‘Can I Get Your Email?’:
Gender, Social Capital and Networking among Engineering Undergraduates

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Dr. Ames[1] *smiles to the class and says, "O.K., that's all for today." Beside her, the guest lecturer for the day starts packing up his slide projector as the students stand up, shuffle papers into folders and pick up their backpacks. This is the third guest lecturer I have observed in this introduction to Biomedical Engineering, and I wait to see if Elizabeth, who expressed interest in the topic of tissue growing, approaches or speaks to the guest lecturer in any way. Before class began, Elizabeth asked one of the TAs (Teaching Assistants) what today's guest lecturer would be talking about and upon hearing "growing of tissue" turned to a group of her classmates and said, "Oh good, that's what I want to do!"*

During the lecture, several of the students (female and male) ask questions about the slides and information presented; Elizabeth asks one detailed question regarding tissue growth. As the students slowly file out of the small, square classroom, two of the male students stop to talk to the guest lecturer (who is a PhD student), asking for more information about his internship at this particular company. From my vantage point by the door I can see which students stop and talk to the guest lecturer and hear their conversations. Puzzled, I watch Elizabeth, who had excitedly expressed interest in this particular topic, slide past the group of three men talking, and leave the classroom. This is the third time I've observed only the male students approach and talk to guest lecturers and I wonder not only why the female students do not approach them, but also what the consequences might be.

[1] All names are pseudonyms.

Introduction

Success as an engineer is, in good part, tied to having a variety of internships, laboratory experiences and work experiences as a student, attending conferences and making connections, and establishing as many contacts "in the field" as possible (ethnographic interview). One's ability to find out about and gain access to such situations and people who know about them may well be tied to "who you know." In other words, the greater one's networking skills and higher one's social capital—who you know—the greater chances for success in the world of engineering.

Addressing the issue of women engineering students and social capital, then, is important because the still low numbers of women students who do enroll and pursue engineering degrees may be adversely affected by their awareness of and ability to raise social capital. Their success as engineering students, resulting in higher retention rates for universities and their success as participants in industry and academia, resulting in greater diversity may well be linked to the connections and networks they build throughout their daily experiences as engineering students.

Numerous studies still report the "chilly climate" for women engineering students, detailing discrimination (Etzkowitz et al., 2000) and diminished self-esteem and self-confidence (Seymour & Hewitt, 1997). While these problems persistently occur and deserve continued attention, we need to begin digging deeper into the daily experiences of women engineering students, such as their ability to raise social capital, in order to learn the particular ways in which this climate is continuously constructed through everyday interactions.

The experiences of women engineering students demand continued scholarly inquiry, not only because the overall chilly climate results in fewer women continuing to Master's and Ph.D. degrees. This "leaky pipeline" results in women earning nearly 18% of all engineering bachelor's degrees, 20% of engineering Master's degrees, and only 15% of Doctoral degrees awarded for the academic year 1999-2000 (NCES, 2001). Departments such as biomedical engineering show higher numbers of women, with women earning 36% of the bachelor's degrees, 34% of the Master's degrees, and 32% of the Doctoral degrees for the same year (The Whitaker Foundation, 2001). However, by way of comparison, women earned 12% of the Doctoral degrees in chemistry, the next highest area, but a low of 10% in Mechanical and 0% in Mining (NCES, 2001). When asked about this range in numbers, an informant shakes her head and responds ruefully, "we're [women in biomedical engineering] pulling up the numbers of women in engineering."

Whether women engineering students understand the importance of building strong professional networks—social capital—and/or are encouraged to do so, may illuminate not only the ways in which the chilly climate persists but also shed light on their ultimate success as engineers (Etzkowitz et al., 2000; Reskin, 1978). Reskin notes the ways in which research occurs in a social context, prompting the researchers into reciprocal relations with one another: "These may occur as public, formal exchanges, such as presentations at meetings or published reports and the responses they elicit, or as the informal interaction that comprises most exchanges between scientific workers" (p. 8). Stohl (1995) echoes this: "Employees who are enmeshed in information-and resource-

rich networks can build coalitions with powerful supporters and are likely to be more successful" (p. 113).

Clearly, raising social capital has implications for women engineering students not only as students but also as future successful researchers, scientists, and professors. Thus, this study proposes to explore, through participant observation and interviews, the ways in which women engineering students raise their social capital in the classroom setting.

Women Engineering Students and Social Capital

> Social capital is the sum of the resources, actual or virtual, that accrue to an individual or a group by virtue of possessing a durable network of more or less institutionalized relationships of mutual acquaintanceship and recognition. Acknowledging that capital can take a variety of forms is indispensable to explain the structure and dynamics of differentiated societies (Bourdieu & Wacquant, 1992, p. 119).

In their recent book, Etzkowitz et al. (2000) discuss social capital, which they describe as "who you know" or the "web of contacts and relationships that provide information, validation, and encouragement" (p. 117). Whether social capital takes the form of fleeting informal relations to and contacts with other people, or critical concrete resources for internships and jobs, one's likelihood of attaining additional resources grows exponentially. In other words, the more social capital one raises, the more likely other opportunities will come:

> The presence or lack of connections to a mentor or role model of scientific success gives some individuals a head start and places others at a disadvantage.

> Importantly, social capital accumulation is all too often gender linked and makes a difference even among the successful (p. 118).

Bourdieu (1992) suggests that when studying the dynamics of a differentiated society, acknowledging various types of capital is essential. That women engineering students are located within a differentiated society, thus prompting this inquiry into social capital, is evident in part by their low numbers of enrollment as stated earlier in this paper. The other essential component of this differentiated society is the continuous negotiation of engineering's chilly climate for women, regardless of women's increased presence in classrooms and laboratories. Chilly climates are experienced by women in the sciences in general, physics and computer departments (Curtin et al., 1997; Etzkowitz et al., 2000; Margolis & Fisher, 2002), and are currently evident in engineering departments (Rosser, 1995). The chilly climate frequently referred to by these researchers includes advisor/advisee relationships, laboratory work, study groups, team projects, conferences, research/teaching assistantships, access to research grants, classes and other occurrences in the daily lives of women engineering students.

As a result, both minority status and the chilly climate immerse women engineering students in a differentiated society, presenting them with numerous and complex negotiations in order to earn their degrees. The ability to raise their social capital is one such negotiation. Scholars writing from a variety of disciplines underscore the importance of social capital and success in academia: women students in geography programs (Hansen & Kennedy, 1995); black students in accounting programs (Bruce, 1993); and women in the sciences (Reskin, 1978). Women engineering students often remark that isolation is one of their most devastating experiences and Etzkowitz et al.

(2000) note that beginning a career without connections "isolates an individual at the very stage of a scientific career when visible achievement is crucial to long-term success" (p. 122).

That raising social capital during one's college career is essential to success after college becomes particularly apparent when considering that today's scientific work and practice "revolves around interdependencies among scientists best managed through social capital" (Etzkowitz et al., 2000 p. 128). Not only is raising social capital important during college for internships, but awareness of how and when to raise one's social capital may well lead to success when in academia or industry (for the importance of social capital and networking in careers see Ibarra, 1992; Podolny & Baron, 1997).

If women engineering students do not raise their social capital when opportunities present themselves and male students do and social capital positively or negatively affects their careers, then women students are differentially affected by social capital. Puzzling over why male students and not female students talked to guest lecturers after class eventually led me to consider not only the importance of social capital but the consequences of low social capital for women engineering students. Thus, the research questions that follow came directly from phenomena recorded during my participant observation of an introductory biomedical engineering classroom. The overall Research Question that guided my analysis was: In what ways do women engineering students take opportunities to raise their social capital? Inherent in this question are the following sub-questions:

a. What do women engineering students think about the importance of social capital (making contacts with other professors and guest lecturers such as practitioners, research directors, and/or physicians)?
b. In what ways do the students receive encouragement to interact with the guest lecturers from professors, teaching assistants, or the guest lecturers themselves?
c. In what ways do female and male engineering students talk to others who are in positions to raise their social capital?
d. What is the content of these conversations and/or the information exchanged, when they do occur?

Methodology

A qualitative inquiry, such as conducting observations in engineering classrooms, is particularly well suited to pursuing women engineering students and the importance of social capital. As Lindlof and Taylor (2002) note, "humans infuse their actions—and the worlds that result—with meaning. We are, at root, trying to make sense, and to get by. In this view, meaning is not a mere accessory to behavior. Rather, it saturates the performance of social action" (p. 7). Observation, then, of an introductory biomedical engineering classroom at a large research-based university allowed me to enter the world of women engineering students in ways that interviews or self-reporting surveys alone would not permit. For example, it was observation in the classroom that prompted me to look at the ways in which female engineering students did <u>not</u> interact with guest lecturers when the male students unfailingly did. It is unlikely I would have asked such questions in interviews or that such information would be spontaneously self-reported.

I have spent nearly thirty-two hours engaging in participant observation, from the beginning to the end of one semester at a large research university. Two professors (who granted me access) team-taught the class, and were aided by two teaching assistants. The class was comprised of twenty women and twenty men, most of who were sophomores and juniors (class standings based on ethnographic interviews). The higher than average number of women reflects the higher than average number of women in biomedical engineering, in which women earned 39% of bachelor's degrees in the year 2000 (The Whitaker Foundation, 2001). The class of forty students met twice a week and split their time between the classroom and laboratories conducting various experiments. I observed the interactions of students with a total of eight guest lecturers.

During the time I spent observing, I took scratch notes and head notes and engaged in several ethnographic interviews, writing up the notes and ethnographic interviews into fieldnotes within twenty-four to thirty-six hours of each observation, resulting in forty-five pages of single spaced typed fieldnotes. I assigned pseudonyms to the professors, teaching assistants and students in the fieldnotes. In addition, I have conducted one-on-one interviews with three female students (Elizabeth, Ruby and Jessie) from the class who volunteered their time; the interview schedule (see Appendix A) has been generated from the fieldnotes and is reflected in the research questions listed above. The interviews lasted on average one hour, and were transcribed by me within twenty-four hours; the interviewees were invited to choose their pseudonyms.

When crafting questions for qualitative research projects, one must remember to be flexible and open to changes as "[t]he questions that grip researchers in the middle passage of the project may scarcely resemble the ones that motivated them in the

beginning" (Lindlof & Taylor, 2002, p. 7). Indeed, it is the unexpected that emerges during the qualitative process that can produce the most significant and exciting findings. This could not be truer for this particular project. Initially, I approached my fieldnotes with the grounded theory method as suggested by (Charmaz, 2001) and began coding for as many categories as possible, expecting that I would be focusing on various aspects of the chilly climate for women in engineering. To name a few of the emerging codes: female and male students speaking in class; female and male students participation in and presenting for team projects; experimentation on animal "models"; female students discussing perceptions of women in the sciences; female and male students approaching guest lecturers for contact information. By the fourth week of observation, it became apparent that the interactions between the students and the guest lecturers were intriguing, and I narrowed my focus to women engineering students and the importance of social capital.

Consequently, for this paper, I have employed an iterative process of constant comparison between my fieldnotes, interview transcriptions, event listing matrix and the literature on women engineers and social capital. As recommended by (Miles & Huberman, 1994) I created an event listing matrix (see Appendix B) to count and compare how many women vs. men asked questions and/or made comments during guest lectures and how many women vs. men spoke to the guest lecturer after class as well as the content of those conversations. Through this constant iterative process involving fieldnotes, extant literature and research, and interviews I believe my findings will be both plausible and confirmable. Even so, (Richardson, 2000a) reminds us that, "[e]thnography is always situated in human activity, bearing both the strengths and

limitation of human perceptions and feelings" (p. 254). Therefore, I do not claim that my findings represent "the truth" about women engineers and social capital, as despite my taking great care, they are the culmination of my observations, interpretations and biases. As such, I do not make claims of validity through triangulation, for example; rather I suggest the imagery of the crystal (Richardson, 2000b). Holding this study up to the light, as one would a crystal "provides us with a deepened, complex, thoroughly partial, understanding of the topic. Paradoxically, we know more and doubt what we know. Ingeniously, we know there is always more to know" (p. 934).

Raising Social Capital

"It's kind of nice to have connections somewhere."
(Elizabeth interview)

On the last day of observation Dr. Noble presented PowerPoint slides containing information on biomedical engineering as a career: various fields to enter; salaries; geographic locations of various companies; factors affecting employment. The factors affecting employment slide had subheadings, one of which was networking skills. He talked to the class about the importance of getting to know people and reminded the students that one of the guest lecturers met someone at a poster presentation, got an internship from the encounter and now works for that company. He emphasized that meeting people at job fairs or poster presentations "can be really important." All of this advice points to how important social capital is to these students for their futures as engineers and indicates that within the classroom setting they are receiving information and encouragement from faculty about ways to raise their social capital.

However, as observation of this classroom suggests, a disconnect occurs between the students receiving this information, which they receive from various sources such as

faculty, freshman orientation, advisors, graduate students, and societies (ethnographic interview) and women students actually taking advantage of informal opportunities as they arise, at least within this classroom setting. For example, the three women I interviewed (Elizabeth, Ruby and Jessie) were well aware of the department's internship program; they mentioned it without prompting from me, stated the coordinator's name, and were able to tell me what they needed to do to get the department's internship program to work for them. When I asked the three women how they found out about available internships, Elizabeth's answer is typical: "There is an internship coordinator, [name], and she is in our department and you put in a resume, fill out a form and she takes care of you." In addition, she mentioned that most companies have internship information on their websites and it is "easy to go to them and see what's available."

Beyond the departmental internship program, the three students mentioned friends, engineering friends, boyfriends already in industry, family members, and current job connections as means to hear about and obtain internships and jobs. Jessie stated that "more personal contacts" through "boyfriends and other engineering friends" might make the difference for her in obtaining employment after graduation. Her boyfriend is an employed engineer and when she attends corporate parties with him she knows that the "value of a good first impression and remembering somebody's name" will help her maintain connections and keep options open for her. Jessie also works with a graduate engineering student in a lab on campus and indicates that she expects to establish connections through her: "The grad student I work with has been to lots of conferences and maintains contacts from there so she's been a little bit helpful in steering me the right way."

Elizabeth mentioned that her "cousin's husband is a[n] engineering major and he's been feeding me info as well so if I wanted to I could be working for, like, the lab he works for over the summer." Also approaching someone she knew, Ruby detailed how she obtained her current position in a professor's lab:

> I talked to the secretary in the college and she helped me narrow down the list so I knew who was really doing what research. I asked the secretary who was taking students so I would know who to approach about getting in their lab. I knew I really needed the experience and I just more or less talked my way in and offered to work for free just to get the experience. I pushed my way in.

There are three points of interest here. First, all three students are well aware that they need connections and extended networks to obtain information and opportunities about internships and jobs. Second, all three mentioned either a family member or someone with whom they are familiar and/or is not an authority figure (the department secretary for example) as their main source for information. Third, all three women actively pursue their family members, friends, or the people they know to maintain and take advantage of those contacts. They are, in effect, actively managing and raising their social capital.

Consequently, one would expect to see these women actively raising their social capital in the classroom setting, especially one that affords them up to eight guest lecturers with whom to interact, obtain email, and generally meet and make connections. As I will detail in the following section, however, male students overwhelmingly took advantage of opportunities to raise their social capital with guest lecturers, while female students did not.

"A lot of people at the end [of class] will all rush up to, like, the tables, and a lot of them are getting the phone numbers and getting the connections."

Elizabeth made this statement when asked about obtaining information about internships and jobs from the guest lecturers after class. She does not mention, however, that the people rushing up to the table to speak to the guest lecturer are the male engineering students. Throughout the semester I observed, as noted in Appendix B, male students approaching the eight guest lecturers twenty-three times; female students only three times. In general, the content of the conversations between the male students and the guest lecturers involved internships, careers, classes, and contact information. Of the three contacts between the female students and the guest lecturers only one involved contact information, the other two involved a few words exchanged in passing. The content of those conversations is essential for this issue of raising social capital and will be discussed in greater detail in the last section. Here, I discuss any interest expressed by the students in the various topics to explore whether simple individual interest might be a factor in approaching the guest lecturers.

Generally, I arrived thirty minutes before class began and was able on several occasions to observe whether students were interested in the upcoming lecture. Perhaps the best example of this is presented at the beginning of this paper, when Elizabeth expressed such excitement at the prospect of hearing about tissue growth. She turned to her classmates saying, "Oh good, that's what I want to do!" before class and asked a detailed question during the lecture. Another instance occurred during the first guest lecture when I observed one of the female students, who had asked several detailed questions during the lecture, write down the guest lecturer's name, email and telephone number in her notebook. One female student in particular asked questions and

participated in conversations with every guest lecturer and was by far the most vocal and involved of all the students in the classroom during the entire semester. Yet none of these three women approached any of the guest lecturers in order to obtain contact information. Elizabeth, at a later date, does exchange a few words in passing with one of the guest lecturers but no personal connection is made or information exchanged.

Overall, the female students asked and answered more questions during the guest lectures than did the male students. Of the eight guest lecturers women responded either to questions asked or initiated questions on their own forty-one times, and the men thirty times. Based on this information it does not seem likely that women students do not approach guest lecturers merely because they are not interested in the particular topics. If anything, they expressed more interest or at least participated more with the guest lecturers than the male students, yet did not take advantage of those opportunities to raise their social capital. This is not to say that personal impressions might not be a factor, however, or that students should be expected to approach every guest lecturer. Ruby, for example, referred to one of the guest lecturers as "kind of a goof-ball."

It does not appear likely then, that women engineering students fail to raise their social capital through contacts with guest lecturers because lack interest in the topics presented. These are, after all, biomedical engineering students, enrolled in a biomedical engineering class, listening to professionals with various biomedical engineering backgrounds and careers. Nor would this explain why male students approach guest lecturers at a higher rate than female students. Is it possible, then, that the guest lecturers themselves are not as approachable as they might be or that it is not apparent to students that they might raise their social capital by interacting with them?

"Oh, absolutely you can contact me, I love hearing from students!"

Not all of the lectures will be recounted in detail here; rather I will provide general information and then proceed to focus on three that best exemplify whether the guest lecturers encouraged the students to approach them and whether they offered information regarding internships. All eight guest lecturers (who live and work locally) stressed the importance of internships, working during the summers and research/laboratory experience in general; five actively promoted internships with their companies during their talk. Three of them provided their names, emails and telephone numbers on their last PowerPoint slide as well as provided their business cards for the students to pick up after class. During the lecture on tissue growth, in which Elizabeth expressed interest, the lecturer wound up his presentation by talking about the importance of internships and how to go about getting an internship at this particular company. After class was dismissed, two of the male students approached the guest lecturer at the front of the room and began an animated conversation. As the room is small and square and filled to capacity with forty desks, Elizabeth must walk by this group and she literally slid by with her back to the three men and their conversation. Despite the guest lecturer stressing the importance of internships, that he held one himself at this company and could provide information on how to get one at that facility, no female students approached him or lingered by this conversation, which lasted for over ten minutes.

Another guest lecturer was a biomedical engineering graduate of this same university and she recalled how she obtained her current job through an internship. When she was a student, there was no formal internship program but she was able to make a contact for one during a presentation she made at an engineering fair. She "knew

someone who knew someone" who worked at BioMed, Inc. After talking with him at this fair, she explained she was able to "get my foot in the door" and the internship led to her current job there. One of the male students then asked her if she is in a position to make decisions about internships and although she is not she offered to talk to any of the students about how to best obtain internships and what might be available at her facility. She offered her contact information and after class three of the male students talked to her at length about her company, her position there, and internships in general. None of the female students stop to join in this conversation.

The last guest lecturer for the semester did not indicate that he was in a position to offer or talk directly to students about internships, but like the other lecturers stressed that a varied research/lab experience and internships could certainly make a difference when the students were out looking for jobs. After his lecture, Ruby stopped at the table and said, "Can I get your email?" to which he replied, "Oh, absolutely you can contact me, I love hearing from students!" After she wrote down the information, two of the male students walked up and asked the same question to which they also received an enthusiastic reply. It is important to note that all of the guest lecturers stated they would be happy to talk to students about careers and the field of biomedical engineering. In addition, whether they offered direct internship connections for their company or not, the male students of the class approached them: this suggests that the possibility of making a direct connection for an internship or job was not the deciding factor.

"Can I get your email?"

In this final section, I discuss the general content of the conversations between students and guest lecturers and examine in greater detail two of those conversations. When the male students approached the guest lecturers the conversations ranged from classes they should be taking, to their history as students, to internships, to the jobs of the guest lecturers, to whether they could contact the person at a later date. These conversations were as short as a few minutes and as long as fifteen, often with several of the male students clustered around the guest lecturer as they alternately asked questions and listened to one another.

It was not until the fourth guest lecture, which was given by a woman who is both a surgeon and a PhD that I fully appreciated the differences between the ways in which female and male students approached and talked to guest lecturers. While she was not in a position to offer internships, she did talk at length about the importance of them and of getting as much experience as possible in order to succeed after graduation. Students responded well to her lecture by laughing at her jokes, intently taking notes and again, more women than men interacted with her during the lecture by responding to her questions and initiating questions of their own. After she finished with her lecture and the students rustled papers and hauled backpacks to the tops of their desks in preparation of leaving, Elizabeth passed by her at the front of the room and said something so quietly I could not hear the comment. In response, the guest lecturer said to her, "hope that inspired you" and Elizabeth answered "yes, it did" as she smiled, looked down and walked with her back half-turned to the guest lecturer and left the room.

Elizabeth approached and exchanged words with the guest lecturer but the words exchanged did not raise her social capital nor did her body language suggest that she was comfortable engaging with this person to any greater degree. Just after Elizabeth walked past the guest lecturer, another female student approached the table and (again, I don't hear the words) must ask the guest lecturer where she received one of her degrees. I suggest this as the guest lecturer answers "University of ─" and smiles as she says it. The student says, "just wondering" and after smiling back walked past the table and out the door of the classroom. This is the first time any of the women students have approached any of the guest lecturers and in neither case was contact information or career information exchanged. In contrast, four of the male students immediately clustered around the guest lecturer, asking questions about funding from universities for research, how small business venture capital works and more detailed questions about her research. They stay grouped around her and the table for more than five minutes. It is worth noting that I had difficulty hearing the two women who approached the guest lecturer: this never occurred with the male students.

In all, only three women approached guest lecturers after class. As mentioned briefly in the previous section, Ruby also stopped and approached a guest lecturer and asked for his email, as did two of the male students. Again, there is a striking difference: Ruby left the room after writing down the information and the two male students stayed to talk about the guest lecturer's career, their hopes and aspirations, and classes they should consider taking. This was the only instance where I observed one of the female students actively raising her social capital, although it is certainly possible that some of the other female students might contact the guest lecturers at a later date. But as Jessie

indicated during her interview the "value of a good first impression and remembering somebody's name" cannot be discounted when approaching someone for an internship or job. It seems reasonable to suggest that the guest lecturers will likely recall the male students with whom they had extended contact and not the female students with whom they had fleeting or no contact at all.

During the interviews I asked all three women specifically whether talking to guest lecturers was a good way to network for internships. Elizabeth stated that she "should be but I'm just not to that point yet. A lot of people are in their junior year and it's also good that they do that." She indicated that as a sophomore it's too early for her to be thinking about such networking, yet later in the interview she talks at length about her "cousin's husband" who can probably get her a job in his lab and how important that experience will be to her when she is job hunting. When asked whether she had approached any of the guest lecturers, she said that she had a class right afterwards and usually didn't have time. However, a number of the classes with guest lecturers were out early (according to my fieldnotes) and, conceivably, she would have had time for a short conversation. The same could be said for a number of the other women in class. On at least three occasions after class was dismissed, I observed various female and male students sit in the classroom for fifteen to twenty minutes discussing their team projects. As another class did not immediately occupy the room, many of the teams took advantage of the time and space and discussed their labs and papers.

Jessie did not approach any of the guest lecturers and I was unable to arrive at a satisfactory understanding of why. When I asked about talking to the guest lecturers she agreed that this would be a "good way to meet some folks who have similar interests" but

did not elaborate. Additional probes suggest that her "limited contacts in the field" are through a close circle of engineering friends and her boyfriend. Possibly approaching a stranger was too uncomfortable for her as she did mention the department's internship coordinator as a good source for getting an internship.

Ruby, who remains the exception of the women in the class, also talked of people she knew (department secretary, graduate student, internship coordinator) as her main contacts for internships and job possibilities. When asked if she had approached any of the guest lecturers, she said, "Y-e-a-h, I think maybe one or two? It kind of depended on what they talked about." Clearly her brief exchange with the guest lecturer did not leave as great an impression on her as it did on me! She suggested that approaching guest lecturers as a means of networking was an option but not an important one.

Conclusions and Implications

Research indicates that raising social capital is important for women engineering students as higher social capital may well result in greater access to internships, which not only provide experience and additional contacts, but may also lead to job opportunities after graduation. As such, subsequent studies would do well to take race, class, ethnicity, and country of origin into consideration when exploring women engineering students and social capital. Placing analytic weight on gender alone forecloses questions about the intersections with which women engineering students live. Returning for a moment to the workplace, Stohl (1995) notes:

> The difficulties many women and minorities have when they enter the workplace can be explained in large part by the social matrix within which they are embedded. The interpersonal communication differences among men, women,

> and minorities play only a small part in understanding why women and minorities have been unable to move up the hierarchy at the same rate as their white male counterparts. The unequivocal conclusion of dozens of studies is that gender and racially segregated interaction patterns deny women and minorities access to the information, resource allocation, and support that would aid their mobility and success in the organization (p. 113).

Substitute "workplace" with "college" or "engineering department" in the passage above: the stakes for women and minorities in school and in the workplace are exceedingly high. While learning how to access information as students may well aid them later in their professional careers, clearly the institutions must make changes as well. That, however, is the topic for another study.

Nonetheless, within this particular classroom setting, women engineering students did not take advantage of raising their social capital in the same ways in which the male students did. The question remains: Why? Here I revisit my specific research questions along with my findings and suggest why this occurs along with implications for future practice in universities and among supporters of women in engineering.

Clearly, those women engineering students interviewed are aware of the importance of networking, although only one of them actively worked to raise her social capital by speaking with a guest lecturer. The findings from this study coupled with the fact that engineering students in general receive a great deal of information regarding the importance of internships, suggests that women engineering students are aware of the importance of social capital. For example, all three interviewees mentioned the department's internship coordinator by name and on one of the last day of class, Dr.

Noble reiterated the importance of networking. However, making contact with other professors, practitioners, research directors and physicians may not be as easy as networking with people they know or to whom they are related. Perhaps as additional modeling and conversation regarding the importance of social capital occurs between mentors, professors and women engineering students this might be improved.

Students in the class were encouraged by their professors to become better at networking and the guest lecturers invariably stated that they were willing to talk to students about internships and/or jobs and career opportunities. This study suggests that despite these encouragements, women engineering students may need more specific, possibly hands-on mentoring about how to raise their social capital when faced with persons unknown. Professors and mentors may wish to have individual conversations with their female students and give specific examples of how they go about engaging in informal and formal networking. Existing support systems, such as Society for Women Engineers, Biomedical Engineering Society, and Women in Applied Sciences and Engineering, could offer workshops on how to network more effectively in specific situations. Additional interviews with women engineering students with the purpose of investigating their experiences with networking and raising social capital would also add to our understanding of the ways in which women make or do not make these connections. This study is also limited by solely comparing gender differences and not addressing the intersections of race, ethnicity and/or international student status. These variables also need to be addressed in future studies.

The ways in which the female and male engineering students talked to others and the content of those conversations varied greatly. Male students raised their social capital

at higher rates than did women students in the class, even though the female students participated more through questions and answers. Therefore, this study does not suggest that in this particular setting, women students were experiencing an overt chilly climate that wholly silenced their participation in class. Indeed, as the undergraduate ratio of women to men in the biomedical engineering department of this university is nearly 50/50, women's experiences in such classrooms may not reflect the national norm. Nonetheless, in a classroom where half the faces are female, only one woman actively attempted to raise her social capital. This study suggests, then, that in this particular setting high numbers of women engineers do not completely influence the decisions a student makes as she negotiates the complex interactions that comprise her day. As more women enroll in engineering programs and as universities struggle with attrition rates the implications of studies suggesting that numbers do not always matter will become increasingly important. Additional qualitative studies such as this, which dig deeper into everyday experiences, are sorely needed if we are to continue our quest to understand the lives of women engineering students.

What is perhaps most telling about the different ways in which women engineering students raise their social capital is the content of the conversations between the students and the guest lecturers. While the male students discussed internships, careers, classes, and their aspirations as scientists and researchers, the women students (even Ruby, the one exception) missed out not only on those contacts but also on potentially valuable advice and information. As another example, the most vocal female student in the class, who initiated the most questions and responded frequently to questions asked by the guest lecturers, said on several occasions that she was seriously

considering medical school. At least two of the guest lecturers were physicians, yet she did not approach them for advice or information regarding medical school. While there may be many reasons for this, if she possessed greater awareness of raising social capital, she might have taken the opportunity to establish such contacts. Nonetheless, a note of caution is required. This study does not suggest that every student must attach herself to every guest lecturer she meets; common sense should prevail. Topics of interest and personalities certainly will play their part in whether two people connect and communicate.

This study suggests that women engineering students may be differentially affected by their ability to raise social capital in the classroom setting, but does not suggest that women engineering students are wholly incapable of raising their social capital. Rather, institutional support appears to favor those who do not rely solely on kin networks for connections. If women are not aware of how to extend their networks and augment "who they know" beyond family members and friends they may well miss out on information vital to their careers and their research. Networking skills improved while attending school would serve them well as professors and/or engineers in worlds where informal contacts may rely on that essential bit of information.

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Appendix A

INTERVIEW GUIDE

Background of Student

1. What is your major and year in school?

2. Do you recall when you decided to become an engineer?
    a. Are there engineers in your family?

3. What math and science classes did you take in high school?
    a. Were you encouraged to take those classes and, if so, by whom?
    b. How many female students were in those classes?
    c. How many international students?
    d. How many students of color?

Life of an Engineering Student

4. Tell me what your typical day is like as an engineering student

5. What is the general demographic make up of your engineering classes?
    a. Women?
    b. International students?
    c. Students of color?

6. Tell me about some of the people that you interact with most in your engineering classes
    a. Examples?
    b. Can you tell me the demographics of those people?

7. (Depending upon answer/interviewee) Why do you think domestic students don't often interact with international students?

8. What's the best thing about being an engineering student?

9. What's the most difficult thing about being an engineering student?

Speaking in Classes

10. How often would you say students ask questions of professors/TA's in your engineering classes during lectures? Does this differ from your non-engineering classes?

11. How often do you ask questions during lectures? Do you ask more or less questions in your other classes?
    a. Why do you think that some people never speak out in class?

12. I've heard that talking to guest lecturers after class is a good way to network for internships. Do you agree?
    a. What are other ways to find out about engineering internships?
    b. Have you approached any of the guest lecturers in this or other classes?
    c. If so, what have your conversations been about?

13. How important is networking for your success as an engineer?
    a. In what ways do you think you network and what for?

Team Project Experience

14. Give me a sense of how team projects work in engineering classes
    a. How are teams chosen?
    b. What are the different tasks? How are these roles assigned?
    c. I've been told that generally the team leader presents to the whole class. Do you agree and how is that leader chosen?
    d. Do you ever handle equipment with which you're unfamiliar? Tell me what you do when that occurs.

15. Describe your best team project experience and why

16. Describe your worst team project and why

17. What would be the ideal team project experience?

18. (Depending upon interviewee) In what ways have your team project experiences been shaped as a woman of color/international student?

19. Would it make a difference if all your team members were women? Men? International students?

General Experiences

20. I've heard that women often feel uncomfortable speaking in engineering classes and/or are often not called upon. Do you agree? Has this been your experience?

21. Have you overheard sexist, racist, or homophobic comments regarding other engineering students from your classmates? What did you do?

22. Is everyone's experiences in engineering classes the same?

23. What determines, beside your intelligence, your ability to succeed in engineering classes?
    a. To like them, to feel challenged, to feel accepted…

24. In what ways does gender affect students' experiences in engineering classes?
    a. Does one gender have it easier than the other? Why or why not?

Closing Questions

25. What else would be important for me to know about women engineering students? Women of color in engineering? International students in engineering?

26. What advice would you give to women engineering students? Women of color in engineering? International students?

27. What would you like your pseudonym to be?

Appendix B

EVENT LISTING MATRIX FOR STUDENTS SPEAKING TO GUEST LECTURERS

G.L. = Guest Lecturer
W = woman student M = male student
??s = questions asked
p. = fieldnote page

G. L. date & gender	G.L. promoted internships?	Observed specific student interest prior or during lecture?	Questions, answers and/or comments during lecture?	Spoke to G.L. after class?	Who and content of talk after class
#1 9/24 male	Yes p.6	1 W writes down email & phone info p.6	2 W ask ??s p.6 2 M ask ??s p.6	0 W 5 M p.6	M take business card, talk of school, interests, internships p.6
#2 10/8 female	Yes p.19 & 20	1 W intense interest in prosthetics p.19	Several from W and M p. 20	0 W 3 M p.20	M talk of careers in field, classes to take, internships p.20
#3 10/10 male	Yes p.23	1 W upon hearing topic "oh, good that's what I want to do!" p. 22	3 W ask ??s p.23 4 M ask ??s p.23	0 W 2 M p.23	M talk of internships, classes to take p.23
#4 10/22 female	No (she's a vascular surgeon w/PhD & does research)	No	2 W ask 3??s p.27 1 M asks ??s p.27	2 W p.27-28 4 M p.28	W says "thank you" answers "yes, it did" to the ?? "hope that inspired you?" p.27 W asks where G.L. went to school p.29 M talk of ASU funding, about small business, about research p.29
#5 11/5 female	Yes, but not in position to provide p.34	No	4 W ask 8 ??s p.34 4 M ask 4 ??s p.34	0 W 3 M p.35	M talk about her position in company and internships p.35
#6 11/12 male	No	No	2 W ask total of 13 ??s p.37 5 M ask total of 8 ??s p.37	0 W 2 M p.37	M talk of classes to take p.37
#7 11/14 male	Yes p.38	No	2 W ask 4 of the ??s p.38 2 M ask 4 of the ??s p.38	0 W 2 M p.38	M talk of internships, classes to take p.38
#8 11/26 male	No	No	4 W ask 6 ??s p. 43 6 M ask 7 ??s p. 43-44	1 W 2 M	W asks for email, leaves M ask for email & G.L. responds "Oh, absolutely you can contact me, I love hearing from students!" p. 45