. Have you communicated with your mentor since the program ended? (Would you consider them a resource/reference?)

INTERVIEW QUESTIONS FOR MENTORS WHO PARTICIPATED IN 1994 AND/or 1995 (edited 8/14/95)

BACKGROUND

1. Can you start by telling me a little bit about yourself?
   [How they got started in their career, whether or not they are tenured and if that affects their work.]

2. What is your area?

3. What has been your experience in helping undergraduates to do research?

4. What has been your experience in mentoring undergraduates?

MENTORING PROGRAM

5. How did you hear about the mentoring program?

6. Why did you get involved? [PROBE: Was it important that it was only for female undergraduates?]

7. Why did you participate a second time?

8. A.   What did you expect to get out of your experience when you first decided to participate?

   B.   Why were those things important to you?

   C. Did your expectations change the second year? [If so, how? If not, why?]

9. A. In 1994, before the program started, did you have any concerns about participating?

   B.   {Did those things happen?}

   C. Did you have any concerns the second time about participating? Did those things happen?

10.   What was your role in the program each year?

RESEARCH ASPECT OF PROGRAM

11.   A. Each year, how did you decide what the student would work on?

B. Why did you structure it that way?

12. Who supervised her research?

13. [If someone else supervised the student]
A. Did {whoever} volunteer to work with an undergraduate, or did you assign them?

B. How did the match work out for the mentee?

C. How did the match work out for the supervisor?

14. What did you think of the work that your student each year did?

15. In what ways were you involved with your student's research each year?
[Probe: How often did they meet? Did she work on the project at all?]

MENTOR ASPECT OF PROGRAM

16. What did you think of the mentoring aspect of the program?

OVERALL

17. [If not covered elsewhere]
Compare/Contrast your experiences from the two years in which you participated in the program.

18. What stands out about the program for you?

19. What would have improved the program for you?

20. A. Would you participate again?

B. If you did the program again, would you want to change anything?

21. What advice would you give to someone who was considering participating in this program as a mentor?

22. What advice would you give to an undergraduate who was considering participating in this program?

Appendix B:
Surveys for Student Participants and Mentors

Survey sent to the 1995 and 1995 Student participants:

Dear 1995 Student Participant,

The LEAD Center (Learning through Evaluation, Adaptation, and Dissemination) is conducting a three-year formative evaluation of the Distributed Mentor Project. The purpose of this evaluation is to learn what aspects of the project are successful and also to learn how the project can be improved. The following questionnaire is an important part of this evaluation. It will allow us to learn something about each participant's experience in the program. Your thoughtful response to this questionnaire will enable us to help administrators of the Distributed Mentor Project in future planning.

It should be noted that individual responses will be held confidential. When reporting the results of this questionnaire, care will be taken to ensure that no individual's response can be identified.

Would you please take some time to fill out the questionnaire and return it as soon as possible to:
 daffinru@engr.wisc.edu

We thank you for your time. If you have any comments or questions, feel free to email me at the above address.

Sue Daffinrud
The LEAD Center

NOTE: The term "computer science" is used throughout this questionnaire to represent both computer science and engineering.

1. Name~

2. Permanent address~

3. Permanent phone~

4. Local phone~

5. Email address~

6. Ethnic identity~

7. Undergraduate institution~

8. Class standing when applied for the CRA Distributed Mentor Program (Freshman, Sophomore, Junior, Senior)~

9. Projected graduation date~

10. Major(s)~

11. GPA in major(s)~

12. GPA overall~

13. Please rank the following factors which are most important in your choice to study computer science.

    ___   A teacher encouraged me~
    ___   I am good at math and science~
    ___   A relative is in computer science~
    ___   A friend is in computer science~
    ___   Computer science is enjoyable and interesting~
    ___   Computer science affords many career opportunities~
    ___   I like the idea of being a computer scientist~
    ___   Computer science is challenging~
    ___   Computer science jobs pay well~
    ___   Other (please specify)~

14. What are your most likely post - graduation (BS) plans (Grad School; Job; Job, then Grad School; Other)?~

  a. If you chose "Grad School":
     1. What type of degree sought (MS, PhD, or Undecided)?~

     2. What type of position sought?~

  b. If you chose "Job", what type of job?~

  c. If you chose "Job, then Grad School":

     1. What type of job?~

     2. What type of degree sought (MS, PhD, or Undecided)?~

15. If you are planning to go to graduate school now or in the future, please rank the most important factors in your decision.

    ___   Influence of family member~
    ___   Experience/mentor during my high school years or earlier~

___ Work experience~
___ Career goals~
___ Technical interests~
___ Advisor/mentor at undergraduate institution~
___ Extra-curricular activity at undergraduate institution (such as other research project, programming team)~
___ Distributed Mentor Project experience~
___ Other factors (please explain)~

16. If you are not planning to go to graduate school, please rank the most important factors in your decision.

___ Influence of family member~
___ Career goals incompatible with graduate school~
___ Distributed Mentor Project experience~
___ Undergraduate experience~
___ Other personal/family priorities~
___ Lack of interest in the field~
___ Lack of interest in research~
___ Don't expect to be admitted to school of interest to me~
___ Financial concerns~
___ Other (please explain)~

17. Mother's Occupation~

18. Father's Occupation~

19. Prior NSF-sponsored REU or other research experience?~

20. Part-time work experience (on-campus, off-campus)~

21. Other campus activities (sports, recreational organizations, service organizations, sorority)~

22. Residence (dorm, sorority, apartment)~

23. How would you rate your satisfaction with the following facets of the department at your undergraduate institution using the following scale (1 = not at all satisfied; 2 = not very satisfied; 3 = somewhat satisfied; 4 = satisfied; 5 = very satisfied; N/A = not applicable)?

___ Quality of teaching~
___ Quality of academic advising~
___ Degree of interaction with faculty~
___ Availability of extracurricular activities (program teams, etc)~
___ Departmental climate~
___ Overall satisfaction with the department~

24. Year participated in the mentor program~
25. Mentor's name~

26. Mentor's institution~

27. Type of research activity~

28. Number of graduate students in mentor's research group~

29. Source of information about the mentor program~

30. Type of interaction with mentor after participation in mentor program (email, conference, paper)~

31. How would you describe your commitment to graduate school in computer science before participating in the mentor program? (1 = not considering it; 2 = considering the possibility; 3 = tentatively committed; 4 = committed; 5 = certain that graduate school in computer science is right for me)~

32. How would you describe your commitment to graduate school in computer science after participating in the mentor program? (1 = not considering it; 2 = considering the possibility; 3 = tentatively committed; 4 = committed; 5 = certain that graduate school in computer science is right for me)~

33. Which of the following issues would you have liked to learn about through your experience with the mentor program?

     ___ Selecting a graduate school~
     ___ Research opportunities~
     ___ Succeeding in graduate school (e.g. getting a thesis advisor, RA, etc)~
     ___ Selecting a thesis/research topic~
     ___ Study skills (e.g. reading research papers, familiarity with new computing environments)~
     ___ Application to graduate school~
     ___ Career opportunities and options~
     ___ Fellowship opportunities~
     ___ Interviewing advice~
     ___ Job application~
     ___ Letter of reference~
     ___ Resume development~
     ___ Balancing family and work~
     ___ Crisis intervention~
     ___ Departmental politics~
     ___ Networking/professional contacts~
     ___ Advice re: publishing, presentations at meetings, seminars~
     ___ Advice re: minority status, disability, sexual orientation~

___ Sexual harassment~
___ Self-image and self-confidence~
___ Time management (e.g. unstructured nature of research, meeting deadlines, balancing work and personal life)~
___ Other (please specify)~

34. For the issues you learned about as a result of your experience in the mentor program, please rate the usefulness of the information you received, using the following scale: (1 = not at all useful; 2 = not very useful; 3 = somewhat useful; 4 = useful; 5 = very useful; N/A = not applicable)

___ Selecting a graduate school~
___ Research opportunities~
___ Succeeding in graduate school (e.g. getting a thesis advisor, RA, etc)~
___ Selecting a thesis/research topic~
___ Study skills (e.g. reading research papers, familiarity with new computing environments)~
___ Application to graduate school~
___ Career opportunities and options~
___ Fellowship opportunities~
___ Interviewing advice~
___ Job application~
___ Letter of reference~
___ Resume development~
___ Balancing family and work~
___ Crisis intervention~
___ Departmental politics~
___ Networking/professional contacts~
___ Advice re: publishing, presentations at meetings, seminars~
--- Advice re: minority status, disability, sexual orientation~
___ Sexual harassment~
___ Self-image and self-confidence~
___ Time management (e.g. unstructured nature of research, meeting deadlines, balancing work and personal life)~
___ Other (please specify)~

35. Please rate the value of the research experience you had in the mentor program. (1 = not at all valuable; 2 = not very valuable; 3 = somewhat valuable; 4 = valuable; 5 = very valuable)~

36. Please rate the value of the mentor experience. (1 = not at all valuable; 2 = not very valuable; 3 = somewhat valuable; 4 = valuable; 5 = very valuable)~

37. Please rate the importance of having a female mentor. (1 = not at all important; 2 = not very important; 3 = somewhat important; 4 = important; 5 = very important)~

38. Did you work with graduate students on the research project?~

39. If you answered "Yes" to question 38, what was the graduate student(s)' role in interactions with you? (ie: To answer questions, To directly supervise, etc.)~

40. Rate satisfaction with how the graduate student(s) carried out their role. (1 = not at all satisfied; 2 = not very satisfied; 3 = somewhat satisfied; 4 = satisfied; 5 = very satisfied)~

41. Did you interact with graduate students outside of the research project?~

42. Rate your overall satisfaction with interactions with graduate students. (1 = not at all satisfied; 2 = not very satisfied; 3 = somewhat satisfied; 4 = satisfied; 5 = very satisfied)~

43. How often were you in contact with your mentor over the course of the mentor program?~

44. What was the major type of contact between you and your mentor (by email, through individual research activity, through group research activity, through social activity, through mentor discussions)?~

45. Would you have liked more contact with your mentor, less contact with your mentor, or were you satisfied with the amount contact you had with your mentor?~

46. How do you feel about the match between you and your mentor? (1 = not at all satisfied; 2 = not very satisfied; 3 = somewhat satisfied; 4 = satisfied; 5 = very satisfied)~

47. Please rate the overall satisfaction with the mentor program (1 = not at all satisfied; 2 = not very satisfied; 3 = somewhat satisfied; 4 = satisfied; 5 = very satisfied)~

Additional Comments:

Survey sent to 1994 and 1995 mentors:

Dear Faculty Participant in the Distributed Mentor Project,

The LEAD Center (Learning through Evaluation, Adaptation, and Dissemination) is conducting a three-year formative evaluation of the Distributed Mentor Project. The purpose of this evaluation is to learn what aspects of the project are successful and also to learn how the project can be improved. An important part of this evaluation includes the following questionnaire which will allow us to learn something about each participant's experience in the program.

We want to stress that this questionnaire is NOT intended to check on the performance of the individuals in the project. It should also be noted that individual responses will be held confidential, and when reporting the results of this questionnaire, care will be taken to ensure that no individual's response can be identified.

Would you please take some time to fill out the questionnaire and return it as soon as possible to: daffinru@engr.wisc.edu

We thank you for your time. If you have any comments or questions, feel free to email me at the above address.

Sue Daffinrud
The LEAD Center

NOTE: Some questions refer to the student that you had in the project. If you had more than one student, please answer the questions for each student that you had.

1. Name~

2. Permanent mailing address (if changed since application to DMP)~

3. Email address (if changed since application to DMP)~

4. Phone number (if changed since application to DMP)~

5. Ethnic identity~

6. Current institution (if changed since application to DMP)~

7. Faculty rank upon participation (Tenure, etc)~

8. Academic specialization(s)~

9. Current extramural funding (NSF, other federal, industry)~

10. Prior NSF funding~

11. Source of information about DMP~

12. Type of interaction with student participant(s) after the mentor program (publication, conference, email, etc) ~

13. What were the issues that you talked about with students in the mentor program? Check all that apply and add others not listed.

___ Selecting a graduate school~
___ Research opportunities~
___ Succeeding in graduate school (getting a thesis advisor, RA, etc)
___ Selecting a thesis/research topic~
___ Study skills (e.g. reading research papers, familiarity with new computing environment)~
___ Application to graduate school~
___ Career opportunities and options~
___ Fellowship opportunities~
___ Interviewing advice~
___ Job application~
___ Letter of reference~
___ Resume development~
___ Balancing family and work~
___ Crisis intervention~
___ Departmental politics~
___ Networking/professional contacts~
___ Advice re: publishing, presentations at meetings, seminars~
___ Advice re: minority status, disability or sexual orientation~
___ Sexual harassment~
___ Self-image and self-confidence~
___ Time management (e.g. unstructured nature of research, meeting deadlines, balancing work and personal life)~
___ Other (please specify)~

14. Was your student(s)' area of scientific interest in your field?~

15. Do you think that matching mentors' and students' interests is important?~

16. How do you feel about the match between you and your student(s)? (1 = not at all satisfied; 2 = not very satisfied; 3 = somewhat satisfied; 4 = satisfied; 5 = very satisfied)~

17. Rate your satisfaction with your student(s)' technical abilities. (1 = not satisfied at all; 2 = not very satisfied; 3 = somewhat satisfied; 4 = satisfied; 5 = very satisfied)~

18. How much did you expect your student(s) to contribute to your research project? (1 = none at all; 2 = very little; 3 = somewhat; 4 = a fair amount; 5 = a lot)~

19. How closely did the student(s) fill your expectations for contributions to research? (1 = much less than expected; 2 = less than expected; 3 = what expected; 4 = more than expected; 5 = much more than expected)~

20. Please rate your overall satisfaction with the student(s). (1 = not satisfied at all; 2 = not very satisfied; 3 = somewhat satisfied; 4 = satisfied; 5 = very satisfied)~

21. Has your participation in the mentor project taken away from the progress on your own work? (1 = not at all; 2 = very little; 3 = somewhat; 4 = a fair amount; 5 = too much)~

22. Was the amount of time you spent with your student what you expected? (1 = much less than expected; 2 = less than expected; 3 = what expected; 4 = more than expected; 5 = much more than expected)~

23. How do you feel about the amount of time you spent with the student? (1 = didn't feel like spent any time; 2 = didn't feel like spent enough time; 3 = spent the right amount of time; 4 = spent too much time; 5 = spent way too much time)~

24. Are you satisfied with the level of support and recognition that you are receiving for your participation in the mentor program from the following: (1 = not at all satisfied; 2 = not satisfied; 3 = somewhat satisfied; 4 = satisfied; 5 = very satisfied)

    within your department?
    from NSF?
    from CRA?

25. Please rate the overall satisfaction with the program (1 = not at all satisfied; 2 = not very satisfied; 3 = somewhat satisfied; 4 = satisfied; 5 = very satisfied)~

26. How effective do you feel as a mentor? (1 = not at all effective; 2 = somewhat effective; 3 = effective; 4 = very effective)~

Additional Comments: