COMPUTER SCIENCE UNDERGRADUATES' PERCEPTIONS OF E-MAIL PEER MENTORING

A Dissertation Presented

by

SUZANNE M. CASTRIOTTA

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DEDICATION

To my wonderful and supportive husband, Lou, and terrific daughters, Jenn and Alli.

I could have never done it without you!

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I would like to thank Howard A. Peelle for serving as my advisor and guide, and for helping me to challenge myself throughout my doctoral program. I would also like to say thank you to the other members of my committee, Beverly Park Woolf and Robbie Moll, for their insights and suggestions throughout my degree process.

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ABSTRACT

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FEBRUARY 2004

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This research addressed a potential strategy to help boost retention rates for Computer Science undergraduates. A study was conducted at a small New England liberal arts college to determine students' perceptions of e-mail peer-mentoring (EPM). EPM was offered to 40% of students taking the first CS major course (CS1) and was available for the entire semester. EPM participants were assigned peer mentors, selected from an upper-level CS class, to support participants solely via e-mail. Half of the EPM participants knew the name of their mentor while the other half had to communicate anonymously. All participants had additional resources available to them including the textbook, CS department lab tutors, course instructor, and CS1 course tutor. Results indicate that EPM was not well utilized by EPM participants, and that EPM had no significant effect on students' CS interest, CS ability, computer comfort, computer programming, or course completion confidence. Further, knowing or not knowing mentors' names had no significant effect. However, EPM participants recommended that

EPM be continued; while they had not needed it, they felt it would be valuable for other students who might need it. Mentors also felt that EPM was worthwhile but that it may be better suited for the more challenging CS2 course. Both participants' and mentors' suggestions notably included an option to hold mentor-mentee meetings. Overall, it seemed that students regarded e-mail as a lower priority among adequate resources for learning assistance.

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CHAPTER 1

INTRODUCTION

Statement of the Problem

Nationally, the number of students entering computer science (CS) programs is on a downward trend, with a greater drop shown in enrollment of female students (NSF, 1998; NSF, 2000). A review of literature revealed factors which contributed to the success of entering computer science students --including demographic information, computer experience, attitudes, and perceived success (see Chapter 2). The declining number of computer science graduates (both male and female) exemplified that undergraduate computer science is in trouble. The current number of degrees awarded is similar to those found in the early 1980s, down more than 40% from the peak in the mid 1980s (NSF, 2000). This decline is happening at a time when computer science graduates are in demand and positions have gone unfilled.

The dearth of students seems to be a two-part problem: students do not initially choose to enroll in computer science; or they leave after beginning the program. The influences found to affect these decisions include limited or no previous computer experience; mathematical requirements; and computer culture and stereotypes. CS department factors—including the gender makeup of the students and faculty, the stability of the faculty, and the mentoring of students—are also influential in students' decisions to leave (Cohoon, 2001).

Purpose of the Study

The purpose of this study was to investigate a factor believed to positively affect CS student retention (Cohoon, 2001) at a small, state, liberal arts college in New England. This study included the design and implementation of an e-mail-based peer mentoring (EPM) program and examined what influence it has on students taking the CS1 course.

The Study

Some CS1 students were invited to be voluntary participants in EPM. These participants (mentees) were further divided into two subgroups – one knowing the name of their mentor (referred to as the "knowing" group) and one not knowing their mentor's name ("unknowing" group). This study examined EPM's effects on students' perceptions, and data was gathered and analyzed on the success of these students and their continuation in the CS program. Two types of data guided this study–demographic measures and perception measures–to compare between groups. Demographic measures used include:

- Student retention—defined as enrollment in the second Computer Science course (CS2)
- The number of students who successfully completed the CS1 course—defined as a grade of C or better – required to take the next course, CS2

Perception measures used:

- Student-reported CS interest and CS ability
- Student-reported computer comfort

- Student-reported programming ability
- Student-reported confidence in successful course completion

These data were gathered and used to compare two groups of CS students. Comparisons were made between EPM participants and non-EPM students and "knowing" mentees and "unknowing" mentees.

In addition to the demographic and perception measures, information was gathered to develop a profile of both the "knowing" and "unknowing" group participants and their impressions of the EPM program.

Significance of the Study

With the need for trained computer scientists being so great, it is vital that students interested in CS be provided every opportunity to succeed in their pursuit. This study sought to implement one of the factors found to influence students to stay enrolled in computer science. As found in the review of literature, mentoring has an impact on students' decisions to stay in CS (Cohoon, 2001). Unfortunately, there are few studies regarding mentoring entering CS students and its effects on student success and retention, especially those using e-mail as the mentoring medium. This study involved the creation of an e-mail-based peer mentoring system to determine what effects it had on student success and retention, as well as impact on individual student's perceptions of their confidence, interest in and abilities in CS. This method of intervention could prove useful to other computer science departments seeking to increase their students' success and retention, or other departments with mentoring programs looking for a new medium to use for mentoring.

Limitations of the Study

Delimitations of the study design are as follows:

1. Participants in this study attend the college where the researcher is a faculty member.
2. Some students participating in the EPM study will be enrolled in the researcher's CS1 classes for the duration of the study.
3. Regardless of whether they were assigned a mentor or not, all students taking the CS1 course have access to standard support services, including the instructor, lab tutor, course tutor, and fellow students.

Limitations of this research project are as follows:

1. Due to the particular sample used for the study, results may not be generalizable to other populations.
2. Due to the small size of participants in the study, results may not represent a larger population.
3. Because this study is looking at computer science students, the number of female participants will be small.
4. The population ethnicity at this location may not be representative of other areas of the country.

CHAPTER 2

REVIEW OF LITERATURE

This review of the literature (in three parts) discusses factors influencing the success of students, particularly first-year students, enrolled in computer science programs. The first part examines what factors may be keeping students away. The second looks at what influences students to leave a CS program once enrolled. The third considers why students continue in a program and what makes the continuing students successful, both during their first year (the purpose of this study) and at program completion. To begin, it is worth taking a brief look at the state of computer science.

The State of Computer Science

The National Science Foundation publication Women, Minorities, and Persons With Disabilities in Science and Engineering: 2000 provides statistics including the total number of women receiving bachelor's degrees in computer science for the years 1966 through 1996. The peak year for bachelor's degrees in these disciplines was 1986 in which there were 15,216 female recipients and approximately 27,287 male recipients for a total of 42,503 students awarded degrees. (The number of male degree recipients was calculated based on the known number of female award recipients, 15,216, and the percentage of CS degrees awarded to females, 35.8%). The peak year for percentage of these degrees distributed to females was 1984 in which there were 37.2 percent of the total degree recipients, or 12,066 females receiving degrees in computer science.

Since the peak in the mid-1980's, the total computer sciences bachelor's degrees awarded has decreased more than 40 percent and the number of females receiving the

degrees has decreased more than 50 percent, while the percentage of females receiving the degrees has steadily declined (Camp, 1997; Klawe & Leveson, 1995; NSF, 2000). These data are displayed in Table 1 below. In 1996, the last year for which statistics were available in the National Science Foundation publication (2000), there were a total of 24,545 BS degree recipients or 42 percent fewer than the peak year of 1986 in which 42,503 degrees were conferred.

Table 1: Bachelor's Degrees Awarded in Mathematical/Computer Sciences in Selected Years

Academic Year	Total Computer Sciences degrees conferred*	Total degrees as a percentage of the peak year (1986)	Total Computer Sciences degrees conferred to women	Percentage of degrees conferred to women as a percentage of the total degrees conferred
1970	1,543	3.6	199	12.9
1975	5,032	11.8	956	19.0
1980	11,218	26.4	3,399	30.3
1982	20,445	48.1	7,115	34.8
1984	32,435	76.3	12,066	37.2
1985	39,108	92.0	14,431	36.9
1986	42,503	100.0	15,216	35.8
1987	39,911	93.9	13,889	34.8
1988	34,932	82.2	11,353	32.5
1990	27,728	65.2	8,374	30.2
1992	24,948	58.7	7,210	28.9
1994	24,545	57.8	7,020	28.6
1996	24,536	57.7	6,772	27.6

** - These values were approximated based on information listing the number of female CS degree recipients and the percentage of CS degrees awarded to females.*

These trends in enrollment in computer science are happening at a time when women students earn 56 percent of all bachelor's degrees and have earned more than half of all bachelor's degrees since the early 1980's (Wirt, Choy, Gerald, Provasnik, Rooney &Watanabe, et al. 2001). While the percentage of bachelor's degrees awarded to women in CS has decreased almost every year since the mid-1980's, the corresponding

percentage of degrees awarded to women in other science and engineering disciplines has increased (Camp, 1997; NSF, 2000). These increases can be seen in the differences in the percentage of degrees awarded to women in these fields between 1983-84 and 1995-96. While the percentage of computer science bachelor's degrees awarded to women during this time period dropped from 37.2 percent to 27.6 percent (NSF, 2000), the percentage of biological and life sciences degrees awarded to women increased 12.6 percent, engineering grew 25.8 percent, and physical sciences swelled 30.4 percent (Camp, 2001). It would appear that computer science is not doing very well.

Why Students Do Not Initially Enroll in CS

The data in Table 1 show that the number of students receiving degrees in computer science is declining and is currently under two-thirds of the peak year of 1986. Is the decrease in the number degrees being awarded simply the result of fewer students enrolling in CS programs? And if fewer students are enrolling, what is keeping them away?

A key factor influencing a student's decision to enroll in a computer science program is previous computer experience--more specifically, lack of experience (Brown, Andreae, Biddle, & Tempero, 1997; Bunderson & Christensen, 1995; Cohoon, 1999; Klawe & Leveson, 1995). Students gain computer experience in a number of places including the home and at school. Unfortunately, a lack of computer experience can affect or limit a student's choice of majors (Klawe & Leveson, 1995) dissuading them from areas including computer science, computer engineering, and computer information systems. According to the US Census Bureau, of school-age children in the United States

in 1997, 49.7 percent had a computer available for use at home (Newburg, 1999). Breaking that figure down further, it was found that boys were not significantly more likely to have a computer at home than the girls (50.1 percent and 49.3 percent respectively) (Newburg, 1999).

Additionally, computer presence in the home was influenced by the householders' educational achievements (Newburg, 1999). Table 2 shows the breakdown of computer presence in homes by the educational attainment of the householder.

Table 2: Computer Presence in Homes by Educational Attainment of Householder

Educational attainment of householder	Percentage of homes with computers
Less than high school diploma	15.2
High school diploma/GED	40.1
Some college	57.1
Bachelor's degree or more	80.0

The information regarding householders with less than a bachelor's degree is of particular note at Keene State College where there is a very large first-generation student population, 45 percent of the freshman class according to KSC Institutional Research (H. Jasmin, personal communication, October 23, 2001). First-generation students are those who come from a family in which parents may have attended college, but did not earn a four-year degree (H. Jasmin, personal communication, October 23, 2001). This implies that as many as 20 percent of the first-year students at Keene State come from homes without computers. If this is so, will this be the case for all first-year students or does this situation not pertain to computer science students? Given the increasing enrollments in computer science at Keene State College, access at home may not be a problem, or, these students may have computer access somewhere other than at home.

Another significant source of computer access was available to students outside of the home. That source was school, where in 1997, 70.8 percent of the 55 million nationally enrolled children utilized a computer (Newburg, 1999). Many school districts and some states, including New Hampshire, are incorporating a high school graduation requirement involving the completion of a course in computer literacy or other computer-related topic. With 52 percent of the students at Keene State College coming from within the state of New Hampshire (Keene State College, 2001a), it may be assumed that many CS students have taken at least one computer course in high school. This previous experience is a positive factor, since, in a recent nationwide survey of CS department chairs (Castriotta, 2001), the number one anticipated characteristic of incoming computer science students was "[p]revious application software...experience."

Perhaps it is the way in which students' interest in computing develops which influences their decision to consider computer science for their college major. Males have been said to develop an "early and persistent" attraction to computers (Margolis, Fisher, & Miller, 2001) and have described their interest in computing as the result of a moment of epiphany and instantly falling in love with computing (Margolis & Fisher, 2001). On the contrary, females' interest in computing is not usually instantaneous and often develops over a longer time frame (Margolis & Fisher, 2001).

In addition to previous experience, access, and interest, what other factors may be keeping potential computer science students away? Stereotypes of CS students may be adversely affecting enrollments. The stereotypical CS student is seen as super smart, overworking, sitting in front of a computer all day, and talking about nothing but computing (Margolis & Fisher, 2001). Further, this stereotypical, "nerdy" behavior is

often seen as the sole path to success in the computing world (Bernstein, 1997a). This image may deter and/or intimidate students from becoming part of computing.

Computing is more than just a degree area; it is more like a culture within which "those who are knowledgeable about computers are differentiated by special names and have distinguishing characteristics, language, and behaviors" (Pearl, Pollack, Riskin, Thomas, Wolf, & Wu, 1990), and this too may be alienating to prospective computer scientists. Perhaps having an upper-level CS student as a mentor to help navigate through the potential cultural and stereotyping mine field will encourage entering CS students to continue in the program.

Stereotyping and perceptions of computing not only stigmatize computing as a subject area, but also influence which people become involved in it. Computer science suffers as a result because it is thought to be technical and a science, and is perceived as being "male" (Stepulvage & Plumeridge, 1998). Again, the availability of a mentor may help to lessen the effect of these factors.

Why Students Leave CS

There are numerous students who choose to work toward a degree in computer science, many of whom had to overcome obstacles that may have deterred them from their pursuit. All degree programs experience some degree of attrition, and computer science is no exception. However, the number of degrees conferred in computer science does not reflect well the much larger number of students initially setting out to pursue a degree in this field. Relevant questions regarding student attrition to be addressed include: what factors cause students to leave computer science? is it the result of

misconceptions about CS programs and requirements? and do male and female students withdraw at equal rates?

Just as a lack of previous experience influenced students' decisions not to initially enroll in computer science, it can affect a student's decision to leave (Bunderson & Christensen, 1995; Klawe & Leveson, 1995; Liu & Blanc, 1996; Margolis & Fisher, 2001). Some computer science programs are geared toward students with previous computer experience (Bunderson & Christensen, 1995; Klawe & Leveson, 1995), often experience in computer programming. In a survey of the department chairs of four-year CS programs in the United States Castriotta (2001) found that 61.2% of the respondents expected their incoming students to have "previous programming experience." While some introductory CS courses do not have prerequisites, these courses often move through fundamental programming concepts rapidly (Sackrowitz & Parelius, 1996) putting those with a lack of experience at a distinct disadvantage. Students can also become intimidated when they see other students with previous experience completing their assignments quickly and easily (Brown, et al., 1997).

The instant focus in CS programs on programming may come as a surprise to some students, while other students may underestimate the extent of the programming focus. Is the perception of a strong programming concentration in computer science a detrimental factor in student continuation? In the Liu and Blanc study (1996) it was found that many students considered changing majors because "they could not see themselves programming for the rest of their lives, simply for the sake of programming." Programming is not universally appealing; when asked if programming was a source of extra curricular pleasure, 38 percent of the males indicated it was for them, while only ten

percent of the females felt it was (Newburg, 1999). Margolis and Fisher (2001) found that there was a perception that computer science is narrowly focused on programming and other technical issues. This perpetuates the "computers are all they do" stereotype of computer science students that is prevalent among both non-majors and majors (Margolis et al., 2001). Margolis et al. (2001) found that most CS majors felt that stereotypical image did not describe them, yet 20 percent of the females they interviewed in their study indicated they have questioned their involvement in computer science because they do not feel they embody the same devotion and drive they see in their male counterparts.

While students are expected to go to class in order to gain knowledge pertinent to their CS program, there is much more that can be learned outside of the classroom. Some material extends or enhances what is being covered in a course, while some topics are not offered within the formal computer science program. Those students who do not feel they have the same dedication to computing outside of the classroom can be at a distinct disadvantage. Computer science is different from many other majors because so much of it is learned outside formal classroom experiences including information regarding computer culture and its related terminology (Bernstein, 1997b). Pearl et al. (1990) reported that many CS dropouts are "alienated by the foreign culture." Bernstein discusses these facets in her paper about "fostering the computing culture" (Bernstein, 1997b), and in another of her papers she encourages CS departments to include computing culture, including discipline "buzzwords" in their first (CS1) course to help level the playing field between new computer science students (Bernstein, 1997a).

J. McGrath Cohoon (2001) lists the departmental factors related to gendered attrition as student gender composition, faculty characteristics and practices, faculty

turnover, faculty attitudes, mentoring, teaching, and the presence of female faculty. Factors influencing gender composition include peer support and student interaction. The male and female students interviewed by Cohoon (2001) said they felt their classmates were a crucial source of support and help. Bunderson and Christensen (1995) found that students preferred same gender study groups. However, in departments with low numbers of females, the females had to rely on their male counterparts for support, and were sometimes teased and picked on by the males because of their gender (Cohoon, 2001). This teasing likely resulted in the loss of some female computer science majors. Margolis and Fisher (2001) heard similar accounts of what it is like to be a female in CS department when some of the females they interviewed reported not being respected because of their gender; however, they also found contradictory information when some of the females said gender was a non-issue. Perhaps the women who find gender a non-issue have developed mutually supportive relationships with other women computer science students.

The next set of Cohoon's (2001) findings relates to the faculty within the CS departments – both their characteristics and practices. Cohoon (2001) found that there was a relationship between the stability of a department's faculty and its gendered attrition. She further observed that "departments with high faculty turnover were more likely to lose women students at a disproportionately high rate." Faculty attitudes that expressed an appreciation for the work and ability of female students were found in departments that retained the women at similar rates to men (Cohoon, 2001). Yet, females report receiving differential treatment within CS courses (Bunderson & Christensen, 1995), including being called on less and being listened to less often (Klawe

& Leveson, 1995). To further compound things, women reported being interrupted more frequently than the men and that their contributions were either attributed to men or ignored.

Teaching is another important component affecting attrition (Cohoon, 2001). Ruskai (in Liu and Blanc, 1996) questioned previous findings regarding gender-specific learning differences and felt they instead may be attributable to poor pedagogy. This can be exacerbated when women are given disparate treatment in CS courses (Bunderson & Christensen, 1995; Klawe & Leveson, 1995). Cohoon (2001) found that in departments where the faculty enjoyed instructing at the undergraduate level and enjoyed sharing responsibility for student success, gendered attrition rates were likely to be low. When she interviewed students from within these same departments, she found that student complaints about the quality of the teaching varied with the department's gendered attrition rates.

In addition to teaching the students, Cohoon (2001) found that the more time that faculty spent mentoring and the greater the number of female students being mentored, the lower the difference in a CS department's male and female attrition rates. Mentoring activities were listed as including "... 'recruiting individual students into professional activities; offering personalized advice to individual students; encouraging individual students; and helping individual students establish careers' " (Cohoon, 2001). Pearl et al. (1990) found women were more likely than men to be mentored by a female faculty member. With the reported shortage of female faculty (Bunderson & Christensen, 1995), that could mean that a number of female students may not be receiving much needed mentoring. Lower numbers of female faculty members present fewer role models for

females interested in computing. Additionally, having fewer women in positions of high visibility (role models and/or mentors) can discourage women from continuing in CS (Brown et al., 1997). By having female faculty members in a CS department, they can serve as role models who can be living proof that a career in computer science is not only possible, but also a very viable option for women (Pearl et al., 1990). Departments having no female faculty lost female students at a high rate relative to males (Cohoon, 2001).

What needs to be kept in mind is that many of the students lost to computer science through attrition reached college with the interest and ability to complete the program (Cohoon, 1999). Many overcame a variety of hurdles to get there, yet are not retained in the CS programs. Others may have been less qualified, but entered their pursuit knowing they had some ground to make up. However, for whatever reason, were unable to complete their degree program.

What Influences Student Continuation

There are a decreasing number of students receiving computer science degrees, but what factors influence those students who complete their computer science programs and obtain their degrees? The previous sections of this literature review discussed numerous reasons why students did not initially enroll in computer science and why they may drop out once they are enrolled. Since there are so many reasons to withdraw, why do some students continue? Could it be the reason they stay is the absence of reasons to leave, or is it a lack of knowledge about other options?

What are the reasons students initially choose computer science as a major, and are they still factors after students spend some time in the program? Liu and Blanc (1996) listed reasons for choosing CS as a major as: graduates are in high demand; the influence of parents and peers; the portrait of computers in the media; and excellence in mathematics in high school. Teague (1998) found that those she studied chose computing as a career due to: exposure to computing in a setting which enabled them to see the versatility of computers; the influence of someone close to them; personal abilities which they perceived to be appropriate for a career in computing; and characteristics of such careers which appealed to them. These factors tend to fall into three categories: events and influences that led the student to choose computer science, personal attributes of the student, and attributes of computing careers (Teague, 1998).

The events and influences in the student's life appear to be significant prior to the student enrolling in college, as do the personal attributes of the student. However, decisions about a career can change throughout a student's college years. When thinking about a career in computing, Radziemski and Mitchell (2000) found that females ranked opportunities for creativity much higher than salary, and both genders placed competition at the top of their list of least favorite characteristics in the field. Also, computing careers pay well and offer excellent opportunities for advancement (Teague, 1998).

Graduates in CS are still in high demand (Liu & Blanc, 1996; Teague, 1998) and positions go unfilled. An increase in the number of computer science graduates, namely females, could help to make up the deficit. According to Teague (1998) other reasons females should consider positions in computing are: women are over-represented in low-

paying jobs with less opportunity and fewer benefits than men, and there is a greater need now than in the past for women to be capable of earning enough to support a family.

What keeps students enrolled may include what Margolis and Fisher (2001) reported –"intrinsic interest in the computing process" including "computers being a part of the future and...interest in computer science as a practical application of math." Additionally, a reason may be the "exhilaration factor" of computing experienced when things work, resulting in tremendous satisfaction (Bernstein, 1997a).

As with interest and satisfaction, computer experience plays a major role in a student's decision to continue in computer science. Computer experience has been reported to be positively related to attitudes and interest in computers (Sacks & Bellisimo, 1993; Smith & Necessary, 1996). While pre-college computer experience may have whetted a student's appetite for computing, is it enough for a student to continue in the program through degree completion? Previous experience can strongly influence success in initial computing courses, and Fan, Li, and Niess (1998) found that success in introductory CS courses was related to achievement in the overall CS program (correlation values ranging from .66 to .78).

Female students seem to have less pre-college computing experience and a resulting lack of confidence. Smith and Necessary (1996) found that gender differences in computing skills decreased when computing experience increased; Sacks and Bellisimo (1993) found that gender differences in attitudes toward computing decreased as computing experience increased; and Margolis and Fisher (2001) found females' self-confidence rises as they move on in the CS program. In an Australian study (Sackrowitz

& Parelius, 1996), it was reported that the initial advantage for those with the greatest prior experience dissipated for those still enrolled at the end of one year.

What Constitutes Success for a CS Student

While there is an abundance of research investigating reasons students do not initially enroll in computer science or drop out, less research has been done on what factors are common to students who complete their degree in computer science and what is considered a "successful" computer science student. The survey of the four-year CS program department chairs (Castriotta, 2001) included a question asking each chair to check which of the listed characteristics described a successful graduate from their undergraduate CS program; this list included room for their additions. Table 3 (Castriotta, 2001) displays the results of that question.

Table 3: Attributes of Successful CS Students

Attribute	% of respondents indicating successful graduates should have this attribute
Graduates from the program	95.9%
Completion of required courses	95.9%
Obtains employment in a related field	95.9%
Obtains a broad skill base	93.9%
Gains admission to graduate school	57.1%
Above average GPA	42.9%
Completes a study or concentration in one area	34.7%
Completes field-related research	32.7%

Items added to the list of characteristics included "develops a desire to study CS further," "enjoys computing and their chosen profession," "has at least one co-op period,"

"[has] some CS job-related experience," "has learned how to learn," and "feels confident in his/her abilities" (Castriotta, 2001).

All the above-mentioned characteristics are for a student completing a CS program. What about students completing their first or second year of a computer science program? What are the characteristics of those "successful" students? Within the first two years, success may be comprised of grades in required courses that allow students to take the next ones and a formal declaration of the CS major or acceptance into the CS program. Additionally, students could increase their self-confidence through grade satisfaction and obtaining better skills.

Summary

Undergraduate computer science is in trouble and the declining number of computer science graduates, both male and female, exemplifies this. The current number of degrees being awarded is similar to those found in the early 1980's, down more than 30% from the peak in the mid 1980's. This decline is happening at a time when computer science graduates are in demand and positions have gone unfilled.

The dearth of students seems to be a two-part problem—students do not initially choose to enroll in computer science or they leave after beginning the program. The influences found to affect these decisions include—limited or no previous computer experience, mathematical requirements, and computer culture and stereotypes. CS department factors—including the gender makeup of the students and faculty, the stability of the faculty, and the mentoring of students—are also influential on students' decisions to leave.

Those students who continue through CS programs and receive their degrees have been found to have an intrinsic interest in computer science and get great satisfaction from their accomplishments in the program. Some have been drawn to computer science because of its perceived association with mathematics and their existing mathematical abilities. Those who may have come in with weaker backgrounds, often the female students, find that as they endure in the program their skills increase and subsequently their self-confidence increases as well.

CHAPTER 3

THE STUDY

Purpose

The purpose of this study was to investigate a factor positively affecting computer science student retention at Keene State College (KSC) to see what influence it had on students taking the CS1 course. While peer mentoring was believed to make an impact on student retention, little research had been done using e-mail as the communication medium. This study included design and implementation of an e-mail-based peer mentoring (EPM) system and examined EPM's effects on the students' perceptions of their CS interest, CS ability, computer comfort, programming ability, and course completion confidence. Additional data being analyzed included the success of these students and their continuation in the CS program.

Research Questions

The study attempted to answer the following questions:

1. What are the similarities and differences in demographic measures and perception measures between students who participated in the EPM program and those who did not participate in the EPM program?

2. What are the similarities and differences in demographic measures and perception measures between students who participated in the EPM program and knew the identity of their mentor (the "knowing" group) and those who did not know the identity of their mentor (the "unknowing" group)?

In addition to the demographic and perception measures, information will also be gathered to develop a profile of both the "knowing" and "unknowing" group participants and their impressions of the EPM program. The following questions will be asked to develop an assessment of the EPM program and its role in influencing changes in student's interest in CS, self-confidence in CS, and change in understanding of CS concepts and content.

EPM program's influence on student's interest in CS:

- Having a mentor allowed me to gather more information about specific CS courses
- Having a mentor allowed me to gather more information about the CS program in general
- Having a mentor allowed me to gather more information about the field of CS
- Having a mentor allowed me to get more information about career opportunities in CS
- Having a mentor strengthened my interest in CS

EPM program's influence on student's self-confidence in CS:

- Having a mentor helped me to develop areas in which I felt my knowledge and/or skills were weak
- My mentor reinforced my programming thoughts and ideas
- I was able to retain suggestions from my mentor and incorporate them in future programming work
- My mentor was encouraging and motivating

- Having a mentor strengthened my self-confidence in my abilities in CS

EPM program's influence on student's understanding of CS concepts and content:

- My mentor provided clear feedback to my questions
- My mentor was a reliable resource for assistance with CS concepts and course content
- My mentor was able to help clarify CS concepts and course content
- My mentor was able to direct me to additional resources when necessary
- Having a mentor strengthened my understanding of CS concepts and content

Subjects

The students participating in this research study attend Keene State College, a state liberal arts college with a total student population of 5,100 located in the southwestern corner of New Hampshire. Students at Keene State College who have self-selected into the CS1 course were divided into two groups, one participating in the EPM program and one not. The grouping was done by individual course section enrollment, determined by the researcher. Two of the five course sections, initially totaling 56 students, were offered participation in EPM while the other three sections, initially totaling 56 students, were asked only to complete initial and final information surveys. Voluntary participants in the EPM program were divided into two subgroups—one knowing the identity of their mentor, referred to as the "knowing" group (also "known"), and one not knowing, referred to as the "unknowing" group (also "unknown").

Keene State College's CS1 course is not a course that weeds out weaker prospective Computer Science majors as is typical in many other CS programs. While the course is offered as the first CS course for future CS majors, it can be used to fill a Math and Science general education requirement. There is no prerequisite for this three credit course which teaches introductory C language programming. Students begin with very elementary programs and work up to a final group programming project which simulates the operation of a multi-level parking garage. A copy of material taken from the CS1 course syllabus is available in Appendix Q.

Upper-level CS students were trained to act as peer mentors for EPM students and were asked to communicate with their mentees solely via e-mail. Each mentor was assigned approximately two students, one student in the "knowing" group and one in the "unknowing" group.

Data Gathering Procedures and Instrumentation

Two instruments were designed to gather information from the three participant groups – EPM participants, non-EPM students, and mentors: an initial survey and final survey. (See Appendix) A mid-semester "check-in" e-mail was sent to EPM participants and mentors only.

Initial Surveys

An initial survey was designed to collect CS1 students' demographic information and self-reported perceptions about their interest in CS, ability in CS, computer comfort, programming abilities and confidence in succeeding in the course. Appendix D contains the survey for EPM participants and Appendix E includes the survey for non-EPM CS1

students. A similar survey, found in Appendix F, was developed for mentors to gather their demographic information and their self-reported perception of mentor-related skills including verbal skills, leadership abilities, interpersonal skills, ability to help others, ability to handle responsibility, ability to display a positive attitude, and questions about academic achievement.

Mid-semester E-mail Questionnaire

At mid-semester, an e-mail questionnaire was sent out to EPM participants asking them to check in with the researcher regarding their participation in the EPM program with specific questions about e-mail usage, mentor usage, and CS1 resource usage. Within the same e-mail was a section for the CS1 students who had been offered a mentor but had turned the option down. Their section of the e-mail asked about their CS1 resource usage and if they regretted their decision to not have a mentor. A copy of this e-mail is in Appendix G. Additionally, an e-mail questionnaire was sent to the mentors to ask them about their program participation, e-mail usage, and their mentees' usage of them; a copy of this e-mail is in Appendix H.

Final Surveys

At semester's end, all three participant groups were asked to complete a final survey. Non-EPM students were asked similar perception questions to those asked on the initial survey and were also asked about their perceptions of their success in the course, and if they would have liked to have an anonymous e-mail mentor to help with CS1 work. A copy of this survey is in Appendix J.

The CS1 students assigned mentors and those from the same course sections who chose not to have a mentor were given the same survey, with each group instructed which

sections to complete. This survey is in Appendix I. EPM participants had specific questions regarding mentor usage; the mentor's impact on the student's perceptions about CS and their success in the CS1 course; and the student's efforts to communicate with their mentor and the mentor's efforts to communicate with them. They were also asked to assess the EPM program in its current form and asked for suggestions for changes in the future. Those who chose not to have mentors were asked for their impressions of the EPM program and if they regretted their decision not to participate. Finally, all the students were asked to again complete the initial perception questions and to report on the resources they used for CS1 during the course of the semester.

Mentor Materials

Training was provided to mentors during the first class meeting of the upper-level CS course in which the mentors were enrolled. Mentors were shown a PowerPoint presentation defining mentoring, explaining what was expected of them as a mentor including the benefits and responsibilities of being a mentor, how to communicate successfully with their mentees, and what information they need to keep as the semester progressed. A copy of this presentation is included in Appendix L.

A second presentation was shown as part of the training that demonstrated use of the e-mail program being used for the study. Because this was not the college-wide e-mail program, rather one used on the CS department server, a brief review of how to use and navigate through the program was given. This presentation is available in Appendix M.

A guide to resources within the college was created and distributed to the mentors. The handout contained a listing of KSC resources such as Academic and Career Advising, Health Services and Campus Safety. The guide also included a list of matters usually handled by people in each area, their location on campus, and their phone number. This handout was prepared to help the mentors guide their students to the appropriate resources should a problem or question outside of CS arise. A copy of this guide is available in Appendix P.

Procedures

Permission for conducting this research study involving human subjects was obtained from the University of Massachusetts Amherst Human Subjects Institutional Review Board and from the Keene State College Institutional Review Board, as well. A cover letter and a consent form for each subgroup (EPM participants, non-EPM students, and mentors) were distributed to each voluntary participant before officially beginning the study. These are available in Appendices A, B, and C.

Prior to the start of the semester, the following tasks were performed:

- Students enrolled in the EPM-eligible sections of CS1 were alphabetized in reverse order and assigned into two groups – "knowing" and "unknowing."
- Mentors were listed alphabetically and assigned one mentee from each group. Because there were not enough CS1students for each mentor to have two mentees, two mentors were assigned a "knowing" mentee only.
- Mentor training materials (including PowerPoint presentations and handouts) and support materials (including e-mail log sheets and the KSC resource guide) were researched and developed. (Copies of the e-mail log sheets are in Appendix N and O.)

- E-mail accounts for mentees and mentors were created. Taking into account that some mentees and mentors would be sharing names, all e-mail accounts were created generically.
- Meetings were held with CS1 faculty to explain the purpose of this study to provide them with answers to potential questions from their students. Also discussed was their role--distribution and collection of surveys and the project timeline.

At the start-up of the semester, the following tasks were completed:

- During the first meeting of the upper-level CS class in which all the mentors were enrolled, the researcher delivered the mentor training. The training included the two PowerPoint presentations mentioned above and a review of the resources sheet. Also during this training session a review of the materials being used by the mentors was covered, including two log sheets to keep track of their interactions with their mentees – one for the "knowing" mentee interactions and one for the "unknowing" mentee interactions. Mentee e-mail addresses were given to the mentors with instruction to send an introductory e-mail. Following the mentor training, the mentors completed their initial information survey and submitted them to the researcher.
- During the first week of CS1 class meetings, the EPM-eligible students were offered program participation, and those who chose to participate were notified of their mentor assignment and given their mentor's e-mail address. They were given instruction to send an introductory e-mail. The mentors of students who chose not participate were notified. The EPM eligible students were shown the same training PowerPoint presentations that were shown to the mentors to ensure that the mentees understood the expectations of the mentors. EPM participants and willing students who turned down a mentor completed their initial information surveys and submitted them to the researcher.
- Initial information surveys were given to the CS1 instructors for their students to fill out. Once the surveys were completed, they were returned to the researcher.

- At the request of the mentors' course instructor, all CS1 course materials were made available to the mentors via the Web.

During the course of the semester, the following tasks were accomplished:

- The mentor/mentee relationships were allowed to develop without interference. This included not requiring mentors or mentees to e-mail each other.
- If a mentee withdrew from the CS1 course, the mentor was notified.
- At mid-semester, an e-mail questionnaire was sent to the EPM students to find out how the process was going, their usage of their mentor, and their perceived effectiveness of their mentor.
- At mid-semester, an e-mail questionnaire was also sent to the mentors to determine the amount of communication they were having with their mentees and their ability to help them.

At the end of the semester, the following tasks were completed:

- The final surveys for non-EPM students were distributed to the CS1 instructors. Once completed by the students, they were returned to the researcher.
- The final survey for EPM participants was distributed via e-mail and was made available on the Web. Respondents returned their surveys via e-mail or by returning completed hard copies.
- The final survey for mentors was distributed via e-mail and was made available on the Web. Respondents returned their surveys via e-mail or by returning completed hard copies.
- Both mentors and mentees were offered an opportunity to participate in group or individual interviews. Only two students responded, and the researcher met with each of them informally for conversations which were brief due to student time constraints.

Summary

Some CS1 students at Keene State College were offered an opportunity to participate in an e-mail-based peer mentoring (EPM) system. Students choosing to participate were further subdivided into two groups and assigned mentors, one knowing the identity of their mentors ("knowing") and one not knowing ("unknowing"). Mentors, students participating in an upper-level CS course, received training early in the semester. The study examined EPM's effect on the student's CS interest, CS ability, computer comfort, programming ability, and course completion confidence and analyzed demographic measures. Results were compared for two groupings: EPM participants versus non-EPM students and "knowing" versus "unknowing." Data was gathered through two surveys, one at the beginning of the semester and one at the end, and one e-mail questionnaire.

CHAPTER 4

RESULTS AND DISCUSSION

Introduction

This chapter presents data, analysis, and discussion for each of the research questions:

1. What are the similarities and differences in demographic measures and perception measures between students who participated in the EPM program and those who did not participate in the EPM program?

2. What are the similarities and differences in demographic measures and perception measures between students who participated in the EPM program and knew the identity of their mentor (the "knowing" group) and those who did not know the identity of their mentor (the "unknowing" group)?

Much of the data gathered in this study will be presented in table format to quickly and clearly show answers to research questions 1 and 2. Most of the data was collected through an initial survey given at the beginning of the semester (referred to as the pre-test) and a final survey given at the end of the semester (called the post-test), both of which were given to all CS1 students.

Data to be presented for each subgroup comparison (EPM versus non-EPM and "knowing" versus "unknowing") include demographic data, success and retention rates, means and standard deviations of pre- and post-test responses, and the results of t-tests done on pre- and post-test data. T-test comparisons were done using a two tailed test with a significance value of $p < 0.05$.

Participant Groups

Table 4 below shows total CS1 student participation broken down into EPM and non-EPM subgroups. Table 5 shows the EPM participants further broken down into "knowing" and "unknowing" subgroups. Course completers are students who had not withdrawn and finished the semester enrolled in the CS1 course.

Table 4: CS1 Student Groups

Subgroup	Participants in pre-test	Participants in post-test	Number of Course Completers	Post-test Participants as a % of Course Completers
EPM	43	17*	36	47.2%
Non-EPM	48**	36**	57***	70.6%****

** - of the 19 completed post-tests one student had not completed the pre-test, and one had only half the post-test completed*
*** - includes 4 students who chose not to participate in EPM but were willing to complete surveys*
**** - includes 10 students who chose not to participate in EPM*
***** - calculated by dividing participants in post-test by number of course completers who had been participating in the surveys (57 completers – 10 non-EPM participant course completers + 4 non-EPM survey participants)*

Table 5: EPM Participant Groups

Subgroup	Participants in pre-test	Participants in post-test	Number of Course Completers	Post-test Participants as a % of Course Completers
"Knowing"	25	10	18	55.5%
"Unknowing"	20	7	18	38.8%
Total	45	17	36	47.2%

Results of Research Question 1

Data in Tables 6 through 12 are used to answer Research Question 1. Table 6 below presents demographic information, most gathered on the initial survey regarding the EPM participants and the non-EPM students. Note that gender data were gathered by checking each student's name (including first name and middle name, when listed).

Table 6: General Demographic Information for All CS1 Students

Item Measured		EPM Participants	Non-EPM Students
Gender	Female	17 (38%)	27 (41%)
	Male	28 (62%)	39 (59%)
Age	Mean	20.0	23.3
	Std. Dev.	2.7	8.3
First-year students		50.0%	35.4%
In-state students		50.0%	70.8%
Neither parent earned a 4-year college degree		40.4%	39.6%
Have their own computer		85.7%	70.8%
Number of high school computer courses taken	Mean	0.7	1.3
	Std. Dev.	1.0	1.5
Number of college-level computer courses taken	Mean	0.7	0.9
	Std. Dev.	0.9	0.8
Number of years of e-mail experience	Mean	6.2	6.9
	Std. Dev.	2.0	3.5

When comparing the two groups, it is worth noting that the non-EPM group included 10 continuing education (CE) students which increased the group's average age and percentage of in-state students and decreased the percentage of first-year students in the group. The EPM participant group included only one CE student. CE students are not formally matriculated into college and tend to be older than average college students (typically age 18 to 24). The non-EPM group of CE students ranged in age from 19 to 53, with an average age of 28.8. Of these ten students, 8 were participants in an evening section of the CS1 course. Evening courses typically draw in local students who are attending college part-time or are looking to enhance or change their current careers.

Research Question 1 required the collection of data regarding students planning to continue in CS by enrolling in a second CS course (CS2) and students who successfully completed the CS1 course. "Success" is defined as a grade of C or better in the CS1

course since this is a requirement to continue on to the CS2 course; students who withdrew from the course prior to the end of the semester were not included. Percentages were calculated using the number of students who completed the CS1 course ("course completers" from Table 4) and had not withdrawn. Data examined for the previous five semesters showed an overall average success rate of 76.1% in the CS1 course and a success rate for course completers (students completing the class and receiving a grade of C or better) of 85.5%. The overall success rate for CS1 students during the semester in which this study took place (Spring 2003) was 64.0%. The success rate for course completers during this same semester was 76.3%. Table 7 below displays the collected data.

Table 7: Demographic Measures for All CS1 Students

Item Measured	Number of EPM Course Completers	Percentage of EPM Course Completers	Number of Non-EPM Course Completers	Percentage of Non-EPM Course Completers
Students planning to take the CS2 course	8	22.2%	5	8.8%
Students who successfully completed the CS1 course	30	83.3%	41	71.9%

While the percentage of EPM course completers planning to take the CS2 course is significantly higher than that of the non-EPM course completers, numeric values may not tell the whole story. As mentioned previously, there are a large number of continuing education students in the non-EPM population. CE students are not allowed to enroll for courses for the subsequent semester at the same time as matriculated students. Instead they register well after matriculated students have selected their courses. Because these students were enrolled in a Spring course, CE students would not be registering for Fall

courses until sometime in mid-to-late July. This may have falsely reduced the ultimate number and percentage of non-EPM completers planning to enroll in a second course.

On the initial survey (pre-test), all students answered five perception questions regarding their self-reported interest in CS, ability in CS, computer comfort, programming abilities and confidence in succeeding in the course, based on a 7-point scale. Preliminary data were gathered on this survey given at the beginning of the semester. Table 8 shows the means and standard deviations for each of the five questions.

Table 8: Means and Standard Deviations for Perception Question Scores on Initial Survey for All CS1 Students

Question		EPM Participants	Non-EPM Students
Q1. CS Interest	Mean	4.9	5.2
	Std. Dev.	1.4	1.6
Q2. CS Ability	Mean	4.2	4.7
	Std. Dev.	1.3	1.2
Q3. Computer Comfort	Mean	5.2	5.7
	Std. Dev.	1.3	1.1
Q4. Programming Confidence	Mean	3.6	3.8
	Std. Dev.	1.4	2.0
Q5. Course Completion Confidence	Mean	5.5	5.7
	Std. Dev.	1.0	1.3

Pre-test results were compared for all 5 questions for both groups (those with mentors (EPM) and those without mentors (non-EPM) using a t-test to see if both groups were equivalent when they started the semester. There were approximately 91 students (2 questions had only 90 responses) involved in the initial surveys. Table 9 shows the t-test results.

Table 9: Results of t-test on Initial Survey Question Scores for All CS1 Students

Question	Calculated t Value
Q1. CS Interest	-0.79
Q2. CS Ability	-2.05
Q3. Computer Comfort	-1.99
Q4. Programming Confidence	-0.54
Q5. Course Completion Confidence	-0.68

Using a t value of 1.9870 and $p < 0.05$, the results of the t-test calculations in Table 9 show that the groups were equivalent at the start of the semester on three of the five questions. There is a calculated significant difference in CS ability and computer comfort, with the non-EPM students starting with slightly higher values. Since the calculated values are so close to the t values, this was interpreted to mean that there were no major differences between the groups.

A second survey (post-test) was given to the students at the end of the semester. There were t-tests performed on the post-test results as well. There were fewer students completing the second survey (see Table 4). Table 10 shows the result of the t-tests.

Table 10: Results of t-test on Second Survey Question Scores for All CS1 Students

Question	Calculated t Value
Q1. CS Interest	.08
Q2. CS Ability	.44
Q3. Computer Comfort	-0.58
Q4. Programming Confidence	.71
Q5. Course Completion Confidence	.99

Using a value for t of 2.0057 with $p < 0.05$, the t-tests showed the groups to be equivalent at the end of the semester on all five questions, including CS ability and computer confidence levels, despite one group having access to a mentor for the semester. This

implies that having a mentor had no effect on a student's interest, ability, computer comfort, programming confidence, or course completion confidence. This finding will be addressed further when a discussion regarding the lack of EPM student participation in the program is covered.

To ensure that nothing was overlooked, a third t-test was performed on the differences in the scores on the pre-test and the post-test. Table 11 displays this result of these calculations.

Table 11: Results of t-test on Survey Question Score Differences for All CS1 Students

Question	Calculated t Value
Q1. CS Interest	1.77
Q2. CS Ability	1.68
Q3. Computer Comfort	1.00
Q4. Programming Confidence	.63
Q5. Course Completion Confidence	1.30

There were 48 total scores used in this calculation and a t value 2.0129 and $p < 0.05$. These t-tests confirmed the results of the first two sets of t-tests—that there was no statistical difference between the two groups.

One final t-test was performed to see if the student's instructor proved influential in his/her scores. There were three instructors for the CS1 course—one instructor had one section of the course, and the other two each had two sections for a total of five CS1 sections. Three t-tests were performed comparing each group. Table 12 displays the results.

Table 12: Results of t-test on Survey Question Score Differences for All CS1 Students by Instructor

Question	A to B t Value	B to C t Value	A to C t Value
Q1. CS Interest	0.04	0.58	0.76
Q2. CS Ability	0.77	0.43	1.30
Q3. Computer Comfort	0.20	-1.04	-0.94
Q4. Programming Confidence	1.34	-0.39	0.96
Q5. Course Completion Confidence	1.36	-0.49	1.06

The number of responses being compared ranged from thirty-six ($t= 2.0322$, $p < 0.05$) to forty-one ($t = 2.0227$, $p < 0.05$). These t-tests show that there was no statistical difference between any of the instructor comparison groups and confirmed the results of the other three t-tests.

In summary, these analyses showed the EPM program had no statistically significant impact on the perceptions of the two groups of students (EPM participants and non-EPM students). Additionally demographic measures for the two groups were also collected and compared.

Results of Research Question 2

Data in Tables 13 through 17 are very similar to those previously presented; however, they will be used to answer Research Question 2 comparing the "knowing" and "unknowing" students within the EPM participant group. Table 13 below presents the demographic information previously presented about the EPM participants divided into "knowing" and "unknowing" groups.

Table 13: General Demographic Information for EPM Participants

Item Measured		"Knowing"	"Unknowing"
Gender	Female	8 (32%)	9 (45%)
	Male	17 (68%)	11 (55%)
Age	Mean	19.9	20.2
	Std. Dev.	3.1	2.5
First-year students		52.6%	47.8%
In-state students		47.4%	52.2%
Neither parent earned a 4-year college degree		40.0%	39.1%
Have their own computer		89.5%	82.6%
Number of high school computer courses taken	Mean	0.8	0.6
	Std. Dev.	1.2	0.7
Number of college-level computer courses taken	Mean	0.6	0.7
	Std. Dev.	1.0	0.8
Number of years of e-mail experience	Mean	6.4	6.1
	Std. Dev.	2.5	1.5

When assigning students to two subgroups, no effort was made to put an equal number or percentage of men and women, or any population subcategory, into each subgroup. Instead students were listed by last name in reverse alphabetical order and assigned to mentor e-mail addresses that had been created and assigned by mentor last name listed in alphabetical order.

Table 14 below presents the data (continuation in CS2 course and successful course completion) from Table 7 broken down for the "knowing" and "unknowing" EPM participants. Percentages were again calculated using the number of course completers from Table 5. As noted in Table 7 above, the overall success rate for EPM participants who were course completers was 83.3%.

Table 14: Demographic Measures for EPM Participants

Item Measured	Number of "knowing" Course Completers	Percentage of "knowing" Course Completers	Number of "unknowing" Course Completers	Percentage of "unknowing" Course Completers
Students planning to take the CS2 course	1	5.6%	7	38.9%
Students who successfully completed the CS1 course	14	77.8%	16	88.9%

While both the number and percentage of students planning to take the CS2 course and successfully completed the CS1 course are higher for the "unknowing" participants, there is little reason to believe that not knowing the name of their mentor was a positively influencing factor on either of these items. This is due to the limited participation of students in the EPM program, both "knowing" and "unknowing" participants, which will be discussed later in this chapter.

The means and standard deviations for the five perception questions on the initial survey completed by the EPM participants are shown below in Table 15.

Table 15: Means and Standard Deviations for Perception Question Scores on Initial Survey for EPM Participants

Question		"Knowing"	"Unknowing"
Q1. CS Interest	Mean	4.5	5.5
	Std. Dev.	1.3	.08
Q2. CS Ability	Mean	3.5	4.5
	Std. Dev.	1.7	1.0
Q3. Computer Comfort	Mean	5.1	5.3
	Std. Dev.	1.6	1.2
Q4. Programming Confidence	Mean	3.6	3.8
	Std. Dev.	1.3	1.8
Q5. Course Completion Confidence	Mean	5.5	5.3
	Std. Dev.	1.3	1.2

The pre-test results were compared for all 5 questions for both groups, "knowing" and "unknowing," using a t-test to check for equivalence at the start of the semester. There were approximately 43 students (1 question was missing a response) involved in the initial surveys. Table 16 shows the results of the t-test.

Table 16: Results of t-test on Initial Survey Question Scores for EPM Participants

Question	Calculated t Value
Q1. CS Interest	-0.58
Q2. CS Ability	0.12
Q3. Computer Comfort	0.91
Q4. Programming Confidence	1.35
Q5. Course Completion Confidence	0.37

Using a t value of 2.0195 and $p < 0.05$, the results of the t-test calculations indicated that the two subgroups were equivalent at the start of the semester on all five questions.

There were also t-tests performed on the post-test results for the "knowing" and "unknowing" groups as well. The results are displayed below in Table 17.

Table 17: Results of t-test on Second Survey Question Scores for EPM Participants

Question	Calculated t Value
Q1. CS Interest	-0.20
Q2. CS Ability	-0.62
Q3. Computer Comfort	-1.40
Q4. Programming Confidence	-0.15
Q5. Course Completion Confidence	0.18

Using a value of $t = 2.1448$ and $p < 0.05$, the t-tests showed the groups to be equivalent at the end of the semester despite one group knowing the names of their mentors. This implies that knowing the name of one's mentor did not affect a student's interest, ability, computer comfort, programming confidence, or course completion confidence.

In summary, these analyses showed the knowing the name of one's mentor had no statistically significant impact on the perceptions of the two groups of students ("knowing" and "unknowing"). Additionally demographic measures for the two groups were also collected and compared.

Student Success

On average almost two-thirds of all CS1 students were successful (grade of C or better) in completing the CS1 course including both EPM participants and those who did not participate in the EPM program. That figures rises to over 75% when calculated for course completers (those who did not withdraw from the course). Additionally, on the initial survey, CS1 students were asked to define what success in the CS1 course would mean to them. Students wrote a number of different definitions. The responses were reviewed and put into general categories:

- Grade related (letter grade listings as well as "passing")
- Understanding of course content ("better understanding of the C language" and "getting a firm grasp on programming")
- Performance ("hard work and dedication" and "more knowledge of comp[uters]")
- Prerequisites for other courses ("I can take Geog[raphy] Map making")

Table 18 shows the frequency of each response type from forty-one written responses by EPM participants and forty-four written responses by non-EPM students and the percentage of students whose response was in each category. Note that the written definitions may fall into more than one category.

Table 18: Definitions of Student Success on Initial Survey

Response Category	Number of EPM Participants	Percentage of EPM Participants	Number of Non-EPM Students	Percentage of Non-EPM Students
Grade-related	29	71%	18	41%
Understanding of course content	16	39%	21	48%
Performance	4	10%	2	5%
Prerequisite for other courses	0	0%	3	7%

In the second survey given at the end of the semester, CS1 students were asked if they felt they were successful in the course and to explain their answers. Of EPM participants, 94% of the respondents reported that they were successful; of non-EPM students, 85% of those reporting said that they were successful. As noted in Table 7, 83.3% of EPM course completers were successful according to the "grade of C or better" definition, as were 71.9% of non-EPM course completers. This would indicate that there is more to success than just the letter grade. This is confirmed in the data shown in Table 19.

Table 19 shows the frequency and percentage of the response types used in the previous table that appeared in the student explanations regarding their success definitions, however, performance was broken down into positive and negative response types. The table also includes data showing how many students listed the same category of success on the second survey as on the first survey. There were thirteen written responses on the second surveys given to EPM participants and twenty-nine responses from non-EPM students. Again, individual responses may fall into more than one category.

Table 19: Definitions of Student Success on Final Survey and Both Surveys

Response Category	Number of EPM Participants	Percentage of EPM Participants	Number of Non-EPM Students	Percentage of Non-EPM Students
Second Survey				
Grade-related	1	8%	4	14%
Understanding of course content	8	62%	17	59%
Performance - positive	2	15%	1	3%
Performance - negative	2	15%	1	3%
Prerequisite for other courses	0	0%	0	0%
Both Surveys				
Grade-related	1	8%	1	3%
Course content	2	15%	8	28%
Performance	0	0%	0	0%

Table 20 shows the change in the percentage of replies in a response category from the initial survey to the percentage on the final survey. Note that there were fewer students in both subgroups (EPM and non-EPM) completing the second (final) survey.

Table 20: Change in Response Category Percentages between Surveys

Response Category	% Change for EPM Participants (Initial → Final)	% Change for non-EPM students (Initial → Final)
Grade-related	71% → 8%	41% → 14%
Understanding of course content	39% → 62%	48% → 59%
Performance	10% → 31%	5% → 7%
Prerequisite for other courses	0% → 0%	7% → 0%

Data in Tables 19 and 20 indicate that despite initial concern about grades (as shown in Table 18), in the end, students found it more important to understand course content than

to earn a specific letter grade. This is confirmed by the number of students who felt they were successful despite the fact that they did not get a letter grade of C or higher.

Resources Utilized by EPM Participants

It is worth taking a look at what resources students were utilizing in order to succeed in the CS1 course. The following table (Table 21) highlights the priority of resources utilized by EPM participants for support with the CS1 course. Students were asked to indicate all resources that they used during the semester from a provided list with an area available to list "other" items not on the original list. Students were also asked to prioritize the resources in the order which they accessed them by giving each a rank (1 being used for the resource utilized first, 2 for the resource being utilized second, etc.). The first column lists the total number of times the resource was mentioned as being utilized by one of the sixteen responding EPM participants, the second column shows the percentage of respondents that mentioned that resource, and the third column averages the priority ranks of the resource. If the resources were checked (marked as utilized but not given a numerical rank), the average ranking for all the items checked was given to each item.

Table 21: Resources Mentioned and Average Priority Rank for EPM Participants

Resource	Number of Times Mentioned	Percentage of Participants Mentioning Resource	Average Priority Rank
Textbook	15	94%	2.03
Lab tutor	14	88%	2.18
Classmate	11	69%	3.05
Instructor	9	56%	3.33
Friend/roommate	8	50%	2.88
Mentor	6	38%	4.67
Course tutor	5	31%	4.00
Notes (listed under "other")	1	6%	3.50

The data in Table 21 show that many of the resources used by EPM participants were likely to provide immediate feedback including -- lab tutor, classmate, instructor, friend/roommate, and course tutor. Mentors, while mentioned by six participants, had the lowest average priority rank indicating that mentors were the lowest ranking resource utilized.

Resources Utilized by Non-Participating Students

A similar question regarding resources was posed to five students who chose not to participate in the EPM program but who were willing to participate in the survey process. The students were asked to indicate the resources they used from the same provided list (without "mentor" as an option), again with an area for "other," and to give a priority rank to each. The following table lists the resources, their frequency of being mentioned, and their priority rank. Table 22 shows the replies from the five respondents; the resources listed here were accessed in an order similar to those listed in Table 21.

Table 22: Resources Mentioned and Average Priority Rank for Non-Participating Students

Resource	Number of Mentions	Percentage of Students Mentioning Resource	Average Priority Rank
Textbook	5	100%	1.70
Lab tutor	4	80%	3.00
Friend/roommate	3	60%	1.83
Instructor	3	60%	2.67
Classmate	3	60%	3.83
Internet (listed under "other")	1	20%	2.50
Course tutor	1	20%	5.00

Non-EPM Student Resources

Non-EPM students were asked on their final survey, "How strongly would you rate your desire to have had an anonymous email mentor to help you with your CS140 work?" (being sure to phrase the question in a way that would have provided them with the exact same resource that the EPM participants received). Answers were based on a 7-point scale with 1 being "Very Weak", 4 being "Neutral", and 7 being "Very Strong."

Students were also asked to explain how having a mentor would have helped them with the course. Those ten students (28% of the respondents) who ranked their interest in a mentor at or below 3 indicated they felt they had sufficient resources. Comments included:

> "I feel my prof[essor] and the tutors were enough, a mentor would be a little much," and "Personally no because I had someone to help me out."

Some of the seven neutral students (the 19% of the respondents who entered a rank of 4) seemed to have more interest in a mentor than their rank indicated. Comments from these students included:

> "I think the tutors did a good job. But a mentor would be able to help when no one else could," "It probably would have helped a little more," "Probably would have helped tremendously...," and "A mentor would have helped greatly with questions."

There were nineteen students (53% of the respondents) who ranked their interest at 5 and above indicating a strong desire to have a mentor. These students' comments about how a mentor would have helped them included:

> "On the fly, just random times where simple errors are making the program not function and you have no idea how to fix," "I think it would be good because sometime you can't meet with the tutor or the teacher," and "A mentor could have made some of the conceptual techniques in CS easier to comprehend."

While thirty-six responses yielded a mean score of 4.35, a mode of 4, and a median of 5, with a standard deviation of 1.80, comments seem to indicate a reasonably strong interest in having a mentor. Because this was the only additional resource offered, it is not known if the students would have preferred a different supplemental resource or a mentor in a form other than "an anonymous email mentor."

Mentors

Mentors utilized for the EPM program were students who were enrolled in the CS department's senior Seminar course, the capstone course for the CS program. These students were asked to participate but were not required to. No student who had been enrolled in the class prior to the first class meeting declined to participate. Two additional students were added to the class during the first class meeting but were not assigned mentees (EPM participants) since the mentee assignments had been completed prior to their first class. Mentors were provided with training during the first Seminar course meeting. Training was provided by the researcher and involved a discussion of mentoring, a presentation, and a review of materials. All materials provided to the

mentors, including the slide show presented, are available in the Appendices. Table 23 contains demographic information about student mentors provided on the initial surveys (pre-test) they completed.

Table 23: Mentor Demographic Information

Item Measured	Mentor Data
Gender – Female	9 (30%)
Gender – Male	21 (70%)
Applied Computer Science or Computer Math major/second major	100%
Have a second major or minor	61.3%
Average age	23.6
In-state students	67.7%
Average number of years at Keene State College	3.9
Served as a course tutor for a CS course	32.3%
Served as a CS lab tutor	38.7%

As shown in Table 23 above, all the students enrolled in this class are either Applied Computer Science (ACS) or Computer Math majors, so they had all successfully completed the CS1 course. Also worth noting is that almost one-third of the students had served as an individual course tutor for a CS course during their time at Keene State College and almost 40% of them had worked in the CS department's lab as a tutor. These data show that many of these students have experience working with students who are enrolled in CS courses and may require assistance with their coursework.

Mentor Perception Measures

Mentors also participated in two surveys, one at the beginning of the semester (pre-test) and one at the end of the semester (post-test). These surveys included questions regarding their perception of their level in skills which are critical to successful mentors including verbal skills, leadership abilities, interpersonal skills, ability to help others,

ability to handle responsibility, and ability to display a positive attitude. The surveys also included questions about academic achievement which is important when helping new students. These data were gathered on a 7-point scale. A t-test ($p < 0.05$) was performed on the differences between pre-test and post-test scores, and it was found that participation in the EPM program as a mentor had no statistically significant impact on the mentors. Again, this is likely to be the result of little EPM student participation.

Mentor Usage

One of the mentors' tasks was to keep a log sheet that tracked any e-mail communication they had with their mentees during the semester. There were separate log sheets for "knowing" and "unknowing" mentees. All mentors and mentees were asked to send an introductory e-mail to each other at the beginning of the semester. All other e-mail correspondence was strictly voluntary.

The researcher requested a mid-semester check-in with both the mentors and the mentees. Copies of the e-mails sent and the questions asked to each group are available in the Appendices. One requirement for the mid-semester check-in was to e-mail the researcher and report the number of e-mail communications thus far. According to the twenty-eight EPM participants (mentees) who performed a mid-semester check-in, the average number of e-mails they sent to their mentors was just over two (2.3), yet the reporting mentors indicated receipt of only 1.4 e-mails. Additionally, mentors reported sending 1.7 e-mails while mentees reported receiving an average of 1.9 e-mails—much closer values.

One thing these data do show is the lack of use the mentors received during the first part of the semester. This led to mentor discouragement and disappointment with

their participation in the EPM program (based on reported ad hoc conversations with their course instructor). There was concern on the part of the researcher that the mid-semester check-in would falsely inflate mentor/mentee communication during the second half of the semester. This, however, was not the case as only six of nineteen reporting mentors had communication with their mentees after the check-in occurred. Many of the mentors felt that they made an effort to communicate with their mentees and that effort was not acknowledged and/or utilized. Communication effort is discussed in the next section.

Information regarding e-mail contact was also gathered from the log sheets maintained by the mentors during the semester that were turned in at the end of the semester. These log sheets were used to track the receipt and sending of e-mails and to track the content of the received e-mails in general categories (course-related, college-related, or personal). They also tracked responses logging the content category of the reply (affirmation, question/request for further information, assistance, or correction).

Overall, information was provided by 22 mentors regarding 34 mentees. From the data gathered on the log sheets it was determined that, on average, the mentors sent slightly fewer than two e-mails to their mentees (1.9) and received almost one and one half e-mails (1.4). Table 24 below is a frequency table that displays the number of e-mails sent by the mentors to their mentees and received by the mentors from their mentees during the course of the semester.

Table 24: E-mail Sent and Received by Mentors

Number of E-mails	Number of Mentors Who Sent This Number of E-mails	Percentage of Mentors Sending This Number of E-mails	Number of Mentors Who Received This Number of E-mails	Percentage of Mentors Receiving This Number of E-mails
0	0	0%	5	15%
1	16	47%	20	61%
2	11	32%	4	12%
3	4	12%	1	3%
4	1	3%	0	0%
5	1	3%	2	6%
6	0	0%	1	3%
7	1	3%	0	0%

Data in Table 24 indicate that many of the mentors and mentees sent the initial, introductory e-mail and then sent no more. More disappointing than the more than 60% of mentees who only sent one e-mail is the 15% of mentees who sent none. That probably would dissuade a mentor from making much of an effort toward their mentee during the course of the semester when they have not even received a note saying "hello." The communication effort of mentors and mentees is the subject of the next section.

Efforts to Communicate

On their final survey, the mentors were asked how much effort they had put into trying to communicate with their mentees and how much effort they felt each of their mentees had put in to communicate with them. Again using a 7-point scale the range was given as 1 being "Very Weak", 4 being "Neutral", and 7 being "Very Strong," the mentors were asked "How strong was your effort to establish communication with your mentees?" The average score was 4.94 with a median score of 5 and a mode of 4. These numbers are not overwhelming yet indicate some communication effort on the part of the mentors.

Additionally, the mentors were asked, in two separate questions, to rank the strength of the communication effort by their "unknowing" mentee and their "knowing" mentee. The "knowing" mentees' average effort score was 2.53 with a median score of 1 and a mode of 1. The "unknowing" mentees' average effort score was 2.73 with a median score of 2 and a mode of 1, placing the "unknowing" mentees slightly ahead of the known mentees in communication effort but both groups still ranked on the weak side of the scale.

On their final survey EPM participants (mentees) were asked the same questions regarding efforts to communicate. Using the same 7-point scale, the overall mentee average of their self-reported efforts to communicate with their mentors was 2.35. When broken down by group, the "knowing" mentees effort score average calculated as 2.90, while the "unknowing" mentees effort worked out to be only 1.57. This difference is not significant at α=.05 due to the small sample size. When asked about their mentor's effort to communicate with them, the overall mentee reported average was 3.35. However, when broken down by group, there was a noticeable difference; the "knowing" mentees reported an average effort score of 4.00, while the "unknowing" mentees reported an average effort score of 2.43. Again, this difference is not significant at α=.05 because of the small sample size. Perhaps there was more obligation to communicate felt on the part of the participants who knew the other person's name ("knowing") than those who were unknowing. Another factor in this lack of communication could have been the medium being used, namely e-mail. This is discussed in the next section.

Use of E-mail as a Medium for Mentoring

On their final surveys both mentees and mentors were asked if they felt e-mail was an effective method of communication for this project. The following table (Table 25) shows responses from seventeen responding mentors and seventeen responding mentees. Mentee data is further divided into replies from ten "knowing" mentees and seven "unknowing" mentees.

Table 25: Replies Regarding E-mail as an Effective Communication Method

Answer	Mentors	All Mentees (EPM Participants)	"Knowing" Mentees	"Unknowing" Mentees
Yes	18%	29%	20%	43%
No	65%	59%	60%	57%
Both Yes and No (Neutral)	0%	12%	20%	0%
Blank	18%	0%	0%	0%

As the data show, the mentors and mentees did not feel e-mail was an effective communication method. Mentee comments were categorized and included:

- A preference for personal contact (all responses in this category answered the effectiveness question with no)
- Difficulty in remembering to check the mentee account and/or finding e-mail usage required too much effort (all answered no)
- Ease of use of e-mail (all answered yes)
- Having to wait for a response (2 answered no, 1 was neutral)
- Finding e-mail difficult to use for effective explanations (all answered no)

Mentee comments included a student who felt e-mail was not effective and said,

> "It would have been better if I had been able to use my own e-mail address, which I am on all day long. It was difficult for me to remember to check my other email,"

and a student who felt positively about e-mail and said,

> "I think email is effective. I just never needed my mentor."

These two statements could be at the root of the lack of EPM student participation – the medium for communication was poor and the lack of need for the EPM program. Table 19 showed the large number of resources available to the CS1 students, many with instant feedback. Perhaps the EPM program was an unnecessary resource and, for some, an added burden.

Mentor comments were also categorized and the following themes emerged:

- Lack of e-mail usage (3 answered no, one answered yes, and one neutral on the effectiveness question),
- A preference for in-person contact (all answered no)
- Communication concerns (all answered no)
- Concerns regarding the timeliness of responding (all answered no)

Mentor comments included a person who felt positively about e-mail and wrote,

> "It has always been effective for me. I just assume my mentee had no difficulties,"

while someone less favorable said,

> "It was not utilized. Many times people with issues will deal with them in person."

These two comments may illustrate confounding factors in the low EPM program usage. Mentors may have felt that lack of communication from their mentees meant that the students were doing well without them and that it did not occur to them to be proactive

and write to their students to ensure that they were doing well and did not need their assistance or support. The second comment speaks to the desire for people to get support in person rather than via e-mail. This theme was found in the comments given by both the mentors and the mentees. A specific question regarding being able to meet was given to both mentors and mentees on their final surveys and is addressed in the next section.

Opportunities to Meet with Mentors

Both mentees and mentors were asked on their final surveys if they felt the effectiveness of the mentor program would have increased if mentors had been able to meet with their mentees. Table 26 below shows the reactions from the responding mentors and the responding mentees with the mentee data, further divided into replies from "knowing" mentees and "unknowing" mentees.

Table 26: Replies Regarding Program Effectiveness Increasing as a Result of Meeting

Answer	Mentors	All Mentees (EPM Participants)	"Knowing" Mentees	"Unknowing" Mentees
Yes	78%	82%	100%	57%
No	17%	18%	0%	43%
Blank	5%	0%	0%	0%

As is shown in Table 26, both mentors and mentees overwhelmingly feel that mentees being able to meet with their mentors would increase EPM program effectiveness. Categories of comments included the increase in personal attention, an increase in comfort level, eased communication, and the opportunity for regular interaction.

However, when looking at the breakdown of the EPM participants (mentees) it is clear that many of the "unknowing" mentees did not feel that meeting was necessary to improve program effectiveness. Comments from these respondents include:

"It was good the way it was,"

but more telling was the following comment,

> "I think most people just did their homework in the lab and rather than email their mentor and wait for a response they just asked a [lab] tutor and got a response right away."

So while the "unknowing" mentee did not feel meeting with his/her mentor would make the EPM program more effective, the comment implies that in-person assistance was used more often than mentor e-mail. Utilizing lab tutors, a form of in-person meeting, could be considered similar to meeting with one's mentor. So while meeting with one's mentor may not make the EPM program more effective, in-person meetings (including those listed in Tables 19 and 20 above) seem to be a widely accepted and utilized practice.

Another comment of interest was provided by one of the responding mentors. The mentor explained his/her "no" response to the question as follows, "It's more helpful (in my opinion) if you keep away from the possibility of having a more personal relationship." That is an issue not considered by the researcher. Time constraints in gathering the data did not permit follow-up with the mentor who made that comment in order to obtain further information. This does lead to another question not asked of the mentors—while there was a great deal of encouragement to included face-to-face interaction, how many mentors would have opted not to participate if in-person meetings had been required and would the "possibility of having a more personal relationship" been a common concern?

Summary

EPM participants were generally favorable in their post-test responses regarding the program and in their suggestions to enhance the program. Positive responses

outnumbered negative responses more than four to one. These positive responses were offered despite minimal program usage and its lack of impact on EPM participants. Almost two thirds of respondents' suggestions included a request for in-person meetings between mentor and mentee. This corresponds with the information presented in Table 26 which showed overwhelming support for the conjecture that program effectiveness would be increased if mentor/mentee meetings were implemented.

Mentors' responses concerning the program on their final survey were far less favorable. A few responses said to discontinue the program, while others were unsure. There were a few supporters of the program, but overall responses included proposed changes to the program. There was a proposal to require weekly emails, while another person suggested pairing freshmen and juniors and continue the relationship until the junior graduated and the freshmen (now a junior) began mentoring an incoming student. Some indicated meetings between mentors and mentees would increase program effectiveness, while several others suggested using the same program with a different CS course. On their final survey, mentors were asked if there was a course, other than the CS1 course, in which a mentor program would be successful. Half of the responses were affirmative and two-thirds of those replies listed the CS2 course.

The bottom line on the EPM program was the communication medium utilized was not conducive to immediacy of feedback the EPM participants felt they needed, resulting in a lack of mentee participation. As a result, the EPM program had no major impact on the mentees neither "knowing" nor "unknowing" nor the mentors.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based upon the results of this study, the following conclusions have been drawn.

Sufficient Resources in Place:

Given that the mentors were an infrequently used resource and were ranked with the lowest priority level of usage, there were sufficient resources in place for Keene State College CS1 students to succeed without the need for the EPM program.

E-mail Not Used:

Given that the majority of mentors reported receiving no more than two e-mails during the course of the semester, students at Keene State College participating in the EPM program did not use e-mail much at all to contact their mentors.

E-mail Does Not Meet Immediacy Needs:

As demonstrated by the number of resources providing instant feedback utilized by the EPM participants, for Keene State College students the use of e-mail in the EPM program was not the most effective medium to serve their support needs.

Opportunities for Meetings Desired:

As confirmed through their numerous of positive responses, for Keene State College students the opportunity to have mentor/mentee meetings would increase EPM program effectiveness.

Program Impact Minimal:

As confirmed by the t-tests performed, for Keene State College students involvement in the EPM program in its current form resulted in no significant impact on

EPM participants' CS interest, CS ability, computer comfort, programming confidence, or course completion confidence, whether they were in the "knowing" or "unknowing" subgroup. T t-tests performed on the mentor data also showed no significant impact on mentor skill levels.

Numerous Variables in Decision to Use EPM:

There are many variables involved in an institution's decision to implement the EPM program or not. These include the reliability of school-offered e-mail, currently available resources, the availability of mentors, and the ability and willingness of mentors to provide timely feedback.

Recommendations

Based upon the results of this study, the following recommendations are made to anyone considering use of an EPM program.

Assess Available Resources:

Based on the difficulty level of the course, it is suggested to anyone considering using this (or similar) program to first do a study of what resources are available to support the students and the order in which they access these resources.

Offer EPM When Fewer Resources Available:

It is suggested that the EPM program be offered after the above-mentioned resource assessment has been performed. If it is found that there are gaps or insufficiencies in the current support structure, EPM could be considered for implementation.

Get Students to Begin Programming Assignments Earlier:

It is suggested that those using the EPM program encourage EPM participants to begin working on programming assignments earlier to allow ample time to get the necessary assistance, especially if their primary source of feedback comes via e-mail. Mentees could be required to send their completed homework to their mentor for feedback each week prior to submission of the assignment in class. This would necessitate the mentees completing the assignment early enough to allow for return of the feedback from the mentor and possible code modification to incorporate suggestions.

Provide Opportunities for Meetings:

It is suggested that as a supplement to the e-mail support opportunities be provided that allow mentors to meet with their mentees. This could lead to the development of long-term relationships and a continued source of informal support between the mentor and the mentee. However, this could also result in lower participation due to concerns about development of more personal relationships.

Use Existing E-mail System:

To ensure more frequent use of e-mail and greater comfort with the e-mail software, it is suggested that anyone using the EPM program make use of the existing institution-provided e-mail system rather than having students utilizing a system with which they are less familiar. In addition to increased comfort, students are more likely to find EPM messages while doing routine e-mail checks.

More Check-ins Required:

To ensure regular communication between mentor and mentee, it is suggested that those using the EPM program require more regular check-ins. This suggestion could incorporate the above-mentioned weekly homework exchange.

Use Mentors with Recent CS1 Course Experience:

While it did not prove to be a problem in this study, it is suggested that people implementing EPM consider using mentors with more recent experience taking the CS1 (or selected) course. When selecting individual course tutors, the students chosen are most often those who have just completed the course. They have the most recent experience with the course content and can remember the feeling of taking the first course in the major (and feeling lost and/or overwhelmed).

Incorporate EPM into Service Learning:

Consider making service learning, including service as a mentor, a part of a higher level CS course, perhaps the CS2 course. Colleges and universities that have a service learning requirement could have students in the CS2 course act as the mentors for the CS1 students as a part of the course requirements. Or institutions could consider adding service learning as a component of a CS course, preferably an early one. This encourages CS students to learn vital skills for a successful future including communication skills, interpersonal skills, the ability to help others, the ability to handle responsibility, and the ability to display a positive attitude. Also enhanced could be academic achievement (how better to learn a subject than to teach it?) and leadership abilities.

Be Sensitive When Pairing Students:

When setting up student pairings consider areas found to cause friction between partners including gender, age, and experience level. An older, non-traditional student may have a difficult time taking advice from a student mentor half his/her age; or a male student may be uncomfortable interacting with a female mentor. It is suggested that those being mentored and those doing the mentoring be asked if they have strong concerns with any of these factors and to take them into account when pairing students.

Suggestions for Future Research

Based upon the results of this study, there are a number of areas that would be suggested for future research.

Offer EPM in CS1 Course Again with Opportunities to Meet:

Consider offering EPM as a support resource in the CS1 course again, however, allow students to exchange information (name, phone number, and/or address) and allow them to meet face-to-face to see if there is more mentor/mentee interaction as a result. Of interest would be whether long-term personal relationships develop as a result of the modified interaction and if that would be an enticement or deterrent to mentor and/or mentee participation.

Offer EPM in CS2 Course:

Consider offering the EPM program to KSC students in the CS2 class in a similar format to how it was set up in CS1 (no meetings allowed, only e-mail interaction) to see if there was an increase in mentor usage and if the increase were attributable to an increased course difficulty level and/or a shift in resource access priorities.

Try as a Resource for Continuing Education Students:

Continuing Education students often have unique challenges to face as they are often older than more traditional matriculated students and frequently live off campus. Consider offering EPM to sections of the CS1 course with a larger number of CE students to see if it is a more effective resource for students who may find on-campus, in-person support less accessible.

EPM in a Different Discipline:

Consider offering EPM as a support resource to students in other disciplines, for example Mathematics, where a content area is cumulative across several courses (like Calculus) and students in subsequent courses are in ideal situations to support students in the earlier course(s).

EPM at a Comparable Institution:

Consider offering EPM at an institution comparable in size to Keene State College with a similarly sized CS department. A comparison should be made regarding the existing number of resources available to the CS1 students and the priority given to each of those resources before and after offering EPM.

EPM at an Incomparable Institution:

Consider offering EPM at an institution incomparable in size to KSC, perhaps a large state university, with a larger CS department. Classes at these schools tend to be large and the students may already have an assigned lab in which to participate, with a lab support person or TA in charge, in addition to attending the lecture portion of the course. Requiring more course-related meetings, even with mentors, may not be well received. Perhaps the mentors can be assigned to a few students within the same class

and support them via e-mail allowing students to request help from their present location versus having to go to a general or department computing lab. It would be interesting to see what affect EPM would have on the retention of the supported students.

Summary

EPM could be a valuable support resource in varying size institutions for a range of subject areas. When inadequate or sporadic support in place, EPM could be considered for implementation. For this research study sufficient resources were already in place and EPM was under utilized. If immediate feedback is a critical support requirement, consider supplementing the e-mail communication with meetings. Finally, when considering EPM, take into account the numerous variables that can impact the program's success including: the reliability of the e-mail system being used; the availability of mentors; the willingness and ability of mentors to provide timely support; and the breadth of existing resources.

APPENDIX A

CONSENT FOR VOLUNTARY PARTICIPATION FOR ENTERING COMPUTER SCIENCE STUDENTS PARTICIPATING IN THE EPM STUDY

Computer Science Undergraduates' Perceptions of E-mail Peer Mentoring

I volunteer to participate in this study and understand that:

1. The primary purpose of this research is to determine the effects of peer mentoring on entering computer science (CS) students.
2. I am free to participate or not to participate without prejudice in the EPM study.
3. Results from questionnaires and interviews during the course of the semester will be included in the researcher's doctoral dissertation and may also be included in manuscripts submitted to professional journals for publication.
4. The questions I will be answering address background information, my ratings of my confidence, interest in and abilities in computer science.
5. E-mail between my peer mentor and me may be reviewed for content but will not be attributed to my e-mail address or me.
6. The researcher may interview me, either individually or as part of a group, using a guided interview format.
7. Interviews will be tape recorded to facilitate analysis of the data.
8. My name will not be used, nor will I be identified personally in any way or at any time in written reports.
9. I may withdraw from part or all of this study at any time. It is my option to state my reasons for withdrawing to the researcher.
10. I have the right to review material at the end of the study.
11. The researcher can be contacted by email at scastrio@keene.edu.

_____ _____

Researcher's Signature Date

_____ _____

Participant's Signature Date

APPENDIX B

CONSENT FOR VOLUNTARY PARTICIPATION FOR ENTERING COMPUTER SCIENCE STUDENTS NOT PARTICIPATING IN THE EPM STUDY

Computer Science Undergraduates' Perceptions of E-mail Peer Mentoring

I volunteer to participate in this study and understand that:

1. The primary purpose of this research is to determine the effects of peer mentoring on entering computer science (CS) students.
2. I am free to participate or not to participate without prejudice in the EPM study.
3. Results from questionnaires and interviews during the course of the semester will be included in the researcher's doctoral dissertation and may also be included in manuscripts submitted to professional journals for publication.
4. The questions I will be answering address background information, my ratings of my confidence, interest in and abilities in computer science.
5. The researcher may interview me, either individually or as part of a group, using a guided interview format.
6. Interviews will be tape recorded to facilitate analysis of the data.
7. My name will not be used, nor will I be identified personally in any way or at any time in written reports.
8. I may withdraw from part or all of this study at any time. It is my option to state my reasons for withdrawing to the researcher.
9. I have the right to review material at the end of the study.
10. The researcher can be contacted by email at scastrio@keene.edu.

_____ _____

Researcher's Signature Date

_____ _____

Participant's Signature Date

APPENDIX C

CONSENT FOR VOLUNTARY PARTICIPATION FOR PEER MENTORS

Computer Science Undergraduates' Perceptions of E-mail Peer Mentoring

I volunteer to participate in this study and understand that:

1. The primary purpose of this research is to determine the effects of peer mentoring on entering computer science (CS) students.
2. I am free to participate or not to participate without prejudice in the EPM study.
3. Results from questionnaires and interviews during the course of the semester will be included in the researcher's doctoral dissertation and may also be included in manuscripts submitted to professional journals for publication.
4. The questions I will be answering address background information and my ratings of my abilities in mentoring entering computer science students.
5. Email between the students I am mentoring and me may be reviewed for content but will not be attributed to my e-mail address or me.
6. The researcher may interview me, either individually or as part of a group, using a guided interview format.
7. Interviews will be tape recorded to facilitate analysis of the data.
8. My name will not be used, nor will I be identified personally in any way or at any time in written reports.
9. I may withdraw from part or all of this study at any time. It is my option to state my reasons for withdrawing to the researcher.
10. I have the right to review material at the end of the study.
11. The researcher can be contacted by email at scastrio@keene.edu.

_____ _____

Researcher's Signature Date

_____ _____

Participant's Signature Date

APPENDIX D

INITIAL INFORMATION SURVEY – STUDENT PARTICIPANTS

This survey will be used to generate data for use in a study being conducted by an Education Doctoral candidate at the University of Massachusetts – Amherst. Your participation in this survey is strictly voluntary.

Please read and answer each question as carefully and as accurately as possible.

Assigned email name: _____ Age: _____

Academic Year: FR SO JR SR CE Major/Intended Major: _____

Career field interested in pursuing: _____

Home state: _____ I live _____ on-campus _____ off-campus

Number of previous CS courses: _____ in high school _____ in college

Do you have a PC at KSC? Yes No Number of years of email experience: _____

Total number of active email accounts you have, NOT COUNTING the one you were given for this study: _____

	Very weak			**Neutral**			**Very strong**
How would you rate your interest in CS?	1	2	3	4	5	6	7
How would you rate your ability level in CS?	1	2	3	4	5	6	7
How would you rate your comfort level with computers?	1	2	3	4	5	6	7
How would you rate your confidence level about your programming abilities?	1	2	3	4	5	6	7
How would you rate your confidence level about successfully completing CS140?	1	2	3	4	5	6	7
For you success in CS140 would mean:							

APPENDIX E

INITIAL INFORMATION SURVEY – STUDENT PARTICIPANTS

This survey will be used to generate data for use in a study being conducted by an Education Doctoral candidate at the University of Massachusetts – Amherst. Your participation in this survey is strictly voluntary.

Please read and answer each question as carefully and as accurately as possible.

DID Number: _____ Age: _____

Academic Year: FR SO JR SR CE Major/Intended Major: _____

Career field interested in pursuing: _____

Home state: _____ I live _____ on-campus _____ off-campus

Number of previous CS courses: _____ in high school _____ in college

Do you have a PC at KSC? Yes No Number of years of email experience: _____

Total number of active email accounts you have, NOT COUNTING the one you were given for this study: _____

	Very weak			**Neutral**			**Very strong**
How would you rate your interest in CS?	1	2	3	4	5	6	7
How would you rate your ability level in CS?	1	2	3	4	5	6	7
How would you rate your comfort level with computers?	1	2	3	4	5	6	7
How would you rate your confidence level about your programming abilities?	1	2	3	4	5	6	7
How would you rate your confidence level about successfully completing CS140?	1	2	3	4	5	6	7
For you success in CS140 would mean:							

APPENDIX F

INITIAL INFORMATION SURVEY – STUDENT MENTORS

This survey will be used to generate data for use in a study being conducted by an Education Doctoral candidate at the University of Massachusetts – Amherst. Your participation in this survey is strictly voluntary.

The purpose of this survey is to get a general sense of your skills and abilities that will enhance your ability to perform as a student mentor this semester. Please read and answer each question as carefully and as accurately as possible.

Assigned email name: _____ Age: _____

Major: _____ Second Major/Minor: _____

Career field interested in pursuing: _____

Home state: _____ Number of years at KSC: _____

Did you ever tutor for a CS class? Yes No If so, which class: _____

Number of years of email experience: _____ Number of active email accounts: _____

	Very weak			**Neutral**			**Very strong**
How would you rate your verbal skills (ability to express ideas clearly and succinctly)?	1	2	3	4	5	6	7
How would you rate your overall academic achievement?	1	2	3	4	5	6	7
How would you rate your academic achievement in CS?	1	2	3	4	5	6	7
How would you rate your leadership abilities (ex. earning respect from other students)?	1	2	3	4	5	6	7
How would you rate your interpersonal skills (ease with interpersonal relationships)?	1	2	3	4	5	6	7
How would you rate your desire to participate in this mentor program?	1	2	3	4	5	6	7
How would you rate your ability to handle responsibility?	1	2	3	4	5	6	7
How would you rate your ability to help others?	1	2	3	4	5	6	7
How would you rate your ability to display a positive attitude?	1	2	3	4	5	6	7

APPENDIX G

MID-SEMESTER CHECK-IN E-MAIL – STUDENT PARTICIPANTS (BOTH EPM AND NON-EPM PARTICIPANTS)

This assignment is due by 11:55 p.m. on Friday, March 14, 2003. You must send the answers to the following questions to Sue via email (scastrio@cs.keene.edu) with the following subject line: **CS140-4 additional assignment**

Be sure to number the questions so your responses are clear. It is preferred that you use your KSC email account, however, if you choose to use another account, be sure to put your name in the email so you can be identified as the sender.

If you have a mentor, please ask the first set of questions. Students who have chosen not to have a mentor, please answer the second set of questions.

Students with mentors

1. How many times have you accessed your mentee email account? Why this number?
2. Do you use iMail or did you download Eudora?
3. Do you find the email software you are working with easy to use?
4. Does it encourage you or discourage you from using it based in its ease of use?
5. How many emails have you sent to your mentor?
6. If you asked a question of your mentor, was the reply timely enough?
7. How many emails have you received from your mentor?
8. Have you asked your mentor for help with your CS140 course work?
9. If you answered **yes** to question 8, was the information sent back to you helpful?
10. Has your mentor ever referred you to other resource(s) for assistance with your CS140 course work?
11. If you answered **yes** to question 10, what was/were the resource(s)?
12. In addition to your mentor, what other resources have you used to get assistance with CS140 (ex. class tutor, lab tutor, instructor, classmate, friend…)? Please list these resources, including your mentor, in the order in which you would access them in order to get assistance with your CS140 course work (ex. if you always go to your mentor first, list that first, followed by your second most utilized resource, etc.). Also, list next to the resource how helpful you have found it to be.

Sample listing

Mentor	1st	Very helpful
Course tutor	2nd	Helpful
Lab tutor	3rd	Somewhat helpful

Students without mentors

1. What resources have you used to get assistance with CS140 (ex. class tutor, lab tutor, instructor, classmate, friend...)? Please list these resources in the order in which you would access them in order to get assistance (ex. if you always go to the class tutor first, list that first, followed by your second most utilized resource, etc.). Also, list next to the resource how helpful you have found it to be.

   Sample listing

Classmate	1st	Very helpful
Course tutor	2nd	Helpful
Lab tutor	3rd	Somewhat helpful

2. Do you think you would have benefited from having a mentor?
3. If you answered **yes** to question 2, how do you think having a mentor would have helped you?

APPENDIX H

MID-SEMESTER CHECK-IN E-MAIL – STUDENT MENTORS

Please complete this assignment by 11:55 p.m. on Friday, March 14, 2003. You must send the answers to the following questions to Sue via email (scastrio@cs.keene.edu) with the following subject line: **Mentor report**

Be sure to number the questions so your responses are clear. It is preferred that you use your KSC email account, however, if you choose to use another account, be sure to put your name in the email so you can be identified as the sender.

If you have multiple mentees, please indicate next to each answer whether your answer is for your known mentee (by placing a "k" next to the reply) or your unknown mentee (by placing a "u" next to the reply). Below is an example of an answer to question 1:

1. 10 (k), 5 (u)

If you do not have a mentee, please send me a quick email reminding me of that so that I can consider you as having completed the assignment.

1. How many times have you accessed your mentor email accounts?
2. Do you consider your frequency of checking the accounts regular or sporadic?
3. Do you use iMail or did you download Eudora?
4. Do you find the email software you are working with easy to use?
5. Does it encourage you or discourage you from using it based in its ease of use?
6. How many emails have you sent to each of your mentees?
7. If your mentee asked you a question, was the reply timely?
8. How many emails have you received from your mentees?
9. Have your mentees asked for help with their CS140 course work?
10. If you answered **yes** to question 9, were you able to provide them with the information they were looking for?
11. Have you ever referred your mentees to other resource(s) for assistance with their CS140 course work?
12. If you answered **yes** to question 11, what was/were the resource(s)?

APPENDIX I

FINAL INFORMATION SURVEY – STUDENT PARTICIPANTS

This survey will be used to generate data for use in a study being conducted by an Education Doctoral candidate at the University of Massachusetts – Amherst. Your participation in this survey is strictly voluntary. Consent forms were signed and collected at the beginning of this semester.

Students assigned mentors should begin answering questions in the sections entitled "Students Assigned Mentors" and "All CS140 Students." Students who chose not to have a mentor should answer questions in the sections entitled "Students Without Mentors" and "All CS140 Students." Please read and answer each question as carefully and as accurately as possible.

Assigned email name or DID: _____ Major/Intended Major: _____

STUDENTS ASSIGNED MENTORS	Strongly agree			Neutral			Strongly disagree
I feel I made good use of my mentor and his/her knowledge and skills	1	2	3	4	5	6	7
Having a mentor allowed me to gather more information about specific CS courses	1	2	3	4	5	6	7
Having a mentor allowed me to gather more information about the CS program in general	1	2	3	4	5	6	7
Having a mentor allowed me to gather more information about the field of computer science	1	2	3	4	5	6	7
Having a mentor allowed me to gather more information about career opportunities in CS	1	2	3	4	5	6	7
Having a mentor strengthened my interest in CS	1	2	3	4	5	6	7
Having a mentor helped me to develop areas in which I felt my knowledge and/or skills were weak	1	2	3	4	5	6	7
My mentor reinforced my programming thoughts and ideas	1	2	3	4	5	6	7
I was able to retain suggestions from my mentor and incorporate them into future programming works	1	2	3	4	5	6	7

My mentor was encouraging and motivating	1	2	3	4	5	6	7
	Strongly agree			**Neutral**			**Strongly disagree**
Having a mentor strengthened my self-confidence in my abilities in CS	1	2	3	4	5	6	7
My mentor provided clear feedback to my questions	1	2	3	4	5	6	7
My mentor was a reliable resource for assistance with CS concepts and course concepts	1	2	3	4	5	6	7
My mentor was able to help clarify CS concepts and course content	1	2	3	4	5	6	7
My mentor was able to direct me to additional resources when necessary	1	2	3	4	5	6	7
Having a mentor strengthened my understanding of CS concepts and content	1	2	3	4	5	6	7
Note: Change of Rating Scale	**Very weak**			**Neutral**			**Very strong**
How strong was your effort to establish communication with your mentor?	1	2	3	4	5	6	7
How strong was the effort by your mentor to establish communication with you?	1	2	3	4	5	6	7
How would you rate your satisfaction level with your participation in this program?	1	2	3	4	5	6	7

Since the mid-semester check-in, have you had any further contact from your **mentor**?
Yes No

Number of emails: Email content:

Do you feel this mentoring program was a good means of instructional support for CS140 students? Yes No
Explain your answer:

Do you feel using email as a method of communication was effective? Yes No

Explain your answer:

Do you feel the effectiveness of the mentor program would have increased if the mentees had known the names of the unknown mentors? Yes No

Explain your answer:

Do you feel the effectiveness of the mentor program would have increased if mentors had been able to meet with their mentees? Yes No

Explain your answer:

What suggestions do you have for strengthening the mentor program, should it be offered again?

Other than the mentor program, what other resources would you suggest be made available to support CS140 students?

STUDENTS WITHOUT MENTORS	**Strongly agree**			**Neutral**			**Strongly disagree**
I regret my decision to go without a mentor for CS140	1	2	3	4	5	6	7
I feel I had sufficient resources for the successful completion of CS140 without having a mentor	1	2	3	4	5	6	7
I found these resources for CS140 to be readily available	1	2	3	4	5	6	7

What changes, if any, would need to have been made to the mentor program for you to have participated in it?

Based on your knowledge of the mentor program, what general suggestions do you have for strengthening the program, should it be offered again?

Other than the mentor program, what other resources would you suggest be made available to support CS140 students?

ALL CS140 STUDENTS	Very weak			Neutral			Very strong
How would you rate your interest in CS?	1	2	3	4	5	6	7
How would you rate your ability level in CS?	1	2	3	4	5	6	7
How would you rate your comfort level with computers?	1	2	3	4	5	6	7
How would you rate your confidence level about your programming abilities?	1	2	3	4	5	6	7
How would you rate your confidence level after completing CS140?	1	2	3	4	5	6	7
Do you consider yourself successful in completing CS140? Yes No Explain:							

Which of the following resources did you use during the course of the semester to help you with your CS140 assignments? Please number these in the order in which you would access them to obtain assistance:

_____ Mentor (if applicable)
_____ Course tutors (in SCI 120)
_____ Textbook
_____ Classmate
_____ Instructor
_____ Lab Tutors (in CS Lab)
_____ Friend/roommate
_____ Other _____

In other classes, outside of CS, what resources do you make use of?

Please list any additional comments you have about this program on the back of this sheet.

Thank you for your participation in this project!

APPENDIX J

FINAL INFORMATION SURVEY – STUDENT PARTICIPANTS

This survey will be used to generate data for use in a study being conducted by an Education Doctoral candidate at the University of Massachusetts – Amherst. Your participation in this survey is strictly voluntary. Consent forms were signed and collected at the beginning of this semester.

Please read and answer each question as carefully and as accurately as possible.

DID Number: _____ Major/Intended Major: _____

	Very weak			Neutral			Very strong
How would you rate your interest in CS?	1	2	3	4	5	6	7
How would you rate your ability level in CS?	1	2	3	4	5	6	7
How would you rate your comfort level with computers?	1	2	3	4	5	6	7
How would you rate your confidence level about your programming abilities?	1	2	3	4	5	6	7
How would you rate your confidence level after completing CS140?	1	2	3	4	5	6	7
How strongly would you rate your desire to have had an anonymous email mentor to help you with your CS140 work?	1	2	3	4	5	6	7
How do you think having the mentor available would have helped you with CS140?							
In addition to, or instead of, the mentor what other resources would have helped you with CS140?							
Do you consider yourself successful in completing CS140? Yes No Explain:							

Please add any comments you think would be helpful to the researcher:

Thank you for your assistance!

APPENDIX K

FINAL INFORMATION SURVEY – STUDENT MENTORS

This survey will be used to generate data for use in a study being conducted by an Education Doctoral candidate at the University of Massachusetts – Amherst. Your participation in this survey is strictly voluntary. Consent forms were signed and collected at the beginning of this semester.

The purpose of this survey is to get a sense of your skills and abilities following your serving as a student mentor this past semester and your thoughts about the mentor program. Please read and answer each question as carefully and as accurately as possible.

Assigned mentor email name: _____

	Very weak			Neutral			Very strong
How would you rate your verbal skills (ability to express ideas clearly and succinctly)?	1	2	3	4	5	6	7
How would you rate your overall academic achievement?	1	2	3	4	5	6	7
How would you rate your academic achievement in CS?	1	2	3	4	5	6	7
How would you rate your leadership abilities (ex. earning respect from other students)?	1	2	3	4	5	6	7
How would you rate your interpersonal skills (ease with interpersonal relationships)?	1	2	3	4	5	6	7
How would you rate your desire to participate in this mentor program?	1	2	3	4	5	6	7
How would you rate your ability to handle responsibility?	1	2	3	4	5	6	7
How would you rate your ability to help others?	1	2	3	4	5	6	7
How would you rate your ability to display a positive attitude?	1	2	3	4	5	6	7
How strong was your effort to establish communication with your mentees?	1	2	3	4	5	6	7

How strong was the effort by your known mentee to establish communication with you?	1	2	3	4	5	6	7
How strong was the effort by your unknown mentee to establish communication with you?	1	2	3	4	5	6	7
How would you rate your satisfaction level with your participation in this program?	1	2	3	4	5	6	7

Since the mid-semester check-in, have you had any further contact from your **known** mentee?
Yes No I didn't have a known mentee

Number of emails: Email content:

Since the mid-semester check-in, have you had any further contact from your **unknown** mentee?
Yes No I didn't have an unknown mentee

Number of emails: Email content:

Do you feel this mentoring program was a good method of instructional support for the CS140 students? Yes No
Explain your answer:

Do you feel using email as a method of communication was effective? Yes No
Explain your answer:

Do you feel the effectiveness of the mentor program would have increased if the mentors had known the names of both their mentees? Yes No
Explain your answer:

Do you feel the effectiveness of the mentor program would have increased if mentors had been able to meet with their mentees? Yes No
Explain your answer:

Is there a CS course other than CS140 where you think a mentor would be beneficial? Yes
No
If so, what course? Why that course?

What suggestions do you have for the mentor program, should it be offered again?

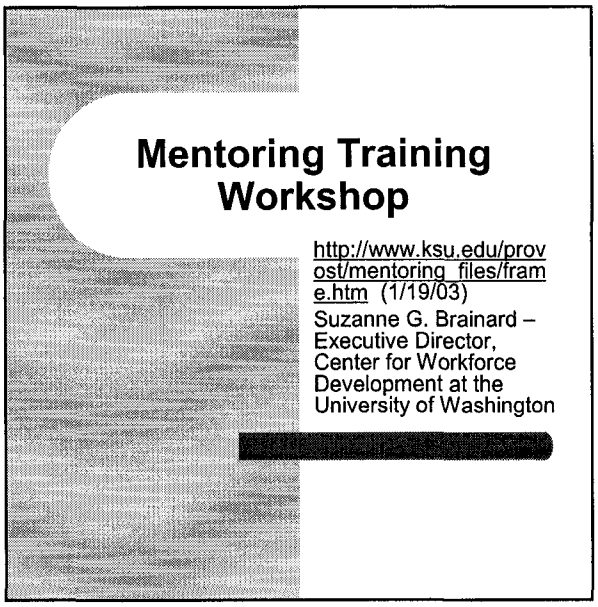
Please list any additional comments you have about this program.

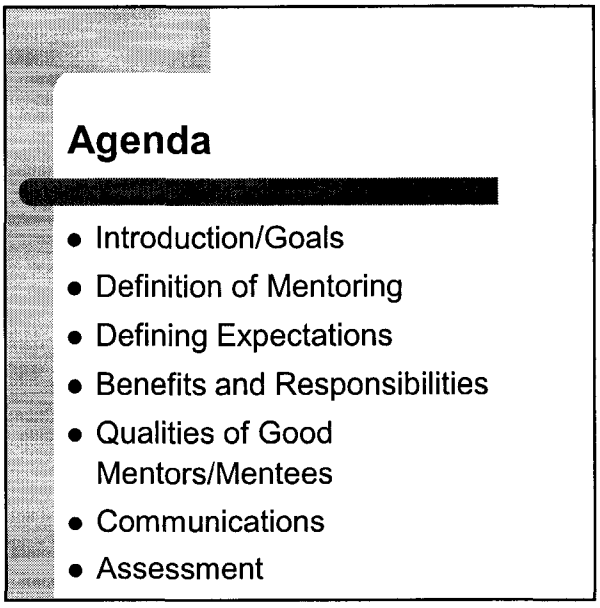
Please turn in your log sheets with this form to Sue Castriotta on Monday, May 5th at your final Seminar class meeting.

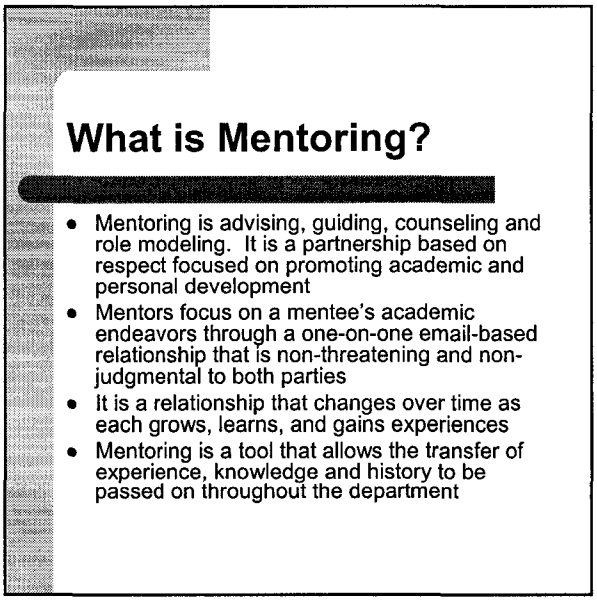
Thank you for your participation in this program!

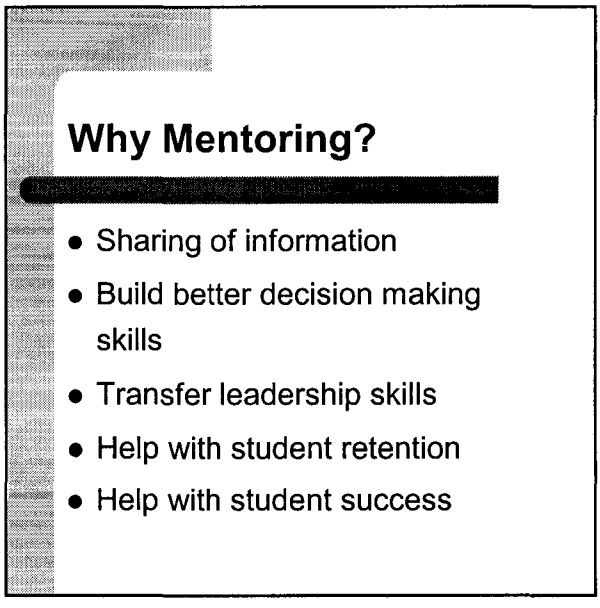
APPENDIX L

MENTORING POWERPOINT PRESENTATION









Goals for Mentoring

- Provide assistance with course material
- Provide positive role model
- Provide access to the department and greater professional community
- Help with personal and career guidance
- Expand the mentee's horizons and vision
- Provide advice, counsel and support
- Listen, give feedback, and share ideas
- Share unwritten rules of culture
- Identify and suggest learning and development opportunities
- Create opportunities for experience and advancement

Benefits

Of Having a Mentor

- Individual assistance with course material
- Individual recognition, encouragement and support
- Increased self-esteem and confidence
- Can challenge self to achieve new goals and alternatives
- Take risks

Of Being a Mentor

- Satisfaction of helping someone reach their goals; giving back
- Stay up-to-date with programming knowledge
- Increased self-esteem
- Improved communication skills
- Revitalized interest in major

Responsibilities of Participants

Common courtesies such as:

- Being considerate
- Ensuring information provided is accurate to the best of one's abilities
- Returning email in a timely manner
- Contacting each other regularly

Additional responsibility of mentors:

- Log all email contact

Mentoring Qualities

- Committed to the mentoring relationship
- Good listeners
- Non judgmental
- Sensitive to another person's struggle
- Stable and flexible
- Discrete, honest, patient, and trustworthy

Getting to Know You

- Exercise for mentors and mentees to get to know each other
- Email by Friday, February 1, 2003
- Must contain the following:
  - Academic year - Live on- or off-campus
  - # of previous CS courses - Major
  - Any previous programming experience
  - NO names, gender, physical descriptors, ages, other contact information

Effective Communication

In order for communication to be effective:

- The message must be clear
- The receiver must understand it and pay attention to it
- The source (sender) must be credible
- The receiver must be willing and able to act on it

Negative Language Habits

- Ordering or commanding
- Warning or threatening
- Moralizing or preaching
- Giving solutions (advising and assistance are different)
- Lecturing or giving logical arguments
- Judging, ridiculing, blaming, sarcasm, shaming with putdowns
- Playing psychologist - analyzing and diagnosing
- Using gender-biased language

Listening Involves...

- Acknowledging
- Being attentive, avoiding distractions
- Reflecting
- Probing
- Summarizing or paraphrasing

Crisis Management

- Crises occur infrequently, but do happen
- Be calm and supportive
- Listen
- Allow for expression of feeling
- Ask how you can be helpful
- Refer to experts when appropriate (use quick guide sheet)

Qualities of Great Mentoring Partnerships

- Balance (mutuality, interdependence, respect)
- Truth (knowledge that's accurate, feedback that's frank, straightforward, and genuine)
- Trust (requires risk taking)
- Abundance (generosity, giver orientation, affirming)
- Passion (interest in subject area, deep caring and willingness to communicate, vibrant)

Potential Pitfalls

- Excessive time and energy demands
- Unrealistic expectations
- Mentees feeling inferior
- Dependent relationships
- Inappropriate match

Assessment

- Program evaluations
  - Done by both mentors and mentees
- Personal evaluations
  - The mentor and mentee will periodically assess the progress and effectiveness of the mentoring
    - Keep **ALL** email throughout the entire semester!
  - Will look at development of personal skills and traits

APPENDIX M

USING IMAIL PRESENTATION

Using iMail

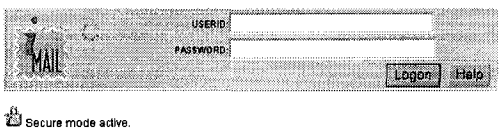
Spring 2003

Where do I begin?

- Use a web browser to point to the following page:

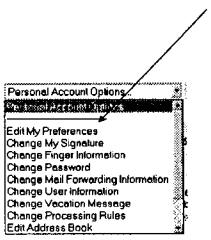
Logging in

- When the following screen pops up, use the user id that you have been given
- For the initial log in, your password and user id are the same – be sure to change your password!



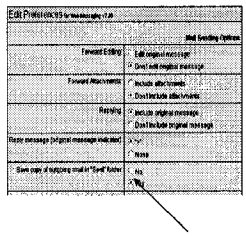
Changing Preferences

- To ensure that you keep a copy of every email you send during the course of the semester, you must choose "Edit my Preferences" from the "Personal Account Options" on the Main Menu page
- You can change



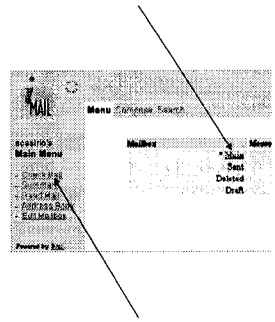
Keeping copies of Sent mail

- In order to keep a copy of all sent mail, you need to change the "Save copy of outgoing mail in 'Sent' folder" from No (the default) to Yes by clicking on the "Yes"



Checking mail

- To check mail in your Inbox (where new mail comes), click on either Main (under Mailbox) or Check Mail under the Main Menu
- If you have new unread messages, the number of

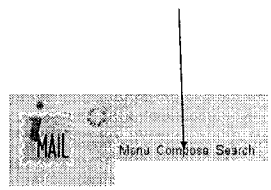


Reading Messages

- To read a message that you have been sent, click on the Subject of the message (should be blue and highlighted)
- The contents of the window will change to reflect the contents of the message
- To go back to the Inbox content, click Back

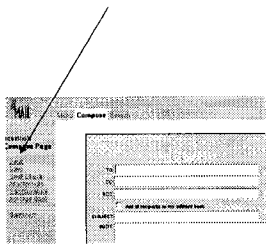
Composing a message

- To send a message, choose Compose from the top of the screen
- The Compose option is on the screen after first logging on and while viewing the contents of your Inbox



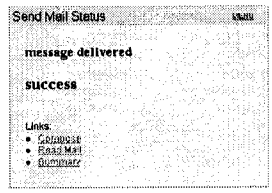
Filling in the information

- Put the email address in the To: field
- Fill in the subject line to give the recipient an idea of what the email is about
- Fill in the body of the email
- Click "Send"



Confirmation

- Once your email has been sent successfully, you should get a confirmation window similar to the one at the right
- To go back to reading email, choose "Read Mail" or use the



To reply to a message

- To reply to the sender of the message, click on "Reply" in the menu bar under the listing of the original message text (body)

General information

- Keep ALL email sent from and received into this email account (both Inbox and Sent mailbox contents) for the entire semester
- This email account should be used for mentor/mentee communication ONLY and should not be used for anything else
- Contact Sue with any questions, concerns, problems, etc.

Thank you in advance for your assistance and cooperation!!

"KNOWN" MENTEE LOG SHEET

My email address _____ Mentee email address _____

Sheet #_____ Mentee name _____

Date of email	Time of email	Email content	Content category	Response generated	Response content	Response category	Date of response	Time of response

Email content categories:
C—course related
K—college related
P—personal

Reply content categories:
A—affirmation (yes)
Q—question (request for further information)
S—assistance (request for information satisfied)
X—correction (no)
+ - additional information supplied (ex. X+)

"UNKNOWN" MENTEE LOG SHEET

My email address _____ Mentee email address _____

Sheet #_____ DO NOT USE NAMES!!!

Date of email	Time of email	Email content	Content category	Response generated	Response content	Response category	Date of response	Time of response

Email content categories:
C—course related
K—college related
P—personal

Reply content categories:
A—affirmation (yes)
Q—question (request for further information)
S—assistance (request for information satisfied)
X—correction (no)
+ - additional information supplied (ex. X+)

Quick Guide to Keene State College Resources

Supplied to CS140 Mentors – Spring 2003

Name	Location	Phone number	Areas dealt with
Academic and Career Advising	Elliot Center (Elliot Hall – 1st floor)	2500	Course selection, transfer of credit, career library
Aspire	Elliot Center	2353	Tutors, supplemental instruction (SI)
Assoc. VP for Student Affairs	Elliot Hall – 3rd floor	2842	Absences (excused and unexcused), leaves of absence
Blackboard	http://keene.blackboard.com	-----	Web site students use to access course materials (not all courses use Blackboard)
Bookstore	Student Center	2651	Book purchases, diskettes for sale
Bursar's Office	Elliot Hall – 1st floor	2263	Bills, payments
Campus Safety	Grafton House Wyman Way	2228	Safety concerns (blue light phones), parking (parking office-Appleton St.)
Counseling Center	Elliot Hall – 3rd floor	2437	Counseling – depression, homesickness, loss (death), relationship problems
Health Services	Elliot Hall – 3rd floor	2450	Medical/physical concerns
Help Desk	Elliot Hall – 2nd floor	2532	Computer-related problems (network jacks, in-room Internet access)
Library	Mason Library – Appian Way	2711	Books, reference materials, periodicals, on-line resources
Math Center	88 Winchester St. (Math Building)	2523	Assistance with math courses
MyKSC	http://prod.campuscruiser.com /myksc/	-----	Web site students use to access their email and academic data (schedule, unofficial transcript)
Office of Disability Services	Elliot Center	2353	Students with physical disabilities and learning disabilities
Registrar's Office	Elliot Center	2500	Course adds, drops and withdrawals; official transcripts
Residential Life	Butler Court	2339	Room concerns, roommate problems
Student Financial Services (Financial Aid)	Elliot Hall – 1st floor	2280	Financial aid, work study
Writing Center	81 Blake Street	2412	Writing assistance (important for students in ENG 101)

APPENDIX Q

CS140 SYLLABUS INFORMATION

Course Description: Computer Programming I

An introduction to problem solving methods and algorithm development using the C programming language. Emphasis is placed on good programming techniques including design, coding, debugging, and documenting. (From Keene State College catalog)

Course Outline:

Topics to be covered list the chapter(s) in the C by Example book to be covered in class during that week. Be sure to read the chapter(s) **prior** to coming to class that week.

Week of	Topics to be covered	Homework Due
1/20	Introductions, Course Overview, MyKSC (portal) – Email, Chapter 1 – What C is All About	Email to instructor
1/27	Hexadecimal and Binary Numbers, Using Microsoft C.net, **Quiz #1**	Hex/Binary/ Decimal Numbers
2/3	Chapter 2 – Analyzing C Programs	HW01
2/10	Chapter 3 – Variables and Constants, **Quiz #2**	HW02
2/17	Chapter 4 – Introduction to Arrays, **Exam #1**	HW03
2/24	Chapter 5 – Preprocessor Directives, Chapter 6 –Input and Output, Chapter 24 – Simple C File Processing	HW04
3/3	Chapter 7 –Operators and Precedence, Chapter 8 – Relational and Logical Operators, **Quiz #3**	HW05
3/10	Chapter 9 – Remaining C Operators	HW06
3/17	**Spring Break – 3/17-3/21**	---
3/24	Chapter 10 – The while Loop, Chapter 24 – Simple C File Processing, **Exam #2**	HW07
3/31	Chapter 11 – The for Loop, Chapter 12 – Controlling Flow	HW08
4/7	Chapter 13 –Introduction to C Functions, Chapter 14 – Variable Scope, Chapter 15 – Passing Values Between Functions, **Quiz #4**	HW09
4/14	Chapter 16 – Returning Function Values	HW10
4/21	Function Review, **Quiz #5**	HW11
4/28	Project Presentations, Review	Project Due 4/28
5/5	**No Classes Monday, 5/5 – Reading Day Final Exam – Wednesday, May 7, 10:30 am – 12:30 pm**	

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