

**AC 2008-816: ON OR OFF THE TENURE TRACK: THE WORK LIVES OF
WOMEN ENGINEERING AND TECHNOLOGY FACULTY**

Stacy Birmingham, Grove City College

Mara Wasburn, Purdue University

On or Off the Tenure Track: The Work Lives of Women Engineering and Technology Faculty

Abstract

Tenured faculty and those on the tenure track are now a minority on American college and university campuses as the number of part time instructors and professors hired on a contract has increased. A disproportionate number of these non-tenure track faculty members are women. With greater demands for publications and funded research in the first five or six years of their careers, many women fear the consequences of having children during this period, which coincides with their prime childbearing years. In response, they may be opting out of the race for tenure in order to achieve what they perceive as a more desirable work-life balance by choosing part-time or non-tenure track full time academic positions.

At the same time, there is a critical shortage of skilled science, technology, engineering, and mathematics (STEM) professionals in the United States, as well as in many Western European nations, which, in turn, decreases the pool from which to recruit faculty, who are urgently needed to educate students in these disciplines. Therefore, it becomes increasingly important for colleges and universities to learn what impact, if any, the availability of tenure-track positions may have on their ability to attract and retain women faculty to meet this need.

Using qualitative and quantitative data, this study examines the work life balance and job satisfaction of women engineering and technology faculty both on and off the tenure track. Recommendations for academic policies and practices based on their responses are offered.

Introduction

The number of full time, tenured faculty positions on college and university campuses has been declining nationwide. In fact, the majority of faculty hires since 1990 have been off the tenure track; a disproportionate number of those new hires are women.¹ In the 1980s, only about 12% of the full time faculty were in non-tenure track positions. However, by the early 1990s, that percentage had more than doubled.² At present, women are far less likely to hold full time, tenure track positions than are men. In 2005-2006, women comprised 41% of tenured and tenure-track faculty and 52% of the non-tenure-track faculty.³ Engineering has by far the lowest proportion of women faculty both on and off the tenure track.² At the same time, requirements for achieving promotion and tenure have increased dramatically.⁴

Given the critical shortage of skilled science, technology, engineering, and mathematics (STEM) professionals in the United States, as well as many Western European nations,^{5,6} the shortage of women engineering and technology faculty, and the decreasing number of tenure-track positions, it become increasingly important to learn whether or not the declining number of tenure-track positions may hamper the ability of colleges and universities to attract and retain women faculty in these disciplines in the future.

Women in STEM Disciplines

Approximately half the potential STEM talent pool at the entering undergraduate level consists of women. Therefore, in 2000, a United States government commission, reporting to the House of Representatives, was charged with developing strategies to attract more women and minorities in STEM careers. The report indicated that significant barriers to these goals persist.⁷ These deterrents include differing male/female attitudes toward science and technology that begin to diverge as early as elementary and middle school, the absence of women faculty, mentors, and fellow students in college and university classrooms, all of which create a “chilly climate for women” in these areas.^{8,9}

As young women grow older, fewer of them express interest in studying STEM subjects. The literature refers to a “leaky” pipeline of women from elementary school through graduate studies and employment, eventually leading to their under-representation in the STEM professions.¹⁰ The effects can be seen in colleges and universities where there are comparatively few tenure track women STEM faculty, and they are concentrated at the rank of assistant professor; few become full professors.¹¹ This pattern mirrors the pattern found throughout academe, however there are vast differences in the percentages. While 23.6% of all full professors in American colleges and universities are women, only 2.8% of all full professors of engineering are women.^{12,13} Moreover, tenured faculty and those on the tenure track are now a minority on the college and university campuses as the number of part time instructors and professors hired on a contract have increased; a disproportionately higher number of them are women.¹⁴

There is a dearth of empirical studies that focus on the situation of women engineers as a group, apart from STEM, probably because there are so few of them nationwide.¹⁵ In the late 1980s, women engineering students were not encouraged to pursue doctoral degrees, limiting the pool of female candidates for faculty positions. Those who persevered and applied for academic appointments were often evaluated negatively for fear that their family responsibilities would impede their productivity. Women engineering faculty were described as facing a “double bind:” attempting to redefine the images of both professor and engineer.^{16,17}

A 2000 study examined the climate for women engineering faculty at two research universities. Most of those interviewed felt isolated because of their gender and had tried not to draw attention to themselves in an attempt to fit in. Those who had families felt as though they were constantly performing a balancing act between the role of wife and mother and that of professor, producing anxiety.¹⁵

The Competing Demands of Family and Tenure

Departments at research and teaching institutions alike are requiring more external grant money and more published research, which has increased the pressure on new faculty to publish early and often.^{4,18,19} This adds considerably to the already existing challenges women faculty face. As more women enter tenure-track engineering and technology faculty positions during their childbearing years, the tensions between childbearing and tenure have heightened. Colleges and universities have made significant progress updating their tenure policies to accommodate challenges encountered during maternity and parental leaves. However, as indicated by the

research below, women faculty seeking advancement, especially those in science, technology, engineering, and mathematics (STEM), continue to face impediments that do not appear to affect their male colleagues.

A survey of 4,400 tenure track faculty found that that women faculty who choose to have children early in their careers are still less likely to achieve tenure than are their male counterparts. Significantly more men than women with children under the age of six achieve tenure. Many women assistant professors are cognizant of this additional disadvantage and are choosing to postpone having children; almost half of them say the decision was made because of their careers. Forty percent of women said they had fewer children than they wanted, compared to 20 percent of men.²⁰

Ginther and Kahn²¹ analyzed engineering data from the National Science Foundation's Survey of Doctorate Recipients to look at the impact of gender on the achievement of tenure. They discovered that single women in engineering had a slightly better chance of earning tenure than did single men. Marriage increased men's chances of earning tenure by 12.2%, however women experienced no similar effect unless they were childless. For each child, male engineering faculty experienced a 4% increase in the likelihood that they would earn tenure. While women engineering faculty with pre-school aged children experienced no decrease in their likelihood of earning tenure, those with school-age children were 22.8% less likely to earn tenure, which did not appear to be the case in other scientific fields.

A study of 1,755 employed parents revealed a substantial loss of productivity due to childcare concerns.²² Joan Williams, a professor of law at American University's Washington College of Law refers to these challenges as the "maternal wall," a less obvious form of gender discrimination than the more familiar glass ceiling. It begins when women become pregnant. The assumption is made that they will only want to work [or are only capable of working] part time. Being a caregiver and an academic are seen as incompatible.²³ The competing expectations of career and motherhood can create a type of stress that their male counterparts who either take a secondary role in childrearing or who are not parents at all rarely, if ever, experience (Williams, 1999).²⁴

Women Off the Tenure Track

In their 2001 study of full time women faculty off the tenure track, Harper, Baldwin, Gansneder, and Chronister² analyzed data from the National Center for Education Statistics and conducted their own survey of 89 colleges and universities. They found that numerous problems plague non-tenure-track women. They are among the lowest paid, often lack office space and administrative support, have little or no access to travel funds, and are generally excluded from decision-making in the departments they serve. They are twice as likely to be childless and unmarried as their male colleagues. They report the shortest workweek but the heaviest teaching loads, devoting the least amount of time to research. The study found very little difference in job satisfaction among all groups of faculty, but in general, women were slightly less satisfied than men. The possibility of a tenure-track position would be a greater incentive to women working full time than for any other group working off the tenure track.

Daily²⁵ analyzed data from the 2001 Survey of Doctorate Recipients, collected by the United States Census Bureau. After controlling for credentials and disciplines, she found that women were 65.2% more likely to be in non-tenure track science and engineering positions than were men.

A study of science graduate students at the University of California, Davis revealed that women students' interest in pursuing academic careers declined at a significantly higher rate than did that of their male colleagues. One of the major factors they cited was concern about integrating family responsibilities with a tenure track position.²⁶

Using qualitative and quantitative data derived from a survey of both tenure and non-tenure track women faculty, this paper focuses on the experiences of engineering and technology women faculty, both on and off the tenure track, who are attempting to balance the demands of work and their personal lives. At issue is whether or not tenured positions lead to better work life balance and greater job satisfaction. The research examines the following:

1. Women faculty's evaluation of their work-life balance as a function of several interrelated variables:
 - a. Whether they are tenure track or non-tenure track.
 - b. Whether they engage primarily in teaching or research activities.
 - c. Whether they are working in doctoral, masters, or undergraduate programs.
2. Whether women's perceptions of work-life balance influenced their choice of academic position (full-time, part-time, tenure track, non-tenure track.)
3. What aspects of women's academic careers they would change in order to improve their work-life balance.

Method

Participants

This study surveyed 1,827 women members of ASEE who identified themselves as faculty. Six hundred and forty-five individuals responded to the survey for a response rate of 35.3%. It is important to note, however, that not all respondents answered every applicable question so that the response rate on each question will be less than 35.3% for each question. In addition, some women who were identified to ASEE as faculty were no longer faculty, and hence the number of women who were eligible to participate in the survey was somewhat less than 1827.

Procedure

The *Women in Engineering & Technology Work Life Survey* was launched on October 16, 2007 and closed on December 31, 2007. An invitation to participate in the survey was emailed to all women ASEE members who were identified to ASEE as faculty (N = 1827), with a link to the survey provided in the email. An email reminder to complete the survey was sent one week after the original invitation. SelectSurvey.NET (ClassApps) was used filter the data so that the responses of various populations of the respondents could be viewed separately, such as those respondents who work part-time only, or those respondents who do not hold a tenured or tenure

track appointment but held a tenured or tenure track appointment at one time. In addition, while the responses for any given respondent could be viewed, all respondents remained anonymous.

The survey contained 37 questions dealing with work/life issues, with a mix of closed-ended and open-ended questions. A flow chart of the survey is shown in the Appendix. The first 11 questions (Q1 – Q11) were used to identify the characteristics of institution and the department where the respondent was employed: for example, private or public, highest degree granted, enrollments, home department, number of full-time and part-time faculty in department, and number of non-tenure-track faculty in department. The next 10 questions (Q12 – Q21) were used to identify the characteristics of the appointment of the respondent: for example, years at current institution, current rank, years at current rank, whether the position is full-time or part-time, whether the position is tenured/tenure-track, distribution between graduate and undergraduate classes in teaching assignment, distribution of effort in workload, and consistency of workload. The following eight questions (Q22 – Q29) were available only to respondents who did not hold a tenured or tenure-track position, and were used to determine if the respondent had ever held a tenured or tenure-track position and if the respondent currently desired a tenured or tenure-track position. The final two questions in this set asked the respondents to comment on the perceived advantages and disadvantages of holding a non-tenure-track position. The next set of questions (Q30 – Q33) was used to characterize the home life of the respondent: for example, if a spouse or partner worked and the ages of minor children living at home. Note that questions 31 and 33 were available only to those respondents who answered affirmatively to questions 30 and 32, respectively. The final four questions (Q34 – Q37) allowed the respondents to provide comments on their work-life balance, including how that balance influenced their choice of academic position, and to offer any other comments regarding the survey.

Data Analysis

A two-tailed t-test was performed on questions of interest to determine if responses from the faculty in the tenured/tenure-track and non-tenure-track populations were statistically different. The variances of the data sets were not assumed to be equal (heteroscedastic). The t-test analysis returns a probability, or p -value, that is used to determine whether or not observed differences in the reported means between two populations of a given question are statistically significant and could not occur by chance. Assuming a significance level of 0.05, the differences in the reported means are determined to be statistically significant for those questions where the t-test analysis yields $p \leq 0.05$.

Results

General Information

Seventy-seven percent of the respondents hold tenured or tenure-track positions while 23% of the respondents hold non-tenure-track positions (Q16). Of those 119 respondents who do not hold a tenured or tenure-track appointment, 82% are employed by an institution that offers tenure and only 36% have ever sought a tenured or tenure-track appointment. It is also of note that 15% of the non-tenure-track respondents held a tenured or tenure-track position at one point in their academic careers. In the following discussion, the responses of the overall, or aggregate,

population are generally reported in addition to the responses of the tenured/tenure-track and non-tenure-track populations, where appropriate.

Table 1 shows that the majority of the respondents are faculty at public institutions (75%) and at institutions where the highest degree granted is a Ph.D. (77%). In addition, the majority of respondents are faculty in engineering colleges (74%), with non-tenure-track respondents less likely to be in an engineering college and more likely hold appointments in colleges with a liberal arts focus. There is no statistical difference between the tenured/tenure-track and non-tenure-track populations on these questions, indicating that the groups are similar in terms of their education and employment (see Table 6 for a summary of the t-test results).

Table 1: Characteristics of the Respondents' Institutions

Question	N	Response	Response Percent		
			All Respondents	Tenured/Tenure-Track Respondents	Non-Tenure-Track Respondents
Q1: Type of institution	618	Public	75%	74%	73%
		Private	24%	25%	26%
		Other ^a	1%	1%	1%
Q2: Highest degree granted by institution	616	B.S.	5%	5%	8%
		M.S.	13%	14%	14%
		Ph.D.	77%	76%	73%
		Other ^b	5%	6%	5%
Q5: Type of college	609	Engineering	74%	76%	70%
		Engineering Technology	9%	10%	8%
		Other ^c	17%	14%	22%

^a Includes military academies.

^b Includes associates degrees and Ed.D.

^c Includes science and engineering, technology, computer science, natural science and mathematics, library science, and liberal arts colleges.

As seen in Table 2, 6% of the respondents are instructors, 32% of the respondents are assistant professors, 29% are associate professors, and 20% are full professors. The majority of the respondents (94%) hold full-time appointments. Non-tenure-track faculty are more likely to be instructors (36%) and much less likely to be full professors (4%). In addition, non-tenure-track faculty are less likely to hold full-time appointments (82%). The differences between the tenured/tenure-track and non-tenure-track respondents on the responses shown in Table 2 are statistically significant, with *p* values of less than 0.001. The most recent data available from ASEE show the following percentages for tenured and tenure-track women faculty members: 22.4% are full professors, 25.3% are associate professors, and 52.3% are assistant professors.²⁷ These data illustrate that the respondents to this survey were less likely to be tenure-track assistant professors, perhaps because this population had not yet encountered issues regarding work-life balance.

Table 2: Characteristics of the Respondents' Appointments

Question	N	Response	Response Percent		
			All Respondents	Tenured/Tenure-Track Respondents	Non-Tenure-Track Respondents
Q13: Current rank	518	Instructor	6%	1%	36%
		Assistant Professor	32%	37%	16%
		Assoc. Prof.	29%	35%	9%
		Professor	20%	25%	4%
		Other ^a	12%	2%	36%
Q15: Appointment	522	Full-time	94%	98%	82%
		Part-time	6%	2%	18%

^a Includes research scientist, research professor, adjunct faculty, project manager, and administrator

Table 3 reveals that the majority of the time is spent on teaching (42%), with research and administration relatively similar at 22% and 18%. It is interesting to note the similarity of this workload distribution for tenure-track and non-tenure track respondents, also shown in Table 3: Tenured and tenure-track respondents report spending 43% of their time on teaching. Surprisingly, non-tenure-track respondents report spending 49% of their time on teaching. In addition, non-tenure-track respondents spend less time on research (13%) and more time on administration (23%) than tenured and tenure-track respondents (25% and 16%, respectively); these differences are statistically significant ($p < 0.001$ and $p = 0.008$, respectively)

Table 3: Workload Distribution of the Respondents (Q20, N = 517)

Activity	Percent of Time Spent on Activity		
	All Respondents	Tenured/Tenure-Track Respondents	Non-Tenure-Track Respondents
Teaching	42%	43%	49%
Research	22%	25%	13%
Administration	18%	16%	23%
Service^a	14%	14%	14%
Other	2%	2%	0%

^a Includes student advising

In addition, the survey respondents teach an average of 2.18 classes per academic term, with a range of 0 to 10. Non-tenure-track respondents report teaching an average of 2.12 classes per academic term while tenured and tenure-track respondents report teaching an average of 2.20 classes per academic term. This difference between the non-tenure-track and tenured/tenure-track respondents is not statistically significant. It is of note that many of the faculty with appointments at Ph.D.-granting institutions, even those who are tenured and tenure-track, report teaching only undergraduate courses.

The faculty were also asked to report on how much input they had in selecting their teaching assignments (Q19). The responses to this question are summarized in Table 4.

Table 4: Input in Teaching Assignment Selections (Q19, N = 495)

Amount of Input	Response Percent		
	All Respondents	Tenured/Tenure-Track Respondents	Non-Tenure-Track Respondents
Significant	53%	57%	42%
Some	28%	28%	27%
Little	9%	8%	13%
None	6%	4%	10%
N/A	4%	3%	8%

Although there are tenured and tenure track faculty who report little or no input into teaching assignments, most believe they have a great deal of input into those decisions, with 57% reporting significant input in the selection of teaching assignments. Typical comments from this population include the following:

“We need to cover the classes, of course, and we all work together to do that. But we generally get to teach the courses that most interest us.”

“I rank the classes which are being offered. Usually get classes in top 4-5 of my ranking.”

“I have a lot of input into my teaching assignments. I’ve only very infrequently been asked to teach classes I didn’t want to teach.”

In addition, respondents in this group often were in charge of assigning classes to the faculty.

Surprisingly, although certainly some non-tenure track faculty feel they little or no input into teaching assignments, many believe they have at least some input into their teaching assignments. While a smaller percentage than tenured and tenure-track, 42% of the non-tenure-track faculty report having significant input in the selection of teaching assignments. At the same time, larger percentages report having little (13%) or no input (10%) in the selection of teaching assignments. Typical comments from this population include the following:

“My choice must be approved by the director of the department, but there is (sic) usually not any problems.”

“My teaching assignment has been fairly fixed for some time. I felt that I had a fair amount of input into deciding which courses I taught and designing the content of the courses that I taught.”

“We are able to express interest in courses and negotiate with other faculty; in almost all cases, we are able to teach the courses that are our first choices.”

The majority of the respondents report that their workloads were relatively constant from term to term. For tenured and tenure-track respondents, 78% reported relatively constant workloads. For non-tenure-track respondents, 76% reported relatively constant workloads.

Table 5 shows that 81% of the respondents have a spouse or partner (Q30, N = 522), and 86% of those spouses or partners work full-time (Q31, N = 423) and there is no statistical difference between the tenured/tenure-track and non-tenure-track populations. Forty-eight percent of the tenured/tenure-track respondents have minor children at home and 47% of the non-tenure-track

respondents have minor children at home (Q32, N = 117). The percentages of respondents with children in the given age ranges are also shown in Table 5. Tenured and tenure-track faculty have an average of 2.4 children while non-tenure-track faculty have an average of 1.9 children. In addition, the children of tenured and tenure-track faculty, on average, are older than the children of non-tenure-track faculty. Taken together, these two findings suggest that non-tenure-track faculty tend to be younger than tenured and tenure-track faculty.

Table 5: Family Life Characteristics of the Respondents

Question	N	Response	Response Percent		
			All Respondents	Tenured and Tenure-Track Respondents	Non-Tenure-Track Respondents
Q30: Spouse or Partner	522	Yes	81	81	82
		No	19	19	18
Q31: Employment of Spouse or Partner	423	Full-time	86	86	86
		Part-time	8	8	8
		None	6	6	5
Q32: Minor children living at home	522	Yes	48	48	47
		No	52	52	53
Q33: Number of children living at home in given age ranges	250	0 – 5 years old	57	57	58
		6 – 10 years old	50	49	53
		11 -17 years old	57	58	55

Seventy percent of tenured and tenure-track faculty reported that they did not consider work-life balance when making career decisions. On the other hand, 69% of the non-tenure-track respondents reported that their work-life balance heavily influenced their choice of academic position. Many cited increased flexibility for balancing family and work responsibilities and reduced expectations for research and publications as a reason for choosing a non-tenure-track position.

“I switched from a research university to a teaching university because I did not like the pressure associated with the former. There was always pressure (or expectations) for more grant proposals, more publications, etc. I probably worked about the same number of hours as I do now, but now I don’t feel the research-related stress.”

“I have worked part time for major portions of my career and taken long maternity leaves twice. This has definitely impacted my career path negatively, but my family life

positively. I quit a tenure track position partially because my family required more time than I could provide while tenure track.”

In addition, the majority (67%) of non-tenure-track faculty do not desire a tenure-track appointment. Responses of this group to this question on desiring a tenured or tenure-track position (Q23) include the following:

“I am not interested in a tenure track position because of my commitment to my family.”

“I am quite happy with the non-tenure track position. I think it provides me with more flexibility to get involved in activities that are important to me and the department such as outreach and educational initiatives. Although I sometimes feel my work would be more recognized if I was on the tenure track.”

“I do not have a terminal degree and have no desire to get one, and I would not want to go through the tenure process.”

“Because of my research, I have been given the opportunity twice to go on tenure track and declined twice. My opinion of tenure track is that it burns people out.”

“No. Been there, done that.”

Non-tenure track faculty identified a number of professional advantages they realized by being off the tenure track (Q28):

“I am free to pursue my research interest in pedagogy, rather than having to maintain a high level of research in my field, which is technical communications.”

“(I) can focus on teaching, educational research, interaction with students, and service valued in annual reviews.”

“The unreasonable pressure of tenure is not on my shoulders.”

A number of disadvantages to non-tenure track positions were also mentioned by respondents to the survey (Q29):

“I have to worry about whether I’ll be renewed. Normally, because I perform a lot of service to the College and the University, the question doesn’t arise. However, my department is now under review. There is some talk – serious – that the administration wants to reconfigure (the department) I could end up with no job.”

“My position has less stature than a tenured one. Faculty tend to discount the contributions of our department, even though most of us are publishing and presenting at the same or higher rate than other tenured/tenure-track faculty.”

“Lower pay, less involvement in department/faculty decisions.”

“Lack of security and promotion possibilities.”

“I don’t have a peer group in my department. I don’t get reviewed, and I’m not considered for promotion.”

“No guarantee on classes being available. No benefits.”

“There is no security. There is no recognition for the work that I do. The university and department have no stake in my success so I often feel like a target instead of a valued team player. Often made to feel like a second class citizen because I don’t have tenure. Still held to a higher standard.”

Finally, faculty were asked to rate their work life balance (Q34). Table 6 shows how faculty perceive their work-life balance

Table 6: Faculty Perception of Work-Life Balance (Q34, N = 500)

Perceived Work-Life Balance	Response Percent			p-value
	All Respondents	Tenured/Tenure-Track Respondents	Non-Tenure-Track Respondents	
Excellent/Very Good/Good	60%	57%	69%	0.016*
Fair/Poor	40%	43%	31%	0.016*

Non-tenure-track faculty are more likely to perceive their work-life balance as better than tenured and tenure-track faculty. Sixty-nine percent of non-tenure track faculty perceive their work-life balance as good or better compared to 57% of tenured and tenure-track faculty. At the other end of the scale, 31% of non-tenure-track faculty perceive their work-life balance as fair or poor compared to 43% of tenured and tenure track faculty. These differences between the tenured and tenure-track and non-tenure-track populations are significant ($p = 0.016$ in both cases). The differences between the two populations are not just quantitative: there is a marked difference in the comments made by the two populations when discussing work-life balance. Tenured and tenure-track faculty express a greater tension between work and family (or personal time) demands:

“My academic life does not run my free time. However, as a young woman, I chose not to have children in order to pursue my career, and I regret that decision now that I’m 50.”

“It’s a continuous struggle. I don’t have time for much of anything besides working and taking care of my 1-year-old. I’ve even gone to washing my hair every other day and taking the newspaper only on weekends to try to save time.”

“It is a constant struggle and I do not feel good about the balance we have at this time. My husband is a full time faculty member also. Even through we both significantly cut back on travel and what used to be a 60-80 hour work week, we feel heavily stressed and don’t have a work/life balance that we are happy with.”

“I am able to balance my work/life ONLY because my children are older. Therefore, if you want to hire women, you may want to consider hiring OLDER women. We live longer, anyway.”

“Awful. It looks like I will eventually have to choose between getting tenure and being married. Having a trailing spouse where the school did not support finding employment for him has been extremely difficult (it took >3 years for him to find even a bad job in the area.) Given the lack of any women faculty at my institution who had children pre-tenure and then successfully got tenure, that part of life (kids) is also being significantly delayed.”

“Precarious. I find balancing a family and an academic career difficult. All of my colleagues are male and do not have the same responsibilities at home that I do. It has been important to me to never make my home life an excuse so I have always taken on a great deal of responsibility at work. It has been quite a challenge, and I’m not convinced I would recommend it to others.”

“Poor. I spend way too much time at work, but can’t seem to get the balance right. There is just so much to do at work. I leave the house at 7 am and rarely leave the office before 6:30 pm. This does not leave me much time for life.”

It’s not only women with families who struggle to find work-life balance. Single women, too, face difficulties as they seek to preserve some personal time. One respondent spoke about the issues facing those who are asked to cover for their colleagues with families:

“Poor – single faculty are not ‘allowed’ to take time for themselves – and so must pick up the slack for other members who must go home.”

Finally, the respondents were asked what one aspect of their academic positions they would change to improve their work life balance (Q36). Looking first at the non-tenure track faculty, several of the respondents noted that there is nothing they would change about the positions they have. Many of their concerns centered on higher pay, job security and consistency from semester to semester.

“Feeling that my job was not always in balance might make it a bit easier to take one or two days off without feeling I could get let go. Feeling that I had some security might make having children easier.”

“As an older woman, I’m not having the balance problem anymore. I do wish I could feel more certain about my position here.”

“Be able to do some of my job-related work at home, without the stigma of “not showing up at the office.”

“It would be nice if there was such a thing as a “real” half time position where one could work half time and get half of a full time salary and some access to benefits such as health insurance.”

Tenured and tenure-track track faculty were concerned about the fairness, the lack of emphasis on quality teaching, lower course loads, and changing the culture:

“Reduce the ever-increasing demands of academia. The bar is always being raised.”

“Have the university value teaching and service more heavily.”

“Make part time tenure track a possibility for parents of young children.”

“Cultivate a family-friendly environment. My university is working towards this by developing new policies, but the policies will take years to truly be the accepted culture.”

“Have a clone who could be the mom when I have to get work done????”

“More time at the office for research/writing, less time on administrative tasks and in meetings.”

Discussion

Table 7 below describes the differences in the two populations:

Table 7: t-test Analysis of Differences in Tenured/Tenure-Track and Non-Tenure-Track Populations

Question	Response	p-value
Q1: Type of institution	Public	0.667
	Private	0.682
Q2: Highest degree granted by institution	B.S.	0.531
	M.S.	0.955
	Ph.D.	0.217
Q5: Type of college	Engineering	0.162
	Engineering Technology	0.638
	Other	0.056
Q13: Current rank	Instructor	<0.001**
	Assistant Professor	<0.001**
	Associate Professor	<0.001**
	Professor	<0.001**
	Other	<0.001**
Q15: Appointment	Full-time	<0.001**
Q17: Classes taught per term		0.615
Q20: Workload distribution	Teaching	0.070
	Research	<0.001**
	Administration	0.008**
	Service	0.895
	Other	0.004**
Q21: Constant workload each term		0.616
Q30: Has spouse or partner		0.796
Q31: Employment of spouse or partner	Full-time	0.922
	Part-time	0.853
	None	0.711
Q32: Has minor children at home		0.831

Our survey found that there is no statistical difference between the tenured/tenure-track and non-tenure track populations in terms of the type of institutions at which they are employed (Q1, Q2, Q5). In addition, there is no statistical difference in the number of classes taught per term (Q17) and the constancy of workload (Q21). Finally, the home lives of the women in both populations are statistically the same in terms of having a spouse or partner (Q30), of the employment of the spouse or partner (Q31), and of having minor children at home (Q32). What we glean from this information is that the women in both the tenured and tenure-track populations are employed by the same type of institutions, experiences the same workload from semester to semester, and are equally likely to have a spouse or partner and minor children at home.

While this “broad brush” approach to categorizing the women in both populations suggests that there are no differences, it is in other areas that differences emerge. Non-tenure-track women are statistically more likely to be instructors ($p < 0.001$) and less likely to hold the title of professor as compared to any other rank ($p < 0.001$ in all cases). Non-tenure-track women are also more likely to hold other positions, including research scientist, research professor, adjunct faculty, and project manager ($p < 0.001$). In addition, non-tenure-track faculty are less likely to be employed full-time ($p < 0.001$).

Non-tenure-track women are more likely to be less engaged in research ($p < 0.001$) and more engaged in administration ($p = 0.008$). This finding correlates with comments from the respondents that administrative appointments (at the expense of research activities) allow for a better work-life balance.

While the home lives of the women, at a superficial level, appear to be the same, non-tenure-track women are more likely to have fewer and younger children. In light of the higher percentage of this population in an instructor position, this finding suggests that the non-tenure-track women may be in the earlier stages of their careers.

Non-tenure-track women are more likely to rate their work-life balance as good or better than tenured and tenure-track women ($p = 0.016$). A theme that is repeated in the comments of all respondents is the tension felt between balancing the demands of both ... a tension that often fueled the choices they made. Many women deliberately chose to take a non-tenured position to achieve what they believe will be a better work-life balance. It is the reasons behind these choices, as evidenced by the women’s statements quoted above, that make us believe that changes must be made.

The fact that many women engineering and technology faculty feel it necessary to give up the salary, prestige, and job security that a tenured faculty position affords in order to achieve good work life balance should be of great concern to college and university administrators. At a time when this country faces a critical shortage of faculty in both engineering and technology, as well as a critical shortage of engineering and technology professionals, it is imperative that our institutions of higher learning do everything they can to make tenure track positions as attractive as possible. They need to be asking themselves critical questions, such as how those positions are structured, and whether they are still normed on men who have stay-at-home wives as they were many years ago. University professorships were designed for men with wives who provided childcare, edited and typed their papers, and in some cases, even graded student work.²⁸

Limitations

This study surveyed only those women faculty who are members of ASEE. Women engineering and technology faculty who do not choose to join this particular professional organization may differ from this population in significant ways.

Recommendations and Conclusion

If women perceive that the tenure track leads to burn-out causing many of them to choose less

secure, less prestigious non-tenure track positions at lower pay even when offered the opportunity to work for tenure, some changes in the way these roles are structured need to be made. The central issue then becomes how to encourage women to pursue tenured and tenure-track positions without sacrificing work-life balance, and how to improve the work-life balance of women already in these positions. While the definition of “good” work-life balance is subjective, there are some steps that colleges and universities can take to improve the work-life balance of women faculty based upon the voices of the women who responded to this survey:

1. Review all faculty-related policies to see whether or not policies are in place to:
 - Protect women faculty, particularly assistant professors, from labor-intensive committee assignments. Example: Requiring that the chairs of the Graduate Committee and the Faculty Search Committee be full professors.
 - Provide adequate leave with pay for women and at least some leave with pay for men when their children are born, along with the expectation that there will be no penalty attached for taking advantage of such a policy.
 - Give adequate guidance as to what the criteria for promotion and tenure are at that particular institution.
2. Perform a cultural audit:
 - Develop an anonymous survey to see how women faculty perceive their work life balance. At least one question should ask for their suggestions about how their departments could better support them.
 - Create a series of focus groups of women faculty to discuss and expand upon some of the results of the survey. Action items or items requiring further follow-up as generated in these discussions should be addressed to the appropriate administrative office.
3. Require that all departments provide each faculty member, both male and female, with a mentoring committee comprised of 2 or 3 tenured faculty colleagues, with responsibilities to:
 - Ensure that new faculty members making adequate progress toward tenure in terms of certain specified criteria.
 - Help female faculty (and also male faculty) strategize ways to find adequate time for their personal lives.

Research indicates that those who are mentored tend to have greater job satisfaction, are promoted more quickly, and earn higher salaries than those who are not mentored.^{29,30,31} Therefore, mentoring has been suggested as an effective strategy for helping achieve greater parity for women faculty.^{32,33,34}

Further research using a national sample of women engineering faculty is needed to determine whether or not the findings of this study would hold. Our nation’s colleges and universities must do everything they can to help their tenured and tenure-track women faculty succeed if we are to prepare the engineering and technology professionals of the future.

References

- [1] Schuster, J. H., & Finkelstein, M. J. (2006). *The American faculty: The restructuring of academic work and careers*. Baltimore, MD: The Johns Hopkins University Press.
- [2] Harper, E. P., Baldwin, R. G., Gansneder, B. G., & Chronister, J. S. (2001). Full-time women faculty off the tenure track: Profile and practice. *The Review of Higher Education*, 24, (3), 237-257.
- [3] West, M. S., & Curtis, J. W. (2006). *Gender equity indicators*. Washington, DC: AAUP.
- [4] Wilson, R. (2001, January 5) A higher bar for earning tenure, *The Chronicle of Higher Education*, A12.
- [5] Femtec. (2002). *Introduction to Femtec: University-based career center for women Berlin, Inc.* Berlin, Germany: Femtec.
- [6] Mervis, J. (2000). Diversity: Easier said than done. *Science*, 289 (5478), 378-379.
- [7] Committee on Science. House of Representatives. (2000), *A review of the Morella Commission report recommendations to attract more women and minorities into science, engineering, and technology, Serial No. 106-83*. Washington, DC: U.S. Government Printing Office.
- [8] AAUW. (2000). *Tech-Savvy: Educating girls in the new computer age*. Washington, DC: AAUW Educational Foundation.
- [9] Seymour, E. (1999) The role of socialization in shaping the career-related choices of undergraduate women in science, mathematics, and engineering majors. *Annals of the New York Academy of Sciences*, 869, 118-126.
- [10] Freeman, C. E. (2004). *Trends in educational equity of girls & women: 2004* (No. NCES 2005-016). Washington, DC: U.S. Government Printing Office: U.S. Department of Education, National Center for Education Statistics.
- [11] Women in Engineering Programs and Advocates Network (WEPAN). Statistics compiled by CPST (www.cpst.org). Copyrighted slides 2006.
- [12] Almanac, (25 August, 2006). Number of full-time faculty members by sex, rank, and racial and ethnic group, Fall, 2003. *The Chronicle of Higher Education*, 53, 26.
- [13] WEPAN. (2001). *Doctoral scientists and engineers in academic institutions by field, rank, and gender, 1991-2001*. Retrieved August 20, 2007, from http://www.wepan.org/associations/5413/files/by_rank_broad_field_and_gender_1991-2001.pdf
- [14] Curtis, J. W., & Jacobs, M. F. (2006). *AAUP contingent faculty index*. Washington, DC: AAUP.
- [15] McKendall, S. B. (2000). The woman engineering academic: An investigation of departmental and institutional environments. *Equity & Excellence in Education*, 33, 26-35.
- [16] Baum, E. (1989). Why are so few women in engineering? *Engineering Education*, 74 (5), 556-557.
- [17] Golladay, M. A. (1989). Women and minority faculty in engineering: Reviewing the figures. *Engineering Education*, 74 (5), 573-574.
- [18] Jacobs, J., & Winslow, S. (2004) Overworked faculty: job stresses and family demands, *The Annals of the American Academy of Political and Social Sciences*, 596, 104–129.
- [19] Valian, V. (1999). *Why so slow? The advancement of women*. Cambridge, MA: The MIT Press.
- [20] Mason, M. A., & Goulden, M. (2004). Marriage and baby blues: Redefining gender equity in the academy. *Annals of the American Academy of Political and Social Science*, 596 (1), 86-103.
- [21] Ginther, D. K., & Kahn, S. (2006). Does science promote women? Evidence from academe, 1973-2001. *NBER Working Paper No. W12691*.
- [22] Catalyst. (2006). *After school worries*. New York: Catalyst Press.
- [23] Santovec, M. L. Tips to change the culture and breach the ‘Maternal Wall. (2005). *Women in Higher Education*, 14 (7), 20-21.

- [24] Williams, J. (1999). *Unbending gender: Why family and work conflict and what to do about it*. New York: Oxford University Press.
- [25] Dailey, S. A. *Female faculty in science and engineering*. (Masters Thesis, University of Texas at Arlington, 1986).
- [26] Sears, A. L. (2003). Image problems deplete the number of women in academic applicant pools. *Journal of Women and Minorities in Science and Engineering*, 9 (2), 169-181,
- [27] ASEE (2006). *Profiles of Engineering and Engineering Technology Colleges, 2006 Edition*. Washington, DC: ASEE.
- [28] Theisen, C. (1997). Mothering on the tenure track: Can we do it all? *Women in Higher Education* 6: 22-23
- [29] Burlew, L.D. "Multiple Mentor Model: A Conceptual Framework." *Journal of Career Development*, 17 (3), 1991, 231-221.
- [30] Chao, G.T. "Mentoring Phases and Outcomes." *Journal of Vocational Behavior*, 51, 1997, 15-28.
- [31] Scandura, T.A. "Mentoring and Career Mobility: An Empirical Investigation." *Journal of Organizational Behavior*, Vol. 13, 1992, pp. 169-174.
- [32] Chandler, C. (1996) Mentoring and women in academic: Reevaluating the traditional model, *NWSA Journal*, 8, 79-98.
- [33] Hackney, C. E., & Bock, M. (2000) Beyond mentoring: Toward an invitational academe. *Advancing Women in Leadership*. Retrieved November 13, 2005 from <http://www.advancingwomen.com/awl/winter2000/hackney-bock.html>
- [34] Valian, V. (1999) *Why So Slow? The Advancement of Women*. Cambridge, MA: The MIT Press.

Appendix: Work-Life Survey Questions

Questions Regarding Respondent's Institution

- Q1: Is your institution public, private, or other?
- Q2: What is the highest degree granted by your institution (B.S., M.S., Ph.D, other)?
- Q3: What is the overall enrollment at your institution?
- Q4: What is the undergraduate enrollment at your institution?
- Q5: Describe the college in which you are a faculty member (Engineering, Engineering Technology, Other)
- Q6: What is your home department (e.g., engineering, mechanical engineering, etc.)?
- Q7: How many faculty (full-time and part-time) have their primary appointments in your department?
- Q8: How many faculty in your department have part-time appointments, and do not have an appointment in any other department or an administrative appointment?
- Q9: How many faculty are non-tenure-track in your department?
- Q10: What is the total student enrollment in your department?
- Q11: What is the undergraduate student enrollment in your department?

Questions Regarding Respondent's Appointment

- Q12: How many years have you been employed at your current institution?
- Q13: What is your current rank (Instructor, Assistant Professor, Associate Professor, Professor, Other)?
- Q14: How many years have you been at your present rank?
- Q15: Is your position part-time or full-time?
- Q16: Is your position a tenure-track or tenured position?
- Q17: How many classes do you teach per academic term (quarter, semester)?
- Q18: What is the distribution between undergraduate and graduate classes in your teaching assignment?
- Q19: How much input do you have in selecting your teaching assignments?
- Q20: What percentage of your time is spent on the following: Teaching, Research, Administration, Service (including student advising), Other?
- Q21: Is your workload relatively constant from term to term?

Appendix (continued) Work-Life Survey Questions

Questions Specific to Non-Tenure-Track Respondents (answered “no” to Q16)

- Q22: Does your institution offer tenure?
- Q23: Do you desire a tenure-track or tenured position? Please explain.
- Q24: How frequently is your contract renewed?
- Q25: Did you, at any point in your academic career, seek a tenure-track or tenured position?
- Q26: Did you, at any point in your academic career, hold a tenure-track or tenured position?
- Q27: Are you engaged in governance or administration at any level (department, program, college, etc.) at your institution? If yes, please describe.
- Q28: What advantages do you realize by holding a non-tenure-track position?
- Q29: What disadvantages do you realize by holding a non-tenure-track position?

Questions Regarding Respondent’s Home Life

- Q30: Do you have a spouse or partner?
- Q31: Does your spouse or partner work full-time, part-time, or not at all? (available only to those that answered “yes” to Q30)
- Q32: Do you have minor children at home?
- Q33: How many children living at home are in the following age categories: 0 – 5 years old, 6 – 10 years old, 11 – 17 years old? (available only to those that answered “yes” to Q32)

Open-Ended Questions Regarding Work-Life Balance

- Q34: Please rate your work-life balance (excellent, good, etc.) Explain.
- Q35: Has your work-life balance influenced your choice of academic position (e.g., part-time, full-time, tenured/tenure-track, non-tenure-track, etc.)?
- Q36: If you could change one aspect of your academic position to improve your work-life balance, what would that be?
- Q37: Are there any other comments that you would like to make regarding the questions on this survey?