

2006-885: LONGITUDINAL SURVEY OF FEMALE FACULTY IN BIOLOGICAL & AGRICULTURAL ENGINEERING IN THE UNITED STATES AND CANADA

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Longitudinal survey of female faculty in biological and agricultural engineering

Abstract

Female faculty in Biological & Agricultural Engineering (BAE) were surveyed in 1998 to examine their professional experiences, motivations, and insights. Approximately 7% of all BAE faculty were women in 1998, and the total number of women in the population was 57. Results, based on a 61% response rate, showed that a significant number of respondents had engineers or professors in their immediate families. Sixty percent of the population was assistant professors. Respondents reported that BAE departments provided a supportive environment and believed that the attraction of women to BAE is due to its emphasis on biological systems, as well as Biological Engineering's newness and lack of long-standing stereotypes of male dominance. Full results of the original survey were published in the *Journal of Women and Minorities in Science and Engineering* in 2000. We are re-surveying the population of women in BAE in 2005-2006 because we believe that longitudinal data on this population will provide interesting insights into this group and its experiences in the profession. The population is now comprised of 96 women and represents approximately 11% of BAE faculty. Approximately 85% of all women in the original 1998 survey population are contained in the current population. Reasons for exiting the pipeline include staying in academia but moving to non-BAE departments such as chemical or bioengineering, being promoted to leadership positions without retaining BAE status, or pursuing other professional opportunities. Confidential surveys are currently being administered (thus far we have a 20% response rate). Forty percent of the population is assistant professors, and the percentage of full professors has doubled since 1998. Full results of the survey to date are reported in this paper.

Introduction

Biological and Agricultural Engineering (BAE) is a science-based engineering discipline that addresses problems or situations involving living things or products of living things. Agricultural Engineering was recognized as a distinct engineering discipline in the early twentieth century and was initially involved with the mechanization of agriculture. Other areas of research and practice developed during the twentieth century, including food and fiber processing, environmental impacts of agricultural practices, and machinery systems. During the past 20 years, agricultural engineering has shifted significantly toward biological engineering. Almost all programs originally named agricultural engineering have been changed to include biological or biological systems to reflect this shift. The primary professional society of the discipline, the American Society of Agricultural Engineers (founded in 1907) changed its name to the American Society of Agricultural and Biological Engineering in 2005. Students with an interest in biological engineering comprise the vast majority of students enrolled in BAE programs.

This study was motivated by an informal conversation among female faculty in BAE departments during the 1998 ASEE meeting. After determining that our experiences as women faculty were remarkably similar, we wondered about the experiences of others in the discipline. This led to an original survey that Lima and Christy developed and administered (with undergraduate researcher Cauble) to female faculty in BAE in 1998. Our objectives were (1) to survey this group on their motivations for choosing engineering, their personal and professional experiences, and their reflections on women in engineering, and (2) to make recommendations to better integrate women into all engineering disciplines. The work was presented at the 1999 ASEE meeting (Cauble et al., 1999) and the full study was published in 2000 (Cauble et al., 2000).

In 2005, we decided to re-survey the same population with a largely similar instrument. The 1998 survey represents the pioneer generation of female faculty in BAE. It is our belief that following this group of faculty longitudinally will provide useful insights into the experiences and career paths of women in all ranks of engineering as they “turn the corner” from underrepresented to critical mass.

Methods

We started with the original 47 item survey, which was developed with assistance from an expert panel and LSU’s Measurement and Evaluation Resources Center (see Cauble et al., 2000, for details regarding survey administration and validation). We consolidated this instrument to 35 items (see Appendix for a copy of the survey) and had this instrument approved by LSU’s Institutional Review Board. The web sites of all BAE and similarly named departments (not including bioengineering or biomedical engineering) were checked and female faculty members were identified accordingly. E-mail surveys were sent to all candidates, who were asked to complete and return the survey within six weeks. Two e-mail reminders have been sent to those who have not yet returned completed surveys. Thus far, 20% of the population (19/96) has completed surveys. An overall 61% response rate was achieved during the 1998 survey. We are hoping to receive a similar overall response rate for the current survey. The results reported below are based on the 20% response rate.

Results

Results will be discussed in the three sections that the survey addressed: general information, advising and mentoring, and gender issues.

General information. The total number of female faculty in BAE increased from 57 in 1998 to 91 in 2005-2006. The total number of faculty in the BAE discipline stayed approximately constant between 1998 and 2005-2006, though four programs were eliminated or merged with other programs during this time period. The University of Florida was the first to hire a female faculty member as Department Head in 2003. In 2005, a faculty member from the original population was hired as the Founding Director (equivalent to a Dean position) of the School of

Engineering at Florida Gulf Coast University. We are encouraged by the increase in the survey population and respondents being promoted into significant leadership positions.

Eighty-nine percent of respondents were tenure track faculty. Table 1 shows the professorial rank of the survey population from 1998, from 2005-2006, and from tenure-track female faculty across all engineering disciplines. It is encouraging to note that the percentage of full professors doubled during the seven year time between surveys and the percentage of associate professors increased by 30%. The data indicate that women are successfully progressing through professorial ranks and are continuing to enter the professional pipeline. BAE data are similar to national data with regard to professorial rank; the percentage of associate professors is 6.5 percentage points higher and the percentage of full professors is 7.1 percentage points lower than the national average. We postulate that BAE is slightly below the national average in terms of promoting women to full professor.

Professorial rank	1998 survey data	2005-2006 data	2005 data, all disciplines (ASEE)
Assistant professor	60	40	39.4
Associate professor	30	39	32.5
Professor	10	21	28.1

Table 1. Percentage of women faculty in professorial rank (based on 100% of female faculty in population)

The age of respondents for the two surveys is shown in Figure 1. Data in 2005-2006 indicate a more uniform distribution between age 31 and 50 than in 1998.

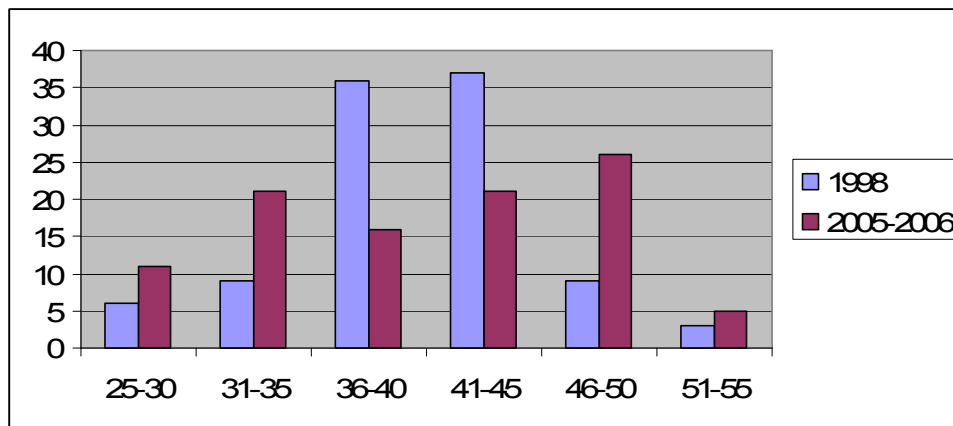


Figure 1. Percentage of respondents as a function of age range

Survey respondents were asked about the number of years that they had been in academia. This question was not asked in 1998, thus 2005-2006 data are presented in Figure 2.

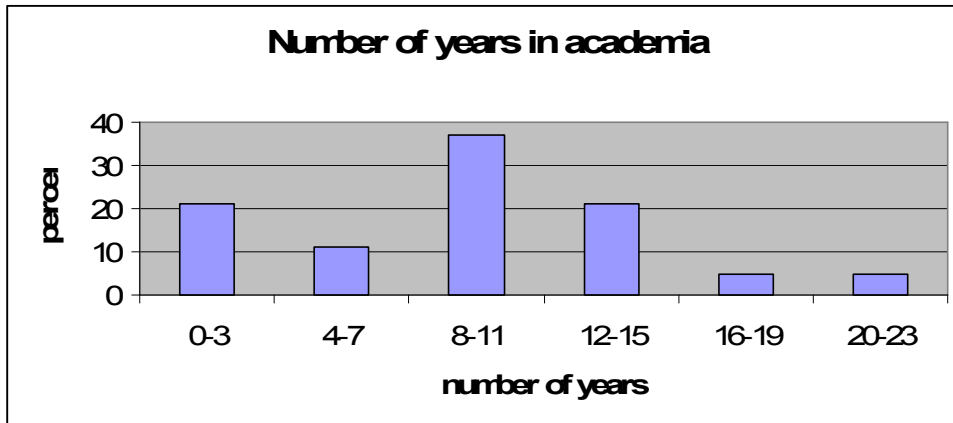


Figure 2. Percent women as a function of number of years in academia

Pipeline effects. It is widely acknowledged that there is a pipeline effect regarding women in engineering, with fewer women represented at higher levels of professional experience. Nationally, women comprise 20.3% of B.S. engineering graduates, 21.9% of M.S. graduates, 17.8% of Ph.D. graduates, and 10.4% of engineering faculty (ASEE, 2004). It is encouraging to note that the pipeline effect appears to have shifted upward, with decreasing representation occurring between finishing the Ph.D. and starting a career in academia. The BAE discipline is similar to national data, as seen in Figure 3. There still exists a pipeline, but all values of percent representation have shifted upward compared to seven years ago.

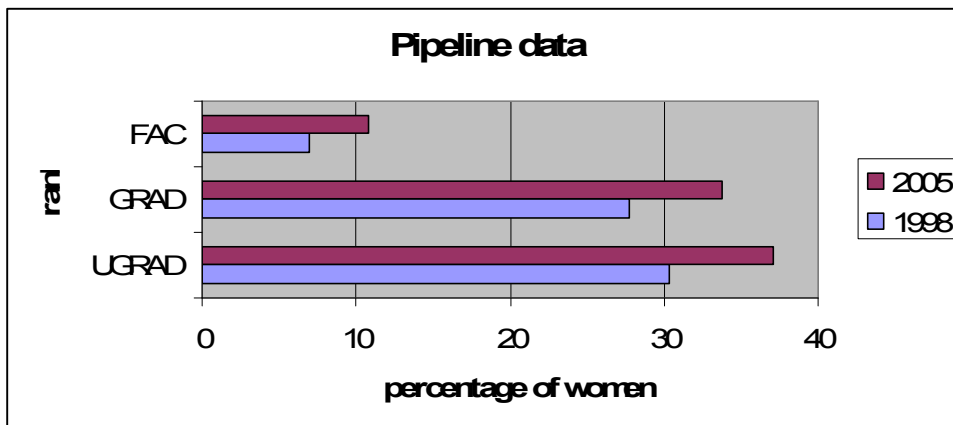


Figure 3. Percentage of women enrolled in undergraduate and graduate programs, and percent female faculty in BAE in 1998 and in 2005-2006.

Respondents were asked about their personal lives and data are contained in Tables 2 and 3. A very high percentage of women faculty in BAE is married or partnered. Nationally, approximately half of all women in academia are married, and approximately 25% have children (Toth, 1998).

Current family situation	1998 survey data	2005-2006 survey
Married/partnered	70.5	89.5
single	15	10.5
widowed	3	0
divorced	11.5	0

Table 2. Personal status of respondents (percent)

Number of children	1998	2005-2006
0	53	68
1	14.5	5
2	20.5	21
3	9	5
>3	3	0

Table 3. Number of children (percent) of respondents

Respondents were asked a number of questions related to factors that led them to engineering and academia. One interesting finding from 1998 was that 34% of respondents had at least one family member that was an engineer and 35% of respondents had at least one professor in their family. Taken collectively, 48% of respondents had neither an engineer nor a professor in their families, 39% had one or the other, and 13% had both. In the current survey, 37% have a family member that is a professor and 47% have a family member that is an engineer, most commonly a father or brother. It is interesting to note that our sample included two respondents whose mothers are engineers. These results indicate that exposure to engineering and academia through family experience may be one important factor to choosing this career.

Respondents overwhelmingly said that an interest and/or aptitude in math and science is what led them to study engineering (84%). Other factors mentioned included the importance of role models (32%) and encouraging job prospects (21%). Two responses are as follows:

- I was surrounded by engineers and scientists growing up. I was familiar with and interested in the work.
- I was interested in pursuing a career in math and science, but wary of the biological sciences because my mother's discipline had changed so significantly over the 15 years she "took off" to raise my brother and me. When I was 16 yrs old, I looked at a museum exhibit about the history of bridge-building over the millennia, determined that bridges didn't change much in a matter of decades, and decided that if I went into civil engineering, I could take out time to raise a family and then return to civil engineering.

(My BS was in engineering, my MS in civil and environmental with minor in agricultural, and my PhD in agricultural).

The most common role models mentioned were parents (mothers and fathers were mentioned equally), though sisters, brothers, and family friends were also named:

- An indirect but strong influence was a family friend, a woman who was for most of my childhood & early adulthood a prison chaplain. She was in a very male-dominated work field, but never gave me the impression when I was younger that it was difficult or that she should have made another choice. Secondly, since I grew up in the 80's, women like Margaret Thatcher contributed to my general impression that a woman could legitimately pursue whatever sort of career she wanted. These influences, and probably a healthy dose of ignorance on my part, combined in such a way that it never occurred to me that gender might ever be an issue in my chosen profession, no matter how traditionally "male" that profession was.

In terms of why respondents chose to pursue a Ph.D., 58% reported that they were interested in the jobs one could get with a Ph.D., especially in teaching and research. Twenty-one percent reported that they were strongly encouraged to continue their work and another 21% reported that they were bored with the engineering job that they had after receiving a B.S. or M.S. in engineering.

When asked if they had ever felt incapable of completing a Ph.D., 32% of respondents reported that they had (compared with 31% of respondents in 1998). Reasons for feeling incapable included overwhelming family responsibilities, internalized stress, having very high expectations (internal), and being overwhelmed by data collection and analysis.

When asked about having confidence on the job currently, 68% reported that they are confident (compared to 65% in 1998). It is important to note that the 68% that are currently confident do not completely correlate with the 68% that always felt capable of completing a Ph.D. Comments include the following:

- Every so often I am intimidated by the high flyers in our department, those who have lots of funding and start up "centers of excellence". I feel like such an under-achiever. But then I refocus by reminding myself that I contribute to department meetings and seminars while these people are too busy to appear for any function, and I think what a nice group of grad students I have and how little respect they seem to have for these high-flyers as academics. This reassures me that I must be doing something right.
- ...I keep an eye on other assistant professors and look for cracks in their armor, which makes me at least feel like I am not alone in my feelings of inadequacy! In that sense, I suppose I deal with it by trying to recognize that these are normal feelings for this point in my career.

- It was the pressure of being a mother, wife and a faculty, and the lack of time and energy to perform to my own expectation at each of these fronts. A combination of a sick infant baby, a husband who worked away from home and visited home every other weekend, teaching a new course somewhat outside my area of expertise, travel to experiment fields that were 5-6 hrs drive from home, and grant writing threw me off balance many a times. I was on the verge of giving up so many times. I used to think of (and still do) giving up my job and concentrating on my family. But the thought that I probably will fail myself and so many other women who look up to successful women professionals kept me going. Also, I knew that I would disappoint my mother and sisters who did so much for my education.

Advising and mentoring. Respondents were asked a number of questions about mentoring and advising. Forty-seven percent of respondents were mentored as graduate students, usually by their major advisors or other departmental faculty, though most stated that the mentoring was informal. Fifty-eight percent of respondents are currently being mentored, though only 18% of those respondents being mentored are served by a formal mentoring program. Eighty-nine percent of respondents report acting as mentors (compared to 72% in 1998). Sixty-eight percent mentor undergraduate students, 84% mentor graduate students, 47% mentor faculty, and 5% mentor post doctoral researchers. The average number of graduate students advised is 3.26; 74% of respondents are currently advising women graduate students. Respondents were asked to describe their mentoring experience:

- Sorry, no time. (see, I'm learning to say no!) But they are good! I'm learning to draw out, rather than preach, in my role as a mentor.
- I feel that I am always mentoring my grad students. And I feel that when I teach and I talk about my children and balancing life I am mentoring senior undergraduates who are wondering about juggling careers and potential motherhood.
- I am a co-leader (3 of us) of the Women in Agriculture Faculty group. We meet 2-3 times/semester. This group fosters networking among women faculty, professionally, personally, and socially. We talk about issues of interest among the women faculty – including: problems with undergrads (disrespect issues, mostly), loss of female grad students from academia (we often hear, “I don't want to work like I see you doing”), problems with male colleagues (from different office/lab space to disrespect to non-inclusion), problems with female colleagues (who believe there are no issues here), child care problems, department heads that do not understand pressures of child care (like not scheduling meetings that run to well after 5 or requiring participation at weekend events), pay inequities..... We invite our Dean and Provost (female) to meet with the group once/year.

Gender issues. Respondents were asked several questions about gender issues in academia. These questions were framed in a “yes” or “no” format. We had significant non-response in several questions, indicating that the answer was not “yes” or “no.” Written comments showed that this was the case much of the time; other possibilities were that the respondent was not sure,

or the question was not applicable. We address these issues in the context of the questions discussed below. In terms of sexual harassment, 21% of respondents report having experienced this phenomenon in academia, 68% have not experienced harassment, and 11% did not respond.

Forty-seven percent perceive the presence of a glass ceiling for women in BAE and 53% do not. When asked if respondents had personally experienced the glass ceiling, 11% reported that they had, 53% reported that they had not, and 37% did not answer this question yes or no. This question brings to bear a flaw in our survey; we will include “not sure” and “other” as possibilities for response to such questions in future surveys, and will ask for elaboration accordingly. We postulate that the high number of no responses indicates that respondents are not sure if they have experienced the glass ceiling or not.

In 1998, the survey asked respondents to compare their teaching and service loads with those of their male counterparts of the same rank. Sixty-three percent of respondents reported having equal duties with their male counterparts, 27% had more, and 10% had fewer. The 2005-2006 asked the same question, but separated teaching load and service load. In terms of teaching, 58% reported equivalent loads, 26% had a higher teaching load, 0% had a lower teaching load, and 16% did not answer. We believe that the 16% non-response represents faculty that have no teaching responsibilities (research and extension appointments in BAE are fairly common). In terms of service, 31.5% of respondents report an equal service load, 56.5% report greater service responsibilities, and 11% report fewer responsibilities than their male counterparts.

In an open-ended question, respondents were asked to describe the biggest sources of stress in the job. Reasons included too much to do and not enough time to do it (52%), balancing work and home lives (26%), pressure for funding (21%), people and conflict management issues (16%), pressure to publish (11%), pressure for tenure (11%), self-induced pressure to perform (11%), too much service (5%), learning to say “no” (5%), and balancing all job activities (5%). In 1998, respondents asked the same question reported a lack of communication and faculty support structure (34%), too little time (29%), and too many responsibilities (23%). Selected comments from the 2005-2006 survey were particularly poignant:

- Pressure for tenure, pressure to publish (lots), constant evaluation, way too many things going on – being pulled in way too many directions. 2 career families are crazy. My husband I are both exhausted when we get home. I can't just stay late in the office any time I choose. I have to do my late night work after child goes to bed. My first year I got up at 3 o'clock in the morning every day to prepare my lectures.
- Too much work – too many demands – too many requests...Additional stress comes from being told that the P&T committee says I need to publish more in research journals and get more grants, preferably large NSF grants. When I replied that I had no time my dept. head said he would like to help me with that and asked what I needed. I stated that I needed my 3 fall, time-intensive 4-H responsibilities removed since I am currently teaching 2 classes this semester and don't have time for the high level of administration these events take...My department head said that he could not relieve me of those

responsibilities but would purchase a piece of equipment for me to help. I can't figure out any "piece of equipment" that would free up time. Consequently, I have worked a number of 70-hour weeks and one week was 80 hours. I doubt that I fall below 60 hour weeks very often. (So, it is understandable that grad students would not want academic jobs.) This adds to the stress of family – I have one child left at home and he is a senior. I was only able to attend 2 of his tennis matches, could not get back from a conference in time for his "senior night" recognition (at the Friday night football game), and will miss the opening night of a play that he is lead in.

- There is no support system within the University/department to mentor or help a new faculty. A spouse working approximately 700 miles away from home was my major stress. The University's spouse hiring program sucks, for a highly educated spouse. The second major stress was from the need to travel. I had to travel on a weekly basis to locations 250-300 miles away for conducting field experiment and data collection. This is because the University is located in the hills, and most of the agriculture was on the other side of the state. It was very stressful to leave a 1-yr old child back home, travel that far, collect data all day and get back the same day. It almost killed me.

When asked if their biggest sources of stress on the job were due to gender issues, 42% of respondents reported yes, 47% reported no, and 11% did not answer yes or no. In 1998, 63% of respondents said that their sources of stress were not related to gender. Some comments are as follows:

- YES, in that older male faculty members would never have had this challenge as their stay at home wives would have looked after the sick children.
- Well, maybe they do relate to gender issues, because women may be more inclined to say yes rather than protect their time.
- YES. How many women do you know have husbands that stay home so that she can focus on her very demanding career? I am envious of my male counterparts whose spouses handle running the home. The social pressures and responsibilities of motherhood greatly exceed those of fatherhood especially in the early years of childhood. It is a solid societal belief in this country that infants need their mothers more than their fathers. This doesn't change in any way for women who have careers of equal or greater intensity than their husbands.

Respondents were asked if they had experienced gender related salary inequities. Eleven percent reported that they had, 78% reported that they had not, and 11% did not respond. When asked about laboratory space inequities (e.g., the MIT study), 11% of respondents reported that they had experienced space inequities, and 89% reported that they had not. Twenty-six percent of respondents had experienced a lack of support for family related issues, 69% had not, and 5% did not answer. Additionally, 37% of respondents reported a lack of support for dual career couples. Fifty-eight percent did not experience this lack of support, and 5% did not answer. Comments included the following:

- No provisions offered.
- That is why I had to leave an excellent tenure track teaching position!
- Not applicable – when I went to work full time, we choose to have my husband work part-time so he could be there for the kids. We choose not to have us both work full time because we felt we could not be there for our children if we did and they are our first priority. This, too, is part of the reason that I am able to put in the hours that I do.
- YES! This world is built for 1 career families.

Respondents were asked to make suggestions for making the climate as inclusive as possible for women in engineering. The bulk of suggestions involved addressing family, work, and dual career issues (47%). Representative comments:

- Dual career problem must be dealt with at highest university levels.
- More women at all levels – students, faculty, administrators
- Here is why women drop out. 2 career families (especially careers of great intensity such as in academia) are extremely exhausting. Many couples come to the conclusion something has to give. The problem is that it is almost ALWAYS the woman who quits. Why is this? Gender roles ... cloaked in a false perception that it's the woman's choice to drop out. No one seems to challenge these gender roles.
- The support for family and dual career issues are most important, they have to be not only strongly available (such as good day care on campus available, release of teaching duties during the entire first year of a new baby in a family, not counting one year toward tenure or promotion decisions per child in the family, not counting one year per child toward any age-related award distributions etc.) and making all of these highly public so that not only women being already faculty are aware of these, but that undergraduate and graduate students are being shown and taught that all of this is available. This is true for the academic, governmental and industrial fields.

Respondents were asked why they thought that the percentage of women enrolled in BAE programs is higher than in other engineering disciplines. Fifty-eight percent thought that the emphasis on biology and engineering “for the greater good” was a major factor. The variety of topics studied, the applied, tangible context of BAE, and the prevalence of small, student-friendly departments were also mentioned. Twenty-six percent of respondents questioned the construction of our survey question and wondered if the percent of women in BAE was truly higher than in other engineering disciplines. According to ASEE (2004), agricultural engineering (BAE) has the third highest percentage of undergraduate degrees granted to women (37.1%), behind biomedical engineering (45.5%) and environmental engineering (40.6%). Twenty-one engineering disciplines were reported in this study.

Finally, respondents were asked to share any comments that they felt relevant to career and life experiences as they relate to gender. Selected responses are included below:

- I feel that there is pressure to not have children because it may influence your ability to get tenure.
- In a department with primarily male faculty there is a camaraderie that exists among men. This, in my experience, makes it much easier for them to discuss uncomfortable topics or to ask the “dumb” questions. Often if I have a question that I perceive as trivial, it will go unasked for fear of appearing incompetent.
- I feel that some of the worst discrimination and least consideration of the need to balance child care/family life with academia comes from women colleagues who are in their 50’s or so and don’t have children, and seem to have unlimited time to work on research and teaching. My most poignant memory is of this fall, pulling my two kids to daycare in a wagon, with a knapsack on my back full of books, lunch, extra juices and cheese sticks, and having a female colleague walk by us and say “gee, you are really burdened down there”. And then she walked off at a faster rate compared to my wagon pulling rate. Why did she choose the words “burdened down” versus, something simple like “hands full”? Why didn’t she instead complement me on my organizational ability to get my kids to daycare and myself to work in the morning?
- Many of us (more women than men) at some point will take time off from work to care for children or aging parents. Some of my peers have left their careers for years; some have changed careers. Others have taken less demanding positions or made other compromises to achieve flexibility to care for family members. Many of us have chosen to leave jobs we loved in order to accommodate our spouse's careers. We make our choices based upon our values; still some of these decisions are very difficult.
- I believe that my university is seriously trying to address gender (and other diversity) issues. Our Provost is very supportive and supports gender and cultural diversity workshops for faculty and some staff. These are primarily informational but they are a starting point and have introduced many faculty to issues and concerns that they had not formerly considered...It will take time and the continued work by women and men to see the differences so that they can address them. It will take even longer for some of our male students to see women faculty as full equals of the men, I think.
- Our female graduates are dropping out after a few years in industry. This is a problem. We have good female percentage enrolled in the undergraduate program ... but where are they among our successful alum pool? They drop out after getting married and having kids. I think this comes back to the cloaked gender roles problem again. I also think we spend WAY too much time on extraneous activities. We all do too much. We create too much pressure for ourselves ... students, faculty (men and women) ... all of us. It is not healthy. It is not productive. It distracts us from our research and our studies. (Yet I sit here at midnight typing away at emails.)

Conclusions

Female faculty in BAE were surveyed in 1998 and re-surveyed in 2005-2006. Objectives were (1) to survey this group on their motivations for choosing engineering, their personal and professional experiences, and their reflections on women in engineering, and (2) to compare data

from this population longitudinally. The 2005-2006 survey was a condensed version of the 1998 survey and is now in the process of being administered. The current response rate is 20%, and data collection will continue until a response rate commensurate with the first study (61%) is obtained. Results showed that the population of women faculty in BAE increased from 57 in 1998 to 96 in 2005-2006. The percentage of female faculty in BAE increased from 7% to 11% during this time, and the percentage of full professors doubled. The pipeline effect for women in BAE still exists but values have shifted upward from 1998 to 2005-2006. The overwhelming majority of respondents are married or partnered; 68% of respondents do not have children. Approximately two-thirds of women faculty in BAE are confident in their ability to do their job. Eighty-nine percent of respondents reported mentoring students, faculty, post docs, or a combination of these groups, and 58% of respondents are mentored by others. Eleven percent of respondents reported experiencing “the glass ceiling” in their careers, 53% have not, and 37% of respondents did not answer the question, possibly indicating that they are not sure if they have experienced these issues. The vast majority of respondents have not experienced salary or laboratory space inequities. More than half the respondents reported having higher service responsibilities than their male counterparts of the same rank. The biggest source of stress on the job is too much to do and not enough time to do it. Thirty-seven percent of respondents experienced a lack of support regarding dual career couple issues; these issues were mentioned much more in 2005-2006 than in 1998. In an open-ended survey question, 47% of respondents mentioned that addressing dual career and family issues is key to making the climate as inclusive as possible for women in engineering.

References

ASEE. 2004. Profiles of Engineering and Engineering Technology Colleges. Engineering statistics summarized and found at <http://asee.org/about/publications/profiles/index.cfm>

Cauble, S., Christy, A. and Lima, M. 1999. *A Survey of Biological and Agricultural Engineering Female Faculty in North America*. American Society for Engineering Education Annual Proceedings, Charlotte, NC. (CD-ROM)

Cauble, S., Christy, A. and Lima, M. 2000. *Toward plugging the leaky pipeline: Women faculty in biological and agricultural engineering in the United States and Canada*. Journal of Women and Minorities in Science and Engineering 6(3): 231-251.

Toth, E. 1998. Ms. Mentor's impeccable advise for women in academia – and especially in science. Associate of Women in Science, Baton Rouge Chapter Speaker Series. LSU Cmapus, September 10, 1998.

Appendix: copy of survey

2005 Survey of Women Faculty in Agricultural and Biological Engineering

Thank you for taking the time to complete this survey, which is a follow-up to an earlier one documented in the article:

Cauble, S., A.D.Christy, and M. Lima. 2000. Toward plugging the leaky pipeline: Biological and agricultural engineering female faculty in the United States and Canada. *Journal of Women and Minorities in Science and Engineering* 6(3):231-251.

Please rest assured that the confidentiality of your replies will be strictly maintained. We only request your name in order to track who has responded, so that we don't annoy you with unnecessary reminders. The Institutional Review Board has approved the use of this survey; filling out this survey demonstrates your consent for this process. This survey should take approximately 15 minutes to complete. Thank you for your time.

GENERAL INFO

1. Respondent # _____
2. University: _____
3. Job Title (rank): _____
4. Tenure Track: YES NO
5. Age: _____
6. What best describes your current situation?
Married Partnered Single Divorced Widowed
7. Number of children: _____
8. Years in academia (not counting grad school): _____
9. University from which you received your Ph.D.? _____
What year? _____
10. Is anyone in your family an engineer? YES NO If so, whom?

11. What factors led to your decision to enter engineering?
12. If role models were at least partially responsible for your decision to enter engineering, what are their relationships to you? (mother, friend, etc.)
13. What factors led to your decision to pursue a Ph.D.?
14. Is anyone in your family a professor? YES NO If so, whom?
15. Did you ever think you were incapable of achieving your Ph.D.? YES NO
If yes, why, and how did you deal with these feelings?
16. Have you maintained confidence in your abilities throughout your educational and work experiences? YES NO If not, how did/do you deal with these feelings?

ADVISING & MENTORING

17. How many grad students do you currently advise? _____ How many are female? _____
18. Were you mentored as a grad student? YES NO By whom?
19. Are you currently being mentored? YES NO By whom?

20. Do you act as a mentor? YES NO

21. If yes, which populations are you currently mentoring: Undergrad/ Grad/ Faculty
(circle all that apply)

22. Please describe your mentoring experiences, if any.

GENDER ISSUES

23. Have you experienced sexual harassment in academia? YES NO If so, how did you deal with it?

24. Do you perceive the presence of a “glass ceiling” for women in our field?
YES NO Have you personally experienced it? YES NO

25. Do you have MORE/ EQUAL/ FEWER teaching responsibilities than your male counterparts of the same rank? (circle one)

26. Do you have MORE/ EQUAL/ FEWER service responsibilities than your male counterparts of the same rank? (circle one)

27. What are the biggest sources of stress in your job?

28. Do any of these stresses relate to gender issues? YES NO

29. Have you experienced gender related salary inequities? YES NO

30. Have you experienced lab space inequities (e.g., MITstudy)? YES NO

31. Have you experienced lack of support for family related issues? YES NO

32. Have you experienced lack of support for dual career couples? YES NO

33. Do you have suggestions for making the climate as inclusive as possible for women in engineering (students, faculty, government, industry, etc.)?
34. Why do you think that the percentage of women in ABE is higher than in other engineering disciplines?
35. Optional: Please discuss any issues you feel are relevant to your career and life experiences as they relate to gender.

Please return completed survey to:

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THANK YOU!