

When Critical Mass is Not an Option: Diversifying Smaller Faculties

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Abstract: *This work discusses the results of the first part of a National Science Foundation funded study to consider the question: How are the needs, strategies, and tactics of smaller and geographically isolated universities trying to diversify their faculty similar and dissimilar to their counterparts? How can this knowledge be used to create positive gains in the diversity of the workforce and climate changes to facilitate such gains? This paper discusses the stage one results in the area of mentoring using data from a faculty work life survey conducted across the STEM faculties in all six public universities in the U.S. state of South Dakota and relevant information, policies, and procedures available to faculty. Initial results and next steps are discussed.*

Introduction

The US National Science Foundation created the ADVANCE initiative to “develop systemic approaches to increase the representation and advancement of women in academic science, technology, engineering and mathematics (STEM) careers, thereby contributing to the development of a more diverse science and engineering workforce.” (NSF ADVANCE) One component of this cross-cutting program is the IT-Catalyst awards which “are designed to support institutional self-assessment activities, such as basic data collection and analysis and policy review, in order to identify specific issues in the recruitment, retention and promotion of women faculty in STEM academics within their institution of higher education.” A recent webinar of IT-Catalyst awardees allowed for questions regarding research methods. One awardee was concerned with small N values in survey results because some of their departments had less than five women faculty. The co-authors wished they had that problem; the South Dakota School of Mines and Technology (SDSM&T) has three female engineering faculty across eight engineering departments and eight STEM tenure track female faculty overall.

While the ADVANCE program has produced a number of laudable mentoring and networking programs aimed at recruiting and retaining women faculty, none have yet fully addressed the issue of critical mass at a single location. Statistics on faculty gender are typically reported as percentages; this can belie problems concerning limited opportunities for mentoring and networking when small percentages are paired with small N values.

On the national (U.S.) level, the low percentages of women faculty in STEM fields are sobering. As of 2006, less than 12% of all engineering faculty were female, and approximately 2/3 of the female faculty have less than 10 years experience (NSF 2007). In science, where the numbers are somewhat more encouraging, 30% of all faculty were female with less than half having over 10 years experience (NSF 2007). What these statistics do not convey is how being on a small campus greatly magnifies the disadvantage in numbers for women. For example, in their ADVANCE-IT proposal, Virginia Tech reported that only 7.2% of engineering faculty and 17.2% of science faculty were female; however, this translated to a total of 65 female faculty (VATech ADVANCE). SDSM&T's percentages are similar; however these percentages translate into a total of just eight tenure track or tenured women in STEM departments, and five of these eight women are isolated as the only tenure track woman in their respective departments. The entire college of engineering, in which over 60% of

the student population is enrolled, has only three tenure-track women faculty, none with more than six years of experience. Many of the known programs for women faculty may be effective in larger engineering or science programs or at large comprehensive institutions, but they can be very difficult to successfully adapt and implement at a small institution. In particular, mentoring programs or campus networking events simply do not have the critical mass required to be strong resources for the women on a small campus. SDSM&T is not alone in the scarcity of women faculty; for example, in 2004-2005, the schools of engineering at University of California Chico and Western Kentucky University each had only one female faculty member, despite engineering enrollments of approximately 750 and 400 students, respectively.

Institutional Context

The South Dakota School of Mines and Technology (SDSMT) is a specialized engineering and science university in a geographically isolated location. It is a predominantly undergraduate institution, although a small number (< 5) of PhDs are conferred annually with an enrolment of less than 2500 students. Similar to many other colleges and universities at both the state and national level, SDSMT is experiencing increased research expectations while maintaining high teaching loads and a dearth of start-up funding (Kramer 2005). While these institutional demographic features mean that SDSMT faces challenges that differ from the challenges of a comprehensive urban or suburban university, many of the core challenges affecting faculty recruitment, retention and advancement still overlap. In addition, SDSMT's institutional demographics are shared in full or in part by a significant group of other colleges and universities. While individually these institutions receive less attention than some of their counterparts, the smaller institutions in the United States produce a significant percentage of the engineering graduates in the US (Ellis 2008). Among these institutions are the public, private, and tribal colleges and universities in South Dakota as well as South Dakota's system of technical institutes. Articulating challenges and potential countermeasures to those challenges for SDSMT and rest of the colleges and universities in South Dakota will also aid institutions who share a portion of these features.

Research Question

Building on the above described theoretical landscape in combination with the constraints and benefits of the institutional context, the overall research questions of this National Science Foundation funded study are: How are the needs, strategies, and tactics of smaller and geographically isolated universities trying to diversify their STEM faculty similar and dissimilar to their counterparts? How can this knowledge be used to create positive gains in the diversity of the workforce and climate changes to facilitate such gains?

This paper discusses the stage one results in the area of mentoring. Given the changing faculty expectations, small number of total faculty, even smaller number of women faculty, and geographical isolation, what are the needs, expectations, and availability of mentoring for STEM faculty? How are these needs unique to smaller, geographically isolated institutions, and how might strategies from larger, less isolated institutions be adapted to service these institutions?

Mentoring

A plethora of articles exist on mentoring and its importance in faculty development (Smith et al 2000). Faculty mentoring is predominantly based on a male model which fosters a challenging, competitive environment and stresses independence (Seymour and Hewitt 1997). However, women prefer inclusive, cooperative environments that provide a sense of belonging (Gilligan 1982). Chesler and Chesler (2002) discuss innovative mentoring strategies related to gender, including the "distributed mentorship." This approach breaks the traditional one-on-one, senior faculty as mentor model and includes alternative methods such as peer mentoring and electronic methods for distance mentoring. This model is particularly suited to an institution lacking critical mass of women faculty and/or geographically isolated from other institutions. To quote a wise student on the SDSM&T campus when asked about isolation and meeting other women on campus, "Just because you have another woman in class doesn't mean you're going to like her." While gender may be one criterion in

choosing a mentor, it cannot be the only criterion, nor does it guarantee a successful mentoring relationship (Chessler and Chessler 2002, Smith et al 2000).

There are numerous examples of programs that have been initiated by NSF-ADVANCE institutions as well as other colleges specifically geared towards women faculty. Examples include the Women in Engineering Faculty Interest Group (WEFIG) at Texas A&M (Autenrieth et al 2004), The Faculty Peer Mentoring Groups at Brown (ADVANCE Brown) The Triad mentoring group at Rice in which two untenured faculty are paired with one senior faculty (Rice) and a myriad number of other groups in which women faculty are paired or, more typically, meet as a group. In fact, many of the mentoring groups developed under ADVANCE groups and outlined on the ADVANCE portal website (ADVANCE) are based on a group mentoring model rather than a dyadic model, such as the program developed at the University of Washington, with the understanding that “mentees benefit from hearing multiple perspectives on career development,” (Yen et al 2005).

At institutions where there are less than ten women faculty in the science or engineering programs, gender-specific mentoring or networking programs are not likely to be to be practical. This is generally due to the lower number of senior female faculty when compared to junior faculty in STEM fields (NSF 2007) as well as the fact that women faculty tend to allocate more time to teaching and service than their male counterparts (Bellas and Toutkoushian 1999). For example, in the University of Washington group mentoring program, senior female faculty develop workshops for the junior faculty. Consider that at SDSM&T, if female STEM faculty at the rank of full professor were required to present to junior faculty, they would both run out of ideas and time very quickly.

In general, however, mentoring can be successfully accomplished across gender lines; in fact, mentoring is viewed as important equally by faculty regardless of gender (see next section). The one exception is that women faculty viewed the importance of mentoring on work-life issues higher than their male counterparts, so mentoring relationships, whether in groups or individual, need to recognize this as a concern for female faculty.

Methodology

The data in stage one of this study comes from two sources: a survey of faculty in the six public universities in South Dakota and the policies and programs of the six universities and the state Board of Regents, as published in manuals and on their web sites. The investigative team opted to use published policies and programs for stage one as this part of the overall study is focused on *faculty perception* of their work life needs and availability of resources to meet these needs. Thus, university resources data in stage one is restricted to sources readily available to the average faculty member on each campus. Stage two will include surveys and interviews with department chairs and administrators.

The invitation to complete the faculty survey was sent via email to all of the STEM faculty members who are tenure line or equivalent at the six public universities in South Dakota; the survey itself was completed online. Out of the 298 total STEM faculty members across the state, 132 responded, or 44.3%. Respondents were coded by general area (e.g. engineering) rather than department or specific field (e.g. civil engineering) because of the small number of members in the population. The distribution by general area is given in Table 1.

Table 1: Distribution of Respondents by General Area

Area	Total Invitations	Total Responses	Response Rate
Science	98	45	45.9%
Technology	47	22	46.8%
Engineering	98	41	41.8%
Math	55	24	43.6%

Fifteen of the respondents identified themselves as female, 96 identified themselves as male, and 21 choose not to answer the question. Additionally, 34 identified themselves as junior faculty (either instructors or assistance professors), 80 identified themselves as senior faculty (either associate or full professors), none of the respondents identified themselves as emeritus faculty, and 21 choose not to answer the question. While additional stratification questions were asked, each had a single mode that

was so large reporting data based on these factors would cause individual responses to be recognizable and thus will not be reported.

The survey, titled “Academic Work Environment Survey”, asked for responses in 6 areas: hiring, mentoring, tenure and promotion, career satisfaction, interaction with colleagues, and demographics. Participants were not told that the survey was funded by a grant to look at strategies to recruit, retain, and support women STEM faculty and questions that the pilot testing found to be “gender laden” were not included in the final survey. The survey questions were based on questions from successful surveys given through the ADVANCE programs at Hunter College and University of Wisconsin (ADVANCE). The survey and protocol were approved by an Institutional Review Board prior to the collection of any data.

Preliminary Findings and Directions

This paper focuses on the results of the mentoring section of the faculty survey and the mentoring policies and programs of the campuses. The South Dakota Board of Regents (SDBOR) has no policy or official statement on the mentoring of faculty members. In fact, of the 63 total results in an April 2009 search for the word “mentor” in all SDBOR policies, reports, press releases, meeting minutes, presentations, and other documents, 52 of the results either referred to faculty as mentors of students or discussed K12 teacher training programs. One of the results was for MentorGraphics software. Only two of the results mentioned faculty or anyone mentoring other faculty, and both of these were simply statements of hope. The only result to mention training of any kind for mentors was a press release about a national program to mentor members of the BOR itself.

Campus by campus searches of information generally available to faculty proved equally as futile, which matches with the faculty perception of mentoring from the survey. On a 1 to 4 scale, where 1 means “strongly disagree”, 4 means “strongly agree”, and the neutral point is 2.5, the survey respondents felt that mentoring is very important to faculty success (3.48), but their university does not value it (2.05) and lacks a process to make sure any mentoring of faculty that does occur is going well (1.85). Additionally, what mentoring does occur is not associated with any sort of tangible recognition of service (1.53). That being said, the STEM faculty in South Dakota find the mentoring they are receiving is just to the unsatisfactory side of the scale (2.41). It is interesting to note that the STEM women were just barely satisfied with the mentoring they are receiving (2.71) while the men were the opposite (2.42). Although this is somewhat less surprising when we also consider that, even though the men were slight more likely to have been assigned a mentor, the women reported an average of 4.03 total (formal/assigned and informal) mentors while the men reported 2.00 average total mentors, or half the number of mentors as the women. As mentioned above, while all respondents rated mentoring on work life issues positively (3.04), women rated the importance of work life issues mentoring higher than men (3.33 for women, 3.02 for men). Table 2 contains a sample of mentoring section questions along with the distribution of results and number of responses per question. Table 3 summarizes the average number of mentors reported by whether or not the mentor was assigned to the faculty member and whether or not the mentor is in the same department as the faculty member.

Our initial findings do not indicate a significant difference by gender in mentoring; instead it points to a general lack of organized mentoring across the state university system. As a preliminary step, a faculty development plan has been developed by the lead author that utilizes best practices of mentoring programs and the results of stage one of this study. The plan facilitates multiple paths to faculty success.

The next step is to consider other sociological and climate issues that may lead to the dearth of women tenure track STEM faculty in South Dakota. In particular, the tendency of faculty tenure and promotion to be limited in scope with respect to diverse definitions of faculty achievement will be considered (O’Meara 2002). An additional area that will be examined is whether small numbers of diverse faculty have the voice on campus to leverage changes of primary interest to that group when those changes may be considered to only affect a small number of people on campus. For example, SDSM&T does not have a formal maternity leave policy, nor is there a policy regarding spousal / partner hires. While the former is more likely to be perceived as a gender issue, the latter substantially

affects the potential to recruit and retain female faculty as significantly more female faculty have partners who require faculty or professional positions than their male counterparts. (NSF 04, Layne et al.) If true equity is to be achieved by the faculty regardless of their categorization, a broader definition of campus culture that respects varied career paths is necessary; this should serve to benefit all respective parties, not just those seen as being in a specific category.

Table 2: Sample of Survey Questions on Mentoring and Distribution of Responses*

Question	Group	Strongly Disagree	Tend to Disagree	Tend to Agree	Strongly Agree	n
I believe that good mentoring is important to the success of more faculty members.	All	1	1	59	61	122
	Women	0	0	5	10	15
	Men	1	1	46	48	96
The university places a high priority on quality mentoring.	All	30	58	25	4	120
	Women	4	9	1	1	15
	Men	23	45	25	2	95
My department/unit has a process to ensure that mentoring relationships are going well.	All	43	54	19	3	119
	Women	5	6	4	0	15
	Men	33	45	14	2	94
My department/unit acknowledges mentoring activities through an award, course release time, or some other tangible recognition of service.	All	72	33	12	2	119
	Women	8	7	0	0	15
	Men	56	26	11	1	94
I am satisfied with the level/quality of mentoring I am currently receiving.	All	22	39	44	13	118
	Women	3	2	8	2	15
	Men	14	36	34	10	94
Mentoring about work-life issues is important.	All	2	22	65	31	120
	Women	0	2	6	7	15
	Men	1	18	54	22	95

*Some respondents opted not to answer every question, thus n value vary.

Table 3: Average Number of Mentors Reported by Group and Mentor Type

Mentor Type	Women	Men
Assigned – in department	0.27	0.33
Assigned – outside of department	0.13	0.13
Informal – in department	1.73	0.88
Informal – outside of department	1.80	0.67
Total	3.93	2.01

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