Diverse Pathways to the Ph.D.: A Study of Women Faculty in the Sciences and Engineering at Hispanic-Serving Institution

Igor Ryabov

Patricia D. Witherspoon

The University of Texas at El Paso

Abstract

The National Science Foundation’s ADVANCE grants for Institutional Transformation have been awarded to institutions to study, and implement programs to improve, the number of women who are recruited, retained, and promoted as faculty in the sciences and engineering at American universities. At one ADVANCE institution, 57 women faculty in the social sciences, natural sciences, and engineering were interviewed to determine their pathways to the doctoral degree. Through the use of qualitative analyses, this study identified major themes that emerged from the interviews of Anglo, international, and Latina faculty. The findings of the study should contribute to the discourse on under-representation of women faculty in the sciences and engineering in general, and Latina faculty in particular.

Introduction

Faculty at minority-serving institutions are well aware of the obstacles many minority female students face if they hope to enroll in, and graduate from, college. Influences on their quests for university degrees begin in elementary and middle school, and are familial as well as individual, financial as well as academic. The challenges for minority women who aspire to be Ph.D.’s, especially in the sciences and engineering, are daunting. Such is particularly the case for Latinas.

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In 1992, Latinas/os received 3.6% of the doctorates awarded that year; by 2002, the percentage had increased to only 5.1% (Contreras & Gandara, 2006, p.94). Latinas/os are the fastest growing minority group in the U. S., but they are vastly underrepresented in the halls of higher education. In 1999, 3.1% of the nation’s assistant professors were Latina/o, compared to 77.7% who were White, 6.3% African-American and 7.2% Asian-American. Among associate professors, 2.5% were Latina/o in 1999 and 2% of the full professors were Latina/o, a lower percentage than any other racial/ethnic group, other than Native Americans (Contreras & Gandara, 2006, p.105).

The doctorate production average among Latinas only, between 1990 and 2000, was 4.1%, less than the average of any other racial or ethnic group except Native Americans (Watford et al., 2006, p.118). Among those few Latinas earning doctorates, most earned their degrees in education, the social sciences, and life sciences; very few were in the physical sciences and engineering (p.124). According to Watford et al. (2006), Latina graduate students are subject to overt marginality, such as verbal abuse and sexual harassment, as well as covert marginality, e.g. stereotyping, and dissuasion from pursuing research interests related to ethnicity and/or race. They also are affected by the lack of their numbers in academe in general, and the sciences and engineering in particular. As a result, these authors have called for an examination of problems that “can only be uncovered fully through in-depth qualitative research” (p.130).

In spring, 2006, the ADVANCE team at the University of Texas at El Paso (UTEP) decided that one way to better pave the road for the recruitment, retention, and promotion of women faculty at UTEP would be to learn more about the pathways to the Ph.D. traveled by women faculty. They focused on women appointed in the 18 departments under the auspices of the ADVANCE institutional transformation grant, e.g. those in the natural sciences, the social sciences, and engineering. The ADVANCE team reasoned that understanding the past experiences of these women faculty might help plan recruitment and retention programs for the future. By interviewing women faculty in these 18 departments, they sought to attain comparative data among the Anglo, international, and Latina faculty, and to identify issues of particular concern to Latina faculty, who are unique role models in an institution where almost three-
fourths of the students are Hispanic. The interviews of these individuals were conducted by the second author; the first author analyzed the data that emerged into major themes discussed in the paper.

**Review of Relevant Research**

Multiple dimensions of inequality are known to determine chances of educational success. These include race/ethnicity, gender, and social class. They do not operate as separate systems of social relations but form interlocking systems of oppression, or what Collins (2000) calls a “matrix of domination.” For example, Anglo women are subordinated to Anglo men by their gender, but are privileged by race vis-à-vis African-American women or Latinas. Depending on the context, an individual may be an oppressor, a member of an oppressed group, or simultaneously an oppressor/member of an oppressed group. Being Hispanic and female, for instance, may create a “double disadvantage” in terms of educational and professional opportunities. Bell (1992) refers to this phenomenon among African-American women as a “double whammy.”

Despite the recent increase in the number of studies with a focus on doubly-disadvantaged groups, such as minority women, there is no question that a gap still exists in the amount and quality of scholarship devoted to these groups. For example, there are few qualitative studies of Latina faculty, documenting their educational and professional experiences, including their successes as well as struggles (e.g., Contreras & Gandara, 2006; Luna & Medina 2000). All these studies have small samples (up to ten respondents) which limits generalizability of their results. Moreover, the overwhelmingly large proportion of research on marginalized groups in academia focuses on negative experiences of isolation, tokenism and discrimination (e.g., Gándara, 1995; Hochschild, 1995; Verdugo, 1995). At the same time, however, the current research has neglected the positive factors in the academic success of minorities such as social support and (Castellanos et al., 2006; Delgado and Humm-Delgado, 1982). Another lacuna, perhaps most evident in the research on Latinos and African-Americans, is that the existing research on underrepresented groups in academia focuses on experiences of these groups in majority-oriented institutions of higher education. Not surprisingly, the experiences of underrepresented groups in majority-oriented institutions are marked by isolation since the underrepresented groups constitute numerical
minorities and consequently may have difficulty in building supportive networks. For example, Latino and especially Latina students tend to rely on extensive ethnic support networks on campus, arguably as a way to compensate for the temporal lack of familial support. (related to the Borjas’ (1995) notion of “ethnic social capital” and Ream’s (2005) and Stanton-Salazar’s et al. (2000) notion of “confianza en confianza”). In contrast, little attention is paid to the professional lives of minority faculty in the context of minority-serving institutions as well as women in women colleges. This study attempts to bridge the lacunae in the existing research on disadvantaged groups in academe by: (1) examining different pathways to the Ph.D. among more than 50 female faculty of different ethnic backgrounds at a Hispanic-serving institution; and (2) providing comparative qualitative data for Anglo, international, and Latina female members of the professoriate.

**Methodology**

Letters requesting interviews were sent in the spring of 2006 to all female tenured and tenure-track faculty in the 18 ADVANCE departments, which represent the natural sciences, the social sciences and engineering. Fifty eight individuals were invited to be interviewed; one declined the invitation. Two women faculty asked that their interviews not be audio taped. Fifty five interviews were audio taped and analyzed for this study. Of these individuals, 27 were Anglo (U.S.-born non-Hispanic) faculty, 18 were international faculty, and 10 were Latinas (U.S.-born Hispanics).

Subjects were interviewed by one of the ADVANCE Co-PI’s. The qualitative analyses, using NUDIST software, were performed by the project evaluator. The interviews ranged in length from 30 minutes to over 1.5 hours. An array of questions dealt with academic choices, time frames in which the choices were made, types of social support during the pursuit of interviewees’ academic degrees, and the process followed to move into their first faculty appointments (see Appendix I). Interviews were audio taped and later transcribed. Several checks were made to insure that the transcriptions were accurate.

Once transcripts were checked for accuracy, the interviews were analyzed using QSR NUDIST, a respected and widely used qualitative data analysis software. QSR NUDIST was used to identify the themes that emerged from the interview analysis. Interview transcriptions were incorporated into a
database, from which relevant text was retrieved based on coding information. The coding in QSR NUDIST or, more exactly, the assignment of nodes (categories), usually based on a preconceived theoretical model, to any piece of text from a single word to a whole document can be achieved on two ways. The least time consuming, but less accurate, method is to assign nodes through the text search, i.e. the results of any text search can be saved as a node. The second and most comprehensive way of assigning nodes is called open coding. This latter method was exclusively used in this study. The nodes are assigned to a piece of text in the process of reading it and examining its structure.

**Emergent Themes**

The findings that emerged from this study are the themes that united and differentiated the interviewees. These themes are discussed below with accompanying quotations illustrating each theme, and relevant references to previous research.

*Early Expectations/Socialization*

Early studies of women in academe revealed that many women report coming into graduate programs with a low degree of self-confidence, which may contribute to the differential socialization of men and women in the professoriate, impaired self-confidence, and differences in gender role expectations (Padilla & Chávez, 1995; Valian, 1999). Anglos and international faculty noted that they were high achievers in school and started thinking about college while in high school, or even earlier. One Anglo woman recalled that “in high school, teachers did encourage me to go to a college. They also held some special tutoring sessions for me to prepare for a particular type of entrance exam in the summer.” Another Anglo woman said: “I went to college right away. My parents…made sure I was on it, and thinking about college from the beginning of high school.” Almost all of the Latinas interviewed did not view themselves as becoming scientists or engineers while growing up. They received little encouragement in school for pursuit of these degrees in college. One Latina recalled: “No one in my immediate family had ever gone to college, and so no one really encouraged me to go to college even though I had done well in high school.”

*Educational Background as an Influence on Expectations*
More than 80% of our respondents indicated that at least one of their parents and/or siblings had some college education. The majority of Anglos and international faculty had college-educated parents and siblings. One Anglo woman stated: “Both my parents were college educated, so that was always on my horizon that I would go to college.” Another Anglo faculty member observed: “My whole family went to the same college, and so it was expected that I would go there since I was five years old.” Most of the Latina faculty came from families with little or no educational history at the post-secondary level. This finding is consistent with other studies of Latinas with doctoral degrees (Luna & Medina, 2000; Padilla & Chávez 1995; Watford et al. 2006). However, one Latina observed: “In my immediate family my parents graduated from UTEP… And I have two aunts that are PhD’s. And education has always been very important in my family.” This faculty member has benefited from familial support for education associated with having college graduates in the family. Such family members serve as role models, and espouse the values that stimulate a positive and active stance toward pursuing higher education. As the stories conveyed by our interviewees show, the values held by their parents proved instrumental in enhancing opportunities and decision processes of these women.

Community Factors affecting Educational Access

In addition to family influences, other environmental factors such as type of community (e.g., rural vs. urban) were found to be related to differences in access to higher education among the interviewees. The majority of Latina faculty came from small, closely-knit communities with no four-year universities. Several other studies also observed the effect of locality on the chances of higher education for women (Aguirre, 1987; Dews & Law, 1995; Glazer-Raymo, 1999). As one Latina remarked, “the thing is we grew up in a really small town, and in that town there were no opportunities for higher education.” Other interviewees went to high school in larger communities and often in urban areas where institutions of higher education were located.

Familial Support

“Social support” is found in a variety of organizational and personal contexts. It can serve as a coping mechanism for individuals and as a buffer for stress in personal and organizational situations.
Albrecht & Adelman (1987) offer one of the most-cited definitions of social support as “verbal and nonverbal communication between recipients and providers that reduces uncertainty about the situation, the self, the other, or the relationship, and functions to enhance a perception of personal control in one’s life experience” (p. 19). Barnes & Duck (1994) define social support as “those behaviors that, whether directly or indirectly, communicate to an individual that she or he is valued and cared for by others” (p. 176). Miller & Ray (1994) suggest that “an action or interaction is not supportive unless it is understood as such” (p. 216) and so have studied perceptions of intended recipients of social support. Types of social support offered in individual, group and organizational contexts have been posited by several scholars. House (1981) discusses four types: instrumental support, e.g. concrete assistance such as the offer of money, time and other resources; informational support, e.g. the provision of information to assist the recipient, such as suggestions and advice; appraisal support, e.g. feedback, compliments, and constructive critiques; and emotional support, e.g. expressions of concern, empathy, sympathy and listening. Albrecht & Adelman (1987) delineated five categories of supportive messages, prompted by two fundamental needs of individuals: control and uncertainty reduction. Communication that helps one develop skills to enhance control and/or reduce uncertainty, that provides tangible assistance, such as time or money, that validates one’s worth through acceptance or assurance, and that encourages individuals to express their emotions through venting, are some of these categories. Cutrona & Suhr’s (1992) category system of support types also includes “network support.” Such support is comprised of messages that help broaden one’s social network by connecting the individual to people with similar interests and situations.

Social support can be relationship-specific, where one receives support from individual relationships, or global in nature, i.e. coming from one’s social environment. Peers provide communication support through task and social relationships. Mentoring is also a relationship-specific type of social support. Familial social support is, of course, relationship-specific.

Family, including parents and siblings, constituted the main informal and most enduring support group for female faculty. Consistent with the results of earlier research (Banks, 2001; Guanipa & Chao, 2003; Watford et al. 2006; Xie & Shauman, 2003), we found that continuous family support influenced
motivation to attend college and was one decisive factor in determining if the woman received a doctoral degree.

In general, the majority of female professors, regardless of their ethnic background, stated that their families were always supportive of their graduate studies and academic careers. Anglo and international faculty also mentioned receiving material and financial support from their family members while pursuing their studies. Latinas, however, sometimes felt pressure not to leave home for advanced education, because of the close-knit nature of many Hispanic families. One Latina interviewee explained: “When you are Mexican and you are growing up, it is not necessarily that they don’t want you to succeed, but they don’t want you to leave. It seems to be an attitude that says: ‘Don’t step above the group; stay close, stay tight and don’t excel.’” She emphasized an important distinction: the sentiment focuses more on keeping a family together as a collective, rather than trying to undermine the goals of one individual. Another Latina’s experience was different: “My father had to drop out of school when he was a freshman in college and my mother had to drop out of school when she was in eighth grade. So their vision for their children…is that we would all have a college education…All of the girls had to finish college before they could get married.” All five children in this family graduated from college, including the three daughters. Although there were only a few single mothers in our sample, our findings indicate that single mothers created social support networks from a variety of sources: best friends, parents and children were all mentioned as important agents in their support networks. According to one single mother: “My daughter still tells people: ‘You don’t know what I went through to put my mother through that PhD’…We were always struggling for money…and [now she says] mom, it was worth it…But I think - the cost, I wonder, was this awful to my daughter?”

**Family Influences: Role of the Father**

The first adult role model in a traditional nuclear family for a girl is often considered to be her mother (Thorne, 1993; Witt, 1997). In our sample (and this concerns both Latinas and non-Latinas as well), more references were made about fathers than mothers as a source of social support, guidance and role modeling. The father role was complemented, but not substituted by that of a mother, as many of our
interviews convey. According to one Latina: “If I would have told him I’m going to take over the world tomorrow he would have said, ‘What time? Because I want to be there.’ He was always (saying) ‘you are the best, you can do whatever you want, you are a great woman’…He was a very educated man…but he only went to…the 11th grade in high school.”

**Spousal Support**

Studies show that women scientists and engineers are more successful in pursuing their academic careers if they have significant spousal support, including rearing children and running the home. Indeed, previous research indicates that spousal support is seen as critical at every point of an academic career (Glazer-Raymo, 1999; Padilla & Chávez, 1995; Valian, 1999). The majority of interviewees praised their husbands’ support, whether in the form of material assistance (e.g., time management, helping with housework) or advice. There were also instances when women indicated that their husbands actually pushed them to discuss their salary and/or promotion with their employers. Some studies note that this is characteristic of males; women usually are less experienced than men when it comes to negotiating salary and start-up packages or conditions of employment in general (Etzkowitz et al., 2000; Valian, 1999; Xie & Shauman, 2003).

A lack of spousal support usually resulted in conflict and ultimately divorce among our interviewees. One Latina professor who had to go through a divorce noted that her ex-husband was vehemently opposed to her being engrossed in studies. She also believed that, due to her husband’s opposition to her academic career, the open conflict with her husband was inevitable. In an attempt to analyze her marriage, another woman states that her husband’s hostility towards her academic career became the major problem that ultimately led to their divorce. The divorce was, nevertheless, a turning point in her life. She says: “I hit thirty and got divorced and the most awful day of my life was the day after my husband moved out and I realized that I could no longer blame my parents, I could no longer blame my husband; my life… [was] solely in my own hands, and if I didn’t make anything of it now, there was nobody to blame but me.”

**Mentoring**
The role of a mentor as a form of social support was mentioned by nearly all interviewees. At different stages of women’s careers, mentors functioned as teachers, guides, role models and friends. One woman said: “I’m still in contact with him [the mentor]. Whether I have an issue about a grant or this or that, I can call him up and say ‘what do you think?… He was just a total inspiration and … when I first met him, to me he was Einstein. I just thought this guy is the most brilliant guy and how could I ever be a scientist like that, in that I’m never going to know as much as he does.” Many women mentioned that their mentor taught them to be persistent: “He [mentor] just exudes mentorship and constantly, constantly supports me and encourages me. Right now my main thing is trying to get a grant for my lab right. And so he tells me all the time, focus on the science. Just focus on the science, put your nose down and be persistent. And it looks like that is going to pay off for me.”

Mentors were particularly influential in graduate students’ careers as dissertation/doctoral advisers. The importance of these mentors grew in the later stages of academic careers as the role of family support dwindled. According to previous research, young women become less dependent on their families as the source of support and advice when their personalities mature and their academic careers gain momentum (Coughlin, 2005; Etzkowitz et al., 2000; Xie & Shauman, 2003). Consistent with the findings of other studies, our analyses point out that the majority of mentors were men since there were and still are not enough senior female professors in academe who might assume the role of mentor to younger women. One interviewee said: “I have had absolutely fantastic male mentors … All along the line they were all men. Now, it wasn’t because women refuse to do it. It was because there were no women around … I would not have gotten a PhD, had it not been for [him]. I just simply would not have done it, and I would have had a miserable life.” One interviewee recalled visiting a favorite high school teacher during the Christmas holidays when she was in graduate school. “I said that I was going to go for the Ph.D., and he said: ‘Really, why?’ And I said: ‘Because I want to teach,’ and he said: ‘You don’t know how long I’ve waited to hear you say that.’…Talk about validation…that was unbelievable.”

*Support Groups*
Family members, friends, neighbors and classmates were usually mentioned as the main sources of informal social support during college years by these faculty. Such was particularly the case during graduate school. According to numerous studies, social support is critical at all stages of women’s academic careers (Castellanos et al., 2006; Luna & Medina, 2000; Tokarczyk & Fay, 1990). Peers were cited by a few of our respondents as important agents that influenced decisions to go to college. Several Anglo females mentioned that their choice of college was determined by the choice of their best school friends who were the same age. Having reliable friends during undergraduate, and especially graduate, studies was mentioned by many women as one of the factors that helped them negotiate both the academic and the social college environment: “We just went to a professor and said we want to learn chapters x, y, and z…Would you just monitor or examine us so we can teach each other this?…It was extremely motivating to do that and it was positive.” Another interviewee remembered: “I made a lot of good friends and I lived in the dorm and that made a big difference because I immediately had a little cluster of friends, and so …I had a pretty instant support network.”

The majority of Latinas tended to seek social support during their college-going years more than the majority of Anglo and international faculty. This is consistent with other studies which note that, in order to compensate for temporally severed close-knit family ties (reminiscent of familismo in Latino communities), Latina students established friendships in social or other groups that provided them with informal support needed to be successful in an unfamiliar environment (Castellanos et al., 2006; Luna & Medina, 2000).

Financial Need

The majority of interviewees, regardless of their ethnic background, did not recognize economic difficulties as one of the factors that shaped their childhood experiences or limited their choice of college. Those whose parents paid for their higher education were less likely to solicit help from social support groups during their undergraduate and graduate studies. Several women indicated they worked during their undergraduate or graduate studies, but their parents paid all or most of their tuition. Anglo and
international faculty tended to work during graduate school in research or teaching assistantships or they held fellowships. One of them recalled: “…I was really lucky, he [father] was paying for all my tuition, most of my expenses. So I worked part-time to have the experiences. I tutored and babysat.” Despite the fact that only a few interviewees mentioned they had to pay for education themselves, their stories are informative of factors affecting choice of college, discipline and, sometimes, an academic career in general.

Latinas tended to work at a variety of jobs during their undergraduate years. Other studies also report that the majority of Latino students have to work in at least one job during their undergraduate and graduate studies (e.g., Aguirre, 1987; Castellanos et al., 2006; Luna & Medina, 2000). Padilla & Chávez (1995) relate this finding to the fact that Latino students come from families of working-class background with a strong sense of work ethic. One Latina began working with her parents in the fields in her early teens and, when coming to visit her parents from college during the summer, continued working with them. Because of the value of hard work that her parents instilled in her from early childhood, she became appreciative of her background and took pride in it.

Yet another Latina faculty recalled having a full-time job, and having to save for future graduate study: “I didn’t take vacation. I didn’t have a car... My objective was clear. I was not going to spend. I [had] to spend money buying good clothes because [when] you go to a company you cannot be with jeans… and a t-shirt. So I had to buy suits, and all that stuff. That’s it. That was all.”

Institutional Financial Support

Given that women encounter more obstacles than men in academe, it has been argued that institutional support for women, especially for those who are in dire financial need, is essential for extending educational opportunity to female students (Glazer-Raymo, 1999; Valian, 1999; Xie and Shauman, 2003). Generally, institutional support in the form of scholarships, stipends and assistantships was very important for female students because it gave them a chance not only to complete their education but also to compete with male students. Several faculty stated that they were receiving engineering scholarships while in college, and one mentioned receiving a minority scholarship. “I actually
got… a three year fellowship from the National Science Foundation for the doctoral programs for minority students. So I had a full ride actually. The university didn’t have to pay anything.”

Moreover, institutional support in the form of grants and endowments later in their academic careers was cited by many women as a measure of personal success that elevated their own self-confidence and self-esteem. A number of women referred to institutional support as an empowering experience: “I always wanted to be the one that was managing the millions and billions of dollars and figuring out how that should be used to more effectively help minorities become scientists.”

A number of programs were mentioned by female faculty when discussing access and support of women and minorities in higher education: MARC (Minorities Access to Research Careers), SACNAS (Society for Advancement of Chicanos and Native Americans in Science), and the National Chicano Council for Higher Education. Not only did scholarships make a difference in the professional lives of female scientists and engineers, but other forms of institutional financial support definitely gave boost to academic aspirations of these women. One woman, for example, indicated that because her father had lost his life in war, her studies were supported by the Veteran’s Administration.

**Identity Formation**

Identity formation was found to be critical in at least two ways. It included increased self-awareness in a diverse social environment and becoming aware of socio-economic class, as one was exposed to stratified social groups in the transition to college life. Increased self-awareness in a diverse social environment such as a university is an inevitable outcome of this transition. Some studies also relate this outcome to the fact that the college years are associated with the transition from adolescence to young adulthood (Banks, 2001; Hancock, 1989). A few women reported becoming aware of their social class as they became more exposed to stratified social groups on campus:

“It was the first time that I realized I was middle class or that I wasn’t, or that class became an issue because people could afford to do things that I could not do… A lot of the people that I went to school with had brand new SUV’s, cars, or they would go skiing on the weekends, which were things that
I could not afford to do. And then I would work in the summer and a lot of them did not have to do that, that they could do study abroad…”

“It was a social class adjustment. It was difficult. I did not like it [at] all because it was very different attitudes… Most of them come from really well off families, and I wasn’t and so I just did not connect very well.”

For some faculty, living in different cultures has created a complicated dichotomy. Here is an example: “I feel like my world is split in two. I have my friends from graduate school, or who I’ve known from my graduate school experience that know me in a completely different light than my friends that I grew up with. My friends that I grew up with don’t get it. You’re working so hard and you don’t have time off. It’s very frustrating for me that they don’t get it. But I understand.” A Latina observed a tendency to ask for “permission” to move her career forward: “As an Hispanic…what I was always looking for was someone to say, ‘okay, you should go on.’ And that’s what happened to me when [a mentor] came up to me and said: ‘…You should go on.’ But why did I have to wait for someone to say that to me? I’m really still puzzled by that.”

**Gender Awareness**

 Becoming gender- or ethnic-aware as women and/or minorities encouraged several women to pursue political activism, or women and ethnic minorities’ agendas on campus. Other authors note that many women become aware of their womanhood when opposed and/or threatened by men (Coughlin et al., 2005; Thorne, 1993). We also found that gender-conscious individuals were particularly sensitive to prejudice and discrimination against them in their academic career. Individuals who look to other factors for their identity (e.g., ethnicity, social class, position) tended to interpret instances of unfriendly behavior toward themselves as a reaction to their ethnicity, class or position.

**Cultural Adjustment of Foreign-Born Faculty**

Almost all foreign-born faculty mention language as one if not the most difficult of any issues related to culture shock which is precipitated by the anxiety caused by inability to read through the symbols of the U.S. culture. Dealing with cultural differences at home and in the U.S. is an important
theme in the interviews of foreign-born faculty. Earlier studies (e.g., Marvasti, 2005) also showed that cultural factors, among them English language proficiency, can seriously affect self-esteem of foreign-born faculty and therefore impede their professional advancement. Nevertheless, a foreign-born woman stated that, although language constituted the most conspicuous cultural barrier, the cultural adjustment to campus life also involved isolation. However, after becoming familiarized with the culture, language lost its importance as a cultural problem to many. Importantly, several interviewees mentioned the differences between educational systems in their home countries and in the U.S. One faculty member said: “The main difference between the systems is that XXX [name of the foreign country] generally, the system is based on intelligence or smartness… But here much is based on how much you put into it, which is …. a lot more motivating because you feel it’s under your control…I think that made a difference. I guess it made me believe more that it was up to me.”

Effects of Women in Leadership Positions

Evidence suggests that having a female chair and, to a lesser extent, having women among the university CEOs is critical in assuring female faculty that women’s issues will not be neglected (Carli, 1999). Further, studies point to the fact that not only women but also men benefit from female leadership because women are better than men at team building and communication (Arliss, 1991; Coughlin et al., 2005; Glazer-Raymo, 1999). The female faculty in our sample who were in leadership positions in their departments indicated that they had initiated a number of activities aimed specifically at changing climate and promoting issues that are of interest to junior female faculty. Women in departments headed by women provided positive comments about their chairs’ leadership styles and endeavors. Several junior female professors recalled that, after women had assumed leadership roles in their departments/colleges, the climate toward diversity and collegiality became more supportive and their opinions as junior faculty counted. The following excerpt is noteworthy in this respect: “Having a female Chair makes a big difference because I think that women, at least in my own experience, and maybe because it is the way that I am, I think that women are more confrontational and they will be more persistent about stating what they need and how they plan to go about it, and that has been my experience with our Chair. She is very
clear, and very hard-working, has very keen ideas on what she wants and how to go about getting that. That means facing up to some of the full-time, long-term members of the department, male members, when she does that.”

_Differing Pathways Due to Finances_

Women take different pathways to doctorate destinations. Some of our interviewees started their academic careers later than others and their educational pipeline was often interrupted by pursuit of careers in industry that were financially, rather than professionally, satisfying, or they worked to earn money for school, starting and stopping on the educational road when finances demanded it. One of them said: “I did things like baby sat, I worked temporarily as a cashier somewhere. Then … I worked at a furniture store … I worked to try to save money at a very awful place. It was a mental health center … it wasn’t anything academic …”

Almost every woman, Latina or non-Latina alike, reported working part time to cover her non-educational expenses, while tuition was paid by their parents or scholarships. The majority of UTEP female faculty worked as research and/or teaching assistants while pursuing their graduate studies, although Latinas reported working at other jobs as well.

_Conclusions_

Through the use of interviews, we explored pathways to the doctorate among women at one Hispanic serving institution. After careful examination of all factors that influenced professional careers of these women, the following conclusions emerged. First, expectations about their futures varied significantly among the women interviewed in this study, as did the educational backgrounds of their families and the opportunities for education in their communities. Some Latinas encountered greater obstacles to their academic aspirations from institutions, such as family and community, than women from more privileged backgrounds (the majority of Anglo and international faculty). Second, familial and spousal support, as well as that from close friends or fellow graduate students, was important to the success (attainment of the PhD) of these faculty. Third, a mentor was critical to the educational and professional development of these women. Most mentors, although not all, were men. Fourth,
institutional financial support was especially important to the Latinas and international faculty in the study. Fifth, interactions with family, friends, professors, spouses, children, and anyone with whom one has ongoing communication, help shape our identities. What people tell us, especially ABOUT us, is important to the development of identity. As young women go through school and college, teachers and professors must be aware that what they say affects the perceptions young people have about themselves and their potential for academic success in the future. This is particularly true for minority women, who may already have negative self-perceptions about themselves generated by the society around them. Sixth, the vast majority of interviewees, regardless of their origin and family background, emphasize the value of support that they received from their parents, siblings (earlier in their academic careers) and spouses (later in their academic careers). Only a few faculty mention that emotional and material family support was not always available to them. Seventh, friends and peer groups are important in the early stages of an academic career, especially during graduate studies. Finally, a few faculty reported receiving mixed, or contradictory, messages of support from colleagues and complained about the unsupportive atmosphere they sometimes encountered on the pathway to the Ph.D.

Guided by our findings, we expect that the following interventions are likely to produce a positive effect on the advancement of women’s careers in sciences and engineering. First, special attention should be paid to the professional and educational needs of the Latina professoriate, one of the most, if not the most, disadvantaged groups in academe. Providing positive institutional climates for the academic growth of these women during their years as graduate students may help to compensate for the deficits of early socialization which may not focus on pursuing academic careers in science and engineering. Fostering peer networks that provide social support during early years in the professorate is also an important strategy for enhancing retention in organizational cultures that do not value gender and ethnic diversity. Since our findings underscore the importance of familial types of social support, easing the burden of family vs. work choices is an institutional goal that should be incorporated in policies regarding balancing career and home responsibilities. Hence, designing generous family-oriented policies (e.g., dependent-care leaves, extending the tenure clock, child-care facilities, etc.) and, more importantly, making them
work is another important area of institutional support for women faculty. Because we found strong
effects of mentoring on professional development of our interviewees, we recommend establishing
mentoring programs that allow for a variety of mentoring relationships by department, discipline,
etnicity, gender, function (teaching, research, service), etc. Mentoring programs that pair only two
persons may not account for all the mentoring needs of women in the professoriate. It makes sense for a
woman engineer to mentor a new faculty member in engineering. It also makes sense to pair a senior
woman in English with a junior faculty member in mechanical engineering if the latter is interested in
becoming a mother and the former has integrated work and family issues with great success. As
evidenced by our finding, stipends and assistantships for female graduate students as well as start-up
packages for junior women scientists and engineers are important economic stimuli in support of
women’s academic careers. Moreover, we propose financial incentives for academic units that succeed in
increasing the number of women faculty in science and engineering. Finally, we recommend fostering
positive interactions in an academic setting to compensate for the heterogeneity of social environments
outside of academe. This could be done by initiating programs that would facilitate acculturation of junior
faculty into the institution and help build communities of faculty across ranks.

A Final Note: The Importance of Memorable Messages

Memorable messages are statements made to us that we recall for many years, that may initiate
life changes (Knapp, Stohl, & Reardon, 1981; Stohl, 1986). They are comments, or pieces of advice, we
carry with us, and may be memorable because of their content or their source. Initially, almost all
interviewees were unable to think of any long-standing “memorable message.” As they talked, however,
most recalled a “memorable interaction,” or conversation, that has remained in their memory for many
years. In some cases, the interaction was with a parent, in others with a mentor or a teacher. In all cases,
the interaction, especially its content, was meaningful. The following are some examples of these
messages.

“I just remember when I went to be an archeologist… I remember everybody saying you’re not
going to have a job. You are going to starve to death.”
“I still thought I wanted to be a mathematician… I took the first exam in the class … I got a C… I went to talk to the professor… I was wondering if he had any recommendations on how to be better prepared for the next exam … And instead of recommending something that I should do, he said: ‘Well, you just might want to consider that you may have reached your intellectual limits in mathematics.’ At first I thought he was joking… He said: ‘Well, everybody… gets to the problem… they just can’t solve, and for some people that happens in elementary school, for some people it’s in high school, for some it’s college, and for some it’s twenty years into a…into a professorial position.’ Instead of asking him whether he had reached that point, which I was kind of wondering… I explained to him that I didn’t believe that. But at some point you might get to the problem that is just not worth solving it, worth what it would take to solve it… Never did they [parents] or anyone else, my grandparents, or my aunts and uncles, none of them ever suggested that I wouldn’t be able to something because I was a girl.”

After her graduate studies, one interviewee recalled leaving the job she held to apply for a fellowship under the supervision of a nationally-known scholar: “I applied for the fellowship and then I had to apply for a leave of absence …There were things that didn’t get timed that perfectly, and I was really worried about it… So in the middle of all these chaotic things happenings, he [supervisor] said: ‘If we never take risks, life would never be worth living.’ And that is something that I keep remembering, every time when I have to do something unusual.”

“When I was in second grade, I was sick for about a week or two missing school, and …I had to catch up with the homework I missed. I was working on these math problems … and I got so worried that I was sitting there crying, and my mom came and asked me what was wrong … I told her I would never be able to do these problems, and she told me: ‘Well, lets do one problem at a time.’ And so I did them one by one…So the idea of having so many problems in front of you and just trying to solve the problems one at a time … I think that philosophy stayed with me all my life.”

Perhaps the following memory summarizes the complexities and sacrifices women have faced as they carve out ways to pursue careers and the creation of families.
“My mother had a Master’s degree in Physics which was extremely unheard of in her generation... Back in the days when there wasn’t day care and very good childcare opportunities... basically when I was born... that was the end of her career as a scientist... I am thankful... I didn’t have to do that... When she was working on her Master’s, she actually got a Fulbright and... went to the Netherlands to work for a year... She said the Dutch have a saying that ‘when you educate a man, that supports the family... but when you educate a woman, you educate the family.’” (Italics added.)

These messages that have been memorable to the interviewees participating in this study are now stories of success and inspiration. In their telling, they developed as ways to share information, inspire, motivate, and even served as reflections of reaffirmation among the women faculty who told them to us. Just as the individual interviews were stories of individual recollection along the pathway to a Ph.D., the memorable messages emerged as important stories to share with the authors, as examples of how the oral tradition passes remembrances from one generation to another, one family to another, one faculty member to another. Human beings are story tellers, creators of narratives, and the processes of faculty recruitment, retention, and promotion may benefit from stories like the ones we were told, as memorable messages or as interviews in toto. Indeed, the phenomena of social support communication, memorable messages, and narratives from one’s personal and professional lives emerged as being “woven together” as the interviewee transcripts were analyzed. We recommend the increased use of qualitative studies in identifying and describing the factors, and their interrelationships, that affect the recruitment, retention and promotion of women faculty in the sciences and engineering. Stories about pathways to the doctoral degree, the first academic position, the award of promotion and tenure, etc. are teaching tools, and should be a part of a department’s inventory of information for use by succeeding generations of its members. As narrative paradigm theory suggests, human beings are by nature story tellers, and we analyze, and use, the stories we tell each other through the process of socialization (Fisher, 1985; 1987). Stories, and the events at which they are shared, can become part of departmental efforts to create community, enrich culture, and foster a positive organizational climate for all faculty.
Each of us has a story. The stories within this study have told us much about what enhances, and what impedes, pathways to the Ph.D. for women scientists and engineers. Many women must overcome significant hurdles on the road to success, in order to make great contributions to their disciplines and their universities. For some women, like Latinas in our study, the stories are particularly important to share, and to hear, for they tell us much about how we can create bridges, rather than barriers, along their journeys to the professoriate.

References


