A Conference's Impact on Undergraduate Female Students*

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In September of 2000, the *3rd Grace Hopper Celebration of Women in Computing* was held in Cape Cod, Massachusetts. Along with a colleague from a nearby university, we accompanied seven of our female undergraduate students to this conference. This paper reports on how the conference experience immediately affected these students – what impressed them, what scared them, what was clarified for them. It also reports on how the context in which these students currently evaluate their ability, potential and opportunity in computer science is different now than it was before the conference. Hopefully, by understanding their experience, we can gain some insight into things we can do for all of our undergraduate female students to better support their computer science and engineering education.

The Grace Hopper Celebrations

The Grace Hopper Celebration series of conferences started in June of 1994. The intent of this conference is to bring women, who are developing, advancing, and studying various fields of computing, together to celebrate the accomplishments of women in computing. At each conference, leading researchers from industrial, academic and government communities present their current work, while special sessions focus on the role of women in today's technology fields.

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The conference also strives to serve as a training and networking opportunity for women just entering or preparing to enter the field. As part of this focus, the conference offers scholarships for students and young professionals to attend the conference (funded by organizations such as NSF, Usenix, Intel and AAAI), and programs, sessions and panels specifically geared to beginning computer scientists. Over 300 scholarships were awarded between the 2nd and 3rd Celebrations. The 4th Celebration, in Vancouver, B.C. in October 2002, will again offer scholarships as well as other targeted programs. For example, there will be student/young investigator technical paper and poster awards presented this year. There will also be a "mentor-match" program, in which interested students, junior faculty, and young professionals can spend time during the conference with senior women in the field. (The deadlines for support scholarships, papers, and posters for this year are past, but interested women may still apply for the mentor-match program. See http://www.gracehopper.org/ for details.)

The Grace Hopper Celebration series has already proven to be a wonderful experience for graduate students and professional women in computer science and computer engineering. In addition to increasing the visibility of contributions of women in computing, it has facilitated networking and mentoring for junior faculty and young professionals, provided avenues for innovative and collaborative research, and broadened the discussion of increasing the diversity of computer scientists. As this paper will show, the conference is also a great experience for undergraduate students.

Students Attending the Celebration.

The students represented in this paper are from small, liberal arts, undergraduate institutions. At the time of the conference, three were sophomores, one was a junior, and three were seniors in Computer Science. It was the first professional conference for all of them.

When we came back from the conference, the students were asked to write up a report about their experience at the conference. One and a half years later, they were asked to write a second, follow-up report about how the conference has continued to affect them. The ideas and quotes in this paper come directly from those reports.

First Reactions to the Conference.

All seven students reported that, overall, the conference was a positive experience for them even though not everything about the conference was positive for them. One of the things they all shared was a positive reaction to hearing presentations given by accomplished women in the field. They were very impressed with the women themselves and, more significantly, they were able to see their own selves in these women. Here are some of their early comments:

> "I was completely in awe of their pioneering spirit, their ability to hold their own in a male-dominated field, their enthusiasm and zeal for the subject."
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> "All [of the presenters] were very optimistic and inspiring about the future of women in computer science."
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> "They used to be students too and now they have great careers."
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> "It was fun even just to know that they actually have families and are not different from other women. My previous imagination was far from that."

Most of the students specifically mentioned how listening to the presenters and interacting with other women at the conference increased their own self-confidence. One student commented: "By seeing so many women that have already accomplished what I aspire to someday do, I gained a lot of self-confidence." One of the seniors said that "listening to many of the speakers speak about the common problems girls face in this field, I realized that I was not alone in my fear that I know less than the boys in my class." Interestingly, this was from a student with a near 4.0 GPA who obviously knows quite a bit more than many of the young men in her class.

A primary theme of the conference was the connection between computing and other fields. This exposure to a wide variety of fields and topics was positive for all of the students. One particularly interesting observation related to this is that the three seniors had all previously participated in summer internships – one at IBM-Rochester and two at the Mayo Clinic. Although these internships had exposed the students to "real world" jobs, they had also convinced the students that there was a relatively narrow path to be followed in a computer science job. Their conference experience completely changed this opinion. For example: "After attending the talks, I realized there were many different options and paths that I could take in continuing my education while working in industry. Also: "Many of the talks so piqued my interest, that going to graduate school in Computer Science seems like a viable option." From another student: "But now, after being made aware of the many ways that technology can help improve people's lives, I see a path which may be the golden mean for me – a way to use my abilities and interests to realize my ideals!"

A more subtle benefit to attending the conference was the feeling of support the students felt at the conference for what they were trying to do. As one student said, "at the conference, it was great to be among a group of women who believed in us and *expected* us, as students, to do well." This was contrary to the more frequent reaction they are used to receiving, where people either act surprised that they do well in computer science or treat them as "nerds."

The seniors in our group were very interested in the opportunities that the conference provided for helping them to make the decision of what to

do next. One of the seniors described this part of the conference as such: "One of the scariest things as a college student is deciding whether to continue my education or to join the workforce. I had no idea what I was interested in doing, and was unaware as to what possibilities were available to me. While at the conference, I was able to meet other women who had been in similar situations. These women were willing to share their career and educational experiences with me, and show me some of what the Computer Science field had to offer. Also, the conference included a job fair where I was able to submit resumes and speak with possible employers. It was a great opportunity for sharpening my interviewing skills and for networking. There were also many displays set up by universities to promote graduate programs from around the nation."

On the negative side, one of the sophomore students said that, at the conference, she felt a lot of pressure to stay in computer science. "To me there was too much stress on the fact that women were minorities and we needed to keep girls from dropping out of these fields during school." This particular student was questioning whether or not to stay in computer science herself, and she saw efforts to encourage students to stay in computer science from the point of view that "the women at the conference don't want any of the girls to get out of the pipeline."

A couple of the students also found some of the retention statistics scary and wondered if they too were likely to quit computer science as a major. In fact, the students as a whole seemed to be very surprised by the overall statistics of the number of women in computer science at all levels. They had thought the small numbers of women in their classes were just a local phenomenon. One student said that she thought some of the stories about fewer women than men in CS and the sometimes negative atmosphere of an all-male environment were over-exaggerated.

The students also had some general conference mishaps, such as, assuming "invited session" meant one needed to be invited to attend the session as opposed to meaning that the speakers were invited. In some cases, they attended talks that were not of interest to them or were way over their heads. But, for the most part, they reacted positively to the technical content of the conference: "Attending the lectures greatly helped me to see the endless possibilities that were available to me by being in this field. My eyes were opened up to so many things that I never knew existed. The lectures that were available to me ranged from Language Technologies and Women in Management to technical papers on Java and other languages. I can remember being so excited and overwhelmed at the same time. I couldn't believe all that was out there for me to experience."

Reactions a Year and a Half Later.

A year and a half later, the students feel, even more so, that attending the conference was a very positive experience for them. In some instances, they have experienced first-hand some of the things they heard about at the conference. In other instances, they have been able to directly use things they learned at the conference.

Here are some of their comments:

> "For me, the Grace Hopper conference was a very strong motivation to continue studying computer science. Just a feeling of possibility to reach a high level of knowledge and become a professional is very encouraging. It helps to stay on the right track and not to give up even when the head is overloaded with projects and exams, and it seems as an infinite process."
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> "I learnt about speech synthesis at the conference and that is precisely the area that I am in, currently."
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> " Another myth, in which most female students, particularly freshmen believe, is that the guys perform better in class than they do. I admit being a true believer too, but today the myth does not exist anymore. I am a senior, and so far I noticed that girls do at least as good or better than guys. Of course there are some exceptions, but in general it is true. The Grace Hopper conference was right, and it is very useful

for female students to see it and change their mind in a positive way. It did change my mind, indeed."

"Moreover, at this meeting, I also realized that many other young women had the same fears and insecurities about our ability to be do well in a field that is so male-dominated. Knowing this is helping me be more open about those fears and get advice from more experienced women to overcome those concerns."

"At school, the majority of computer scientists I know are boys who would love to talk about nothing other than computers 24-7. While this is fine, I am relieved to have been introduced to women who share a passion for computer science but still have outside lives as well."

It also appears that the conference experience may have nurtured some budding activists:

"I realized the importance of keeping young girls interested in the areas of math and science after I attended a session about this problem at the conference. Since then, I have enrolled in a mentorship program through my employer, and am a mentor to a sixth grade student."

"Before I went to the conference, the anomaly in the number of women vs. the number of men in computer science was something that I theoretically knew, but it never really bothered me. However, now it does, as it rightly should. Also, it prompts me to encourage other young women to be in the field of sciences, especially computer science."

One of the more positive results for these students is that, not only don't they feel as isolated, but they also feel like they are part of a community. "The most important thing I took away from the Grace Hopper Conference was a sense of community. I had never expected to feel that way attending a technical conference. It was the people I met and spent my time with that made the whole experience so great. It was wonderful to know that there was a whole network of people that have experienced the same things I have. And that I could turn to those people for help, advice, and mentorship whenever it is needed."

The only semi-negative comment in the follow-up reports was that one student felt like she didn't get as much out of the conference at the time as she had expected, since much of the information had no meaning to her yet. She goes on to say, however, that many of the ideas she was exposed to then make sense to her now, and she "would recommend any undergraduate (or graduate student or working) female serious in pursuing a career in the computing or technology field to attend the conference. It is a great experience."

The Next Step for the Students.

Since the conference, three of the students have graduated and four are still in school. Of the students who graduated, one is in graduate school at Oregon Graduate Institute, one is working at IBM, and one is working at a temporary job with plans to attend graduate school next year. Of the ones still in school, three of the four say this about attending graduate school:

"Before attending the conference I had considered attending graduate school upon receiving my undergraduate degree but had never taken the idea too seriously. I think part of me was afraid that I would not succeed and another part of me just didn't know what to expect or what it would be like. Today I am still undecided about pursuing a graduate degree, but no longer for either of these reasons. Seeing so many smart and accomplished women at the Grace Hopper Conference somehow gave me renewed confidence in myself. Talking with them truly helped me to believe that I can go as far in this field as I am willing to take myself."

"One of many interesting things I learned from the Grace Hopper conference, is that one does not need to wait to get a higher degree. There are many women that get their Ph.D. in their twenties. I am planning to follow their steps and go to graduate school

> soon after graduation, since the more knowledge I get, the more opportunities for an interesting job I will have. Certainly, not everything is about a job. I am sure, many would agree, that knowing a lot or being good at something makes you feel good."
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> And from the student who was questioning whether or not to stay in computer science: "Since then, I am thinking about going to graduate school after I finish at Winona State next year. (I used to say that I was, just because I didn't know what I was going to do and I wanted to go to the conference, but now I really am thinking of grad school.)"
> P.S. She is now the president of the student CS Club.

The following is a parting comment of one of the students: "The Grace Hopper conference is a very good source of ideas not only for professionals, but also for students that are just starting their education. It is a great window, through which the real world and real people who achieved a lot can be seen."

Bringing These Experiences to Other Undergraduate Women.

Reading these students' reflections about the conference, I feel like they have indeed benefited from their experiences at the conference. I also think they were lucky in being able to get this kind of exposure while they are still undergraduates. As a discipline, we have benefited as well – since the conference, six of the seven students are going, or are seriously considering going, to graduate school. (Only one was sure of this before the conference.)

The good news for other female undergraduate students is that it is possible for them to also attend one of the future Grace Hopper Celebrations. They should be encouraged to apply for a travel scholarship as well as for other funding at their institutions to be able to attend the conference. But for those who will not have this kind of opportunity, faculty members should try to offer them some of the benefits mentioned by the students in this paper. In particular, we should try to expose them early on to the broader implications and applications of computer science. We should be attuned to their feelings of low self-confidence and give them appropriate feedback. We should also make them aware of the larger community of women in computer science. In that regard, the following site offers a number of up-to-date links to sites focusing on women and girls in technology:
http://www.umbc.edu/cwit/related.html

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