

Advancing Women in STEM: A Case Study

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Abstract

Women are underrepresented in STEM (science, technology, engineering, and mathematics) careers, nationally, for a variety of reasons (chilly climate, family considerations, unconscious bias, and others). To address this problem, the National Science Foundation launched the ADVANCE program. Its aim is to eliminate institutional and programmatic barriers to women's career success in STEM fields. In 2008, the University of Delaware (UD) received an ADVANCE PAID award jointly through the College of Engineering and the natural science portfolio of College of Arts & Sciences. UD ADVANCE seeks to increase the representation and status of women and other underrepresented STEM faculty by focusing on best practices in recruitment and retention. NSF funding for this project ends summer 2012, with a one-year no-cost extension through summer 2013. This paper reflects upon the successes of UD ADVANCE activities related to recruitment and discusses directions for the future.

Key Words: NSF ADVANCE, WOMEN FACULTY, STEM, RECRUITMENT, UNIVERSITY OF DELAWARE

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1. Introduction

In 1995 Bob Birgeneau, the then Dean of Science at MIT, established a Committee on Women Faculty to examine the representation and advancement of women in the School of Science. This action was in response to concerns about under-representation and differential treatment of women faculty at MIT. After gathering quantitative and qualitative data, the Committee reported that from 1984 – 1995 the number of highly qualified women increased significantly at the undergraduate, graduate, and post-doctoral levels in the School of Science. However, the number of women faculty had not changed during that time. It remained stagnant with only 22 female tenured/tenure-track (t/tt) professors as compared with 252 tenured men. They also found gender differences in faculty workloads, salary, space, awards, and resources – as well as a chilly campus climate for many women. In their report, the committee argued that these inequalities are due not to overt discrimination, but to a “pattern of unrecognized assumptions and attitudes, that work systematically against women faculty even in light of obvious good will.” (MIT 1999, p. 11)

The women at MIT were drawing upon and documenting a common theme in second wave feminist theory. Equity cannot be achieved simply by ensuring that institutions have bias-free practices and policies. One reason is that there are implicit barriers to women’s success that also need to be addressed. In the same year that MIT published its “Study on the Status of Women Faculty in Science at MIT,” Virginia Valian published a landmark book arguing that gender schemas, in conjunction with accumulation of advantage, are a fundamental and often invisible cause of career inequalities between men and women (Valian 1999). A ‘schema’ is a set of perceived traits that humans use to classify people (as well as events, objects, and other animals) into groups (or categories) (Fiske and Taylor 1991). *Gender schemas* are, thus, implicit assumptions about gender-related differences – such as “women are more family oriented than men” or “men are more competitive than women.” While schemas are an important part of human cognition (they provide a means of organizing and utilizing the massive quantities of information that people receive about the world), they can be problematic when misapplied. Drawing from abundant evidence-based research, Valian argues that our gender schemas for men – but not women – often include qualities having to do with professional excellence and leadership ability. Consequently, people tend to overrate men and underrate women in professional settings. She adds that the lower the representation of women in a profession – especially when it falls below a “critical mass” of 30% – the higher the likelihood that

women will be judged based on gender schemas rather than on their individual qualities and achievements. As a result, small advantages for men and small disadvantages for women can add up over time and result in large scale inequalities. Valian refers to this as ‘accumulation of advantage.’ Since the publication of Valian’s book, numerous other research articles have documented the effects of gender schemas and other types of implicit biases (also known as cognitive shortcuts or unconscious assumptions) as well as the importance of critical mass for women’s professional advancement (e.g., Biernat, et al. 1991; Budden, et al. 2008; Carnes, et al. 2005; Goldin & Rouse 2000; Madera, et al. 2009; Steinpreis, et al. 1999; Stewart, et al. 2007; Trix & Psenka 2003). Similar findings have also been found for other under-represented groups (Bertrand & Sendhil 2003; Fang, et al. 2000; Noonan 2004; Ginther, et al. 2011).

Based on their findings, the Committee on Women Faculty made recommendations for improving the status of t/tt women and the overall climate at MIT. Dean Birgeneau took immediate steps and the number of women STEM faculty rose steadily from 1996 to 2000. However, when the Dean left MIT in 2000, efforts nearly ceased and the number of women decreased in most units.¹ It was not until 2006, with the publication of Nancy Hopkins’ “Diversification of a University Faculty,” that programmatic activities resumed and, with them, the status of women faculty began to improve once again. Not only did the number of women STEM faculty increase from 2006 - 2011, there was also an increase in the number of women faculty in senior administration positions (MIT 2011). Moreover, many senior women who were signatories on the initial 1999 report cited significant climate changes. Of course, there were still a number of areas in need of improvement. For example, there are still a number of concerns surrounding family-related issues, climate, mentoring, and disproportionate levels of service and status between the sexes. Furthermore, one of the lessons learned from 2006 is that progress must be continually tracked, evaluated, and efforts must be continually sustained (Hopkins 2006).

In 2001, influenced and informed by the actions taken at MIT, the National Science Foundation (NSF) initiated the ADVANCE program as means of improving the status of women in STEM careers nationally. At that time, and even today, women in academia face many of the same problems faced by the School of Science faculty at MIT (Burrelli 2008; Chesler, et al. 2010; Handelsman, et al. 2005; Nelson & Rogers 2006; NSF 2011; Rosser 2004; Schmid, et al. 2010; Stewart, et al. 2007; Wennerås and Wold 1997). Early on, the primary ADVANCE program was the Institutional Transformation (IT) award. As the name suggests, IT awards are based on the idea that change is

best achieved not through ad hoc individual programs, but through sustained institutional commitment to gender equity. Early and influential examples of universities that received IT awards include City University of New York, Hunter College (CUNY-Hunter), University of Wisconsin-Madison (UW-Madison), and University of Michigan (U of M).² These programs, and others like them, aim to increase awareness of biases and institutional barriers to career success by drawing from evidence-based research and creating programs and practices that are systematically applied and supported by the most senior ranks of the university. The types of activities that have been supported include climate studies, formal mentoring and networking programs, lecture series, faculty leadership development programs, and disseminating best practices for recruitment and retention.

Numerous successes have resulted from these early IT programs (Bilimoria, et al. 2008; Sheridan, et al. 2007; Stewart, et al. 2004; Stewart, et al. 2007). Two notable examples come from U of M's and UW-Madison's ADVANCE programs. A hallmark feature of both programs is a centralized group of faculty (known as STRIDE at U of M and WISELI at UW-Madison) who offer their colleagues training workshops in best practices for faculty recruitment.³ Both programs also have a mentoring program aimed at retention. The proportion of women STEM faculty hired during the 2002-2003 recruitment season, when STRIDE began their presentations, more than doubled in comparison with to the previous two academic years (Stewart, et al. 2004). WISELI reports a correlation between departments' participation in the WISELI faculty recruitment training workshop and increased faculty job offers made to women and minorities (Sheridan, et al. 2007). In addition, a dean at U. of Michigan cites STRIDE as significantly influencing his thinking (about gender equity and hiring practices) (Stewart, et al. 2004). This result is important – as the MIT study shows, leadership is critical for creating change.

Due to the successes of early IT programs, NSF created the ADVANCE PAID (Partnerships for Adaptations, Implementation, and Dissemination) award in 2005. The focus continues to be institutional transformation and the dissemination of evidence-based research on the sources of women's under-representation. One purpose of the PAID award is to broaden the impact of ADVANCE by extending successful components of existing IT programs into other institutions. While NSF ADVANCE initially targeted the advancement of *women* in STEM, it has recently begun to include other types of diversity (especially, for example, women from underrepresented groups).

This paper describes the development and evolution of a four-year ADVANCE PAID project awarded to the University of Delaware (UD) 2008, jointly through the College of Engineering (COE) and the natural science

portfolio of the College of Arts and Sciences (CA&S).⁴ Much of the existing literature on NSF ADVANCE focuses on the development and successes of IT programs⁵. We have learned much from this literature and from flagship ADVANCE institutions. Indeed, our program began as an adaptation of the STRIDE and WISELI programs. Like WISELI and STRIDE, we aim to improve the representation and climate for women and other under-represented faculty by implementing best practices in recruitment and retention. However, because each institution is different, it is expected that PAID programs evolve to better fit the needs and climate of their home institutions. Thus, our goal in writing this paper is to contribute to the ADVANCE literature by discussing the evolution of an ADVANCE PAID project. We will focus specifically on the recruitment portion of our program. We will report on its development, successes, modifications, and directions for the future.

2. UD ADVANCE: Background

Prior to the award of UD's NSF ADVANCE PAID grant, the University was already working to improve the status of women faculty. This helped create a culture of support for women's equity and paved the way for a successful ADVANCE program at UD. For example, in 1974 the office of the UD President established the Commission on the Status of Women (CSW). The CSW collected data on the representation of female undergraduates, graduates, and faculty by rank within and across the university. These data were used to create an annual report that was sent to all UD faculty and administrators. UD also adopted a number of family-friendly policies, including stop the clock for tenure, administered load for maternity leave, and paid research leave for junior faculty. Information about these policies is widely accessible to faculty, administrators and prospective UD faculty⁶. In 2001, the University established the E. Arthur Trabant Award for Women's Equity, given annually to a group and/or individual who has made special contributions toward women's equity at the university. This award works to reinforce a climate where successful efforts aimed at diversifying the faculty are both recognized and publicized across the university – and, thus, encourages further efforts and more progress.

In addition to the above university-wide efforts, specific efforts were being made in the College of Engineering (COE)⁷. For example, in 2003 the dean of COE created a new position of Associate Dean for Women in order to support women faculty and graduate students, as well as to advise him and COE department chairs on best practices in fair evaluation and active recruitment. The dean also devoted personal attention to hiring women

faculty, in part, by encouraging the faculty and department chairs to become involved in recruiting and promoting female faculty.

Quantitative data suggest that the Dean's efforts were highly successful. The percentage of t/tt women in the COE jumped from 5% in 2001 to 13% in 2006. For comparison, the percent of women t/tt engineering faculty nationally rose from ~9% to ~11% over the same time frame (Engineering Trends 0509B). However, progress stalled in COE in 2006 when the dean turned his focus to other issues and lessened the emphasis on hiring and retaining women faculty. The percent of t/tt women in the college stopped rising. This result reinforced one of the primary lessons of the MIT study (Hopkins 2006) discussed above: leadership is critical to making lasting change. The COE experience showed that an organized, strongly led effort to recruit women faculty would yield positive results at Delaware, but would need to be sustained.

One aim in starting UD ADVANCE was to organize, enhance, and sustain existing efforts to improve the climate for women faculty in STEM fields. As discussed above, progress was being made university-wide as well as within individual colleges. However, efforts were largely ad hoc, and stronger in some academic units than others. There was no means of institutionalizing efforts – nor were there formal mechanisms to train faculty on the effects of unconscious bias for women's career success.

3. Evolution of UD ADVANCE: Origins & Adaptations

PAID projects commonly build off one or more successful IT programs, often at other institutions. As noted earlier, our project began as a spin-off of two well-known IT programs: WISELI and STRIDE. Like WISELI and STRIDE, we offer two types of training workshops for faculty -- one that focuses on best practices in faculty recruitment and another that offers best practices for faculty retention. Modeling our program after established programs allowed us to get up and running quickly and successfully. However, UD is an institution different in many ways from its parent programs at the U of M and UW-Madison. Thus, it is no surprise that our original model, based upon these programs, needed to be adjusted over time. Like all ADVANCE programs, UD ADVANCE is dynamic and evolving -- and is subject to changing administrations and policies as well as turnover in project leadership and participants. Ongoing evaluation, both internal and external, informs our adaptations. In this section we will describe these adaptations, as well as their results.

To place the adaptations into context, we must first describe the original program model. The summary below spells out the primary steps taken to establish the UD ADVANCE project. A more detailed discussion of the program's development -- as well as detailed discussion of the recruitment workshop -- can be found in the appendices. Programs wishing to replicate UD ADVANCE efforts will find substantial guidance from the details offered therein.

3a. Origins

The primary aim of UD advance is to increase the number of – and improve the climate for – t/tt female faculty in STEM at UD by reducing the impact of unconscious bias and institutional barriers to women's career success. Research shows that one way to reduce unconscious bias is simply to become aware of its existence (Valian 1999). Thus, the UD ADVANCE approach is to educate STEM faculty and administrators about data-driven research on how unconscious bias can negatively impact women's and underrepresented groups' careers in academia. We also provide practical solutions by presenting best practices in recruitment and mentoring. The focus is on recruiting for excellence – regardless of gender, race, or ethnicity -- and many of the best practices in recruiting are gender (and race/ethnicity) neutral.

UD ADVANCE uses two primary means to disseminate information to STEM faculty. The first is a set of two workshops. One workshop trains search committee members and chairs on best practices for faculty recruitment and hiring; the other trains senior STEM faculty on best practices for mentoring junior faculty. The second means is a cohort of faculty leaders and administrators familiar with evidence-based research on implicit biases and barriers -- as well as ways to overcome them. These faculty present the workshops, and also bring their education and best practices into their departments and colleges. There they teach their colleagues by example, and influence policies and practices.

Following the STRIDE and WISELI models, the project began with the recruitment of the first cohort of ADVANCE faculty leaders, who would collaborate to develop and deliver the workshops. The distribution of the original cohort was chosen to achieve gender balance as well as equal representation from the two colleges (COE and CA&S). The majority of the cohort were faculty in STEM departments, but we also sought to include humanities and science education faculty with backgrounds in women's studies, unconscious bias, and other institutional barriers to women's career success. All members of the committee were senior (8 full professors; 4

associates), research active, and highly respected in their fields. The committee's collective high profile is important for the program's success. Being visibly respected among their peers facilitates faculty members' ability to act as natural leaders in influencing policies and practices.

Two members of the committee worked in conjunction with Virginia Valian and the WISELI team to create a reading list of data-driven research on the status of women in science. With this reading list in hand, the UD ADVANCE core faculty met on a regular basis for several months to read and discuss research on the causes of women's under-representation and its effects on the professional advancement of women⁸. Special attention was given to research on unconscious bias and its effects on fair evaluation. This reading group -- a focal component of the UD ADVANCE project -- served multiple purposes. From a practical perspective, it enabled ADVANCE faculty to learn the research they would later present to their colleagues in workshops. But perhaps more significantly, it was an engaging experience that energized the faculty around the project and its goals. It also facilitated connection among the committee members and created opportunities for professional relationships and collaborations outside the boundaries of the project. UD ADVANCE faculty members report that the reading group was an intense time commitment -- but also productive and enjoyable. Furthermore, this original cohort of UD ADVANCE faculty experienced significant career success and upward professional movement, as we will discuss in the results section.

Following the initial reading group meetings, the faculty committee split into two sub-committees to focus on workshop development: one for recruitment and one for mentoring (retention). Around the same time, WISELI members came to UD to present a "train the trainers" template. This invaluable training provided ideas for workshop content as well as suggestions for successful workshop delivery (see Appendix II for a detailed list of examples).

After the ADVANCE faculty committee created and piloted the recruitment and mentoring workshops, they initiated the regular routine of offering two recruitment workshops each fall semester and two mentoring workshops each spring. The justification was that training workshops for search committees would be most helpful during the fall recruitment season. This left the spring for the mentoring workshops, with time between to prepare.

It is noteworthy that early on in the project the then-dean of COE (who is PI on UD's ADVANCE – PAID grant) hired a part-time professional staff member, a STEM PhD, to manage program activities. This individual worked with the faculty committee to revise the workshop content and materials in response to participant feedback, updated research publications, and updated university policies. As the UD ADVANCE program progressed, this staff member's involvement grew to include research, the creation of new materials and workshops, publishing program outcomes, and writing grant proposals. This position was only partially funded through the NSF grant – the COE funded the remainder. Having a project staff person dedicated to implementing and developing ADVANCE activities substantially decreased the burden on the faculty committee members and project leadership. It improved the quality of the program and allowed it to expand in scope as it evolved. It also shows commitment to the advancement of women on the part of the dean of COE.

3b. Adaptations

We implement targeted adaptations on an ongoing basis to our workshops and supporting materials. We continually update our database of data-driven research on the barriers to the career success of women and other under-represented groups in STEM. We also tailor our presentations to the needs of our audiences -- and use different examples for different audiences. For example, we are in the process of expanding our program's reach to include additional colleges with STEM departments, such as the growing College of Health Sciences and the College of Earth, Ocean, and Environment. With this change comes a need to rely more heavily on research from other fields. We are also in the process of broadening our database to include more material on faculty of color -- and to bring these studies more prominently into the workshops. In addition to these targeted adaptations, we have also made several larger changes to our program over the lifetime of the grant.

A reason to modify our workshop series became apparent after the first workshop cycle (fall 2010 – spring 2011). As a mid-sized university, UD doesn't have as large a faculty as its parent programs from which to draw participants. Participants from this first round of workshops included mostly senior faculty and department chairs -- those who would be influential in search committees and as mentors. Further reducing the number of available faculty, UD's smaller PAID program targeted a subset of the colleges that house STEM departments at UD -- namely, COE and CA&S. By the end of this first cycle, UD ADVANCE had reached close to 100 STEM senior faculty members with its workshops.⁹ There are roughly 226 tenured faculty in the targeted STEM departments and ~160

of them are senior faculty. It follows that after only one round, we had reached over half the number of full professors in the involved STEM departments.¹⁰ Because not all senior faculty serve on search committees or as formal mentors -- and not all among those who do would be willing to attend a workshop -- we were concerned that we had already reached a majority of our likely audience. This is a good thing -- as it demonstrates interest in our program. However, it also brought about the need for modification. Around the same time faculty hiring at UD slowed for financial reasons, as was the case at many universities nationwide. It appeared that continuing to offer dedicated, full-scale recruitment workshops -- which involve considerable expense, preparation, and time commitments for the presenters as well as the participants -- would not be the most effective way to disseminate best practices.

In response, we are adapting our longer recruitment workshop (~2.5 hours) into two separate shorter modules -- one on unconscious bias and another on best practices for faculty recruitment. (We also continue to offer the longer workshop as needed or requested.) We will take these modules into pre-established events such as faculty meetings, search committee meetings, and new-faculty orientations. This model requires fewer UD ADVANCE personnel to present and will reach greater numbers of faculty members. It will allow us to maintain a presence and communicate the ADVANCE message even when the university is not actively hiring larger numbers of STEM faculty. Significantly, our new model will make the discussion of unconscious bias and best practices in recruitment part of the job of *all* faculty during their regular activities -- not just when they're serving on a search committee. We feel this approach will be more effective in changing the culture surrounding faculty recruitment and hiring. We successfully piloted this presentation style for the UD Chairs' Caucus, which is described in the results section below.

Another adaptation in progress is to create a separate set of modules targeted specifically toward deans and department chairs.¹¹ Deans and department chairs evaluate faculty and influence promotions, raises, and awards. They therefore need to be aware of roles played by unconscious bias and accumulation of advantage in professional evaluation. They also need to be made aware of the importance of critical mass. In addition, it is important that the instructions given to search committees by deans and department chairs be compatible with and informed by our recommended recruitment and evaluation practices. A third reason for these targeted modules brings us back to the lessons learned from MIT: It is part of the ADVANCE mission to educate -- and

support -- the deans and chairs to strengthen their positions as change agents (Hopkins 2006). Thus, the faculty need a strong message from their chairs and deans about the importance of fair practices in hiring and evaluation. Finally, UD ADVANCE needs backing from deans and department chairs as the program evolves to operate within existing departmental structures.

4. Results: Quantitative and Qualitative Successes of UD ADVANCE

Because one goal of the recruitment portion of UD ADVANCE is to increase the representation of women faculty in STEM fields, it is tempting to measure success primarily in terms of hiring statistics. While hiring statistics are a useful and quantitative measure, they should not be over-emphasized. Not only is it difficult measure the impact of our recruitment workshops relative to other factors that may have influenced hiring; with only three years to track progress and a slowdown in the economy, overall hiring numbers have been low. Frehill, et al. (2007) suggest that it takes several years after the completion of an ADVANCE project to collect sufficient data and conclusively assess progress. Thus the quantitative results presented here should be considered preliminary.

Also important, and in keeping with the goals of NSF ADVANCE, are certain qualitative measures of progress -- such as positive feedback on formal evaluations, invitations within and outside UD, honors and awards, as well as an increase in the number of the core cohort who have risen into higher administration. As discussed below, our qualitative data suggest progress in the form of improved climate and institutional change at UD. This is perhaps one of the most important aspects of NSF ADVANCE and it is something that we can say with confidence that we have achieved. Below we will discuss first the quantitative and then the qualitative results.

4a. Quantitative Results

We collected hiring data in COE and the STEM departments in CA&S for the two years before and two years after the start of the UD ADVANCE program.¹² Table 1 shows the number of male and female faculty members hired in these departments from 2008-2011.

INSERT TABLE 1

The data from the STEM departments in CA&S don't reveal a trend. As the table shows, in 2010 the overall hiring rate was high, and in 2008 it was quite low. In 2009, before UD ADVANCE workshops began, the natural sciences departments in CA&S hired six women -- but only one the following year (i.e., after the workshops began). Clearly, we cannot extract statistical significance from these small, scattered numbers. Because we plan to

continue to our recruitment efforts in CA&S, we will continue to track hiring data. It is our hope that a longitudinal study will reveal more meaningful and positive results.

The data that come from COE tell a more encouraging story. In the two years before the workshops began, COE hired only one woman. However, in the two years after, they hired five. Due to small numbers and other factors we cannot say with certainty that the workshops drove this notable increase in hiring of women engineering faculty. We believe a factor more significant than the workshops is the influence that the UD ADVANCE committee members had in changing departmental and college-wide hiring practices and policies. It is unlikely a coincidence that the PI of UD's ADVANCE PAID grant was the COE Dean (and the COE Associate Dean was a co-PI). We believe these data support Hopkins' (2006) message that strong leadership is necessary to drive climate change.

For a comparison against our parent programs, the University of Michigan and UW-Madison each report an increase in the number of faculty offers made to women during the hiring seasons following their recruitment workshops¹³ (Sheridan, et al., 2007; Stewart, et al. 2006). However, it is not meaningful to directly compare our success rate against theirs because their STEM departments, and correspondingly their hiring rates, are significantly larger than UD's. In addition, their programs – and hence their results – began well before the economic downturn, which has impacted hiring rates nationally for the last several years. For example, Stewart, et al. report that between 2001 and 2003 UM hired 101 new faculty members in engineering and the natural sciences; during the same time period Delaware hired 33.

We believe our quantitative data – especially in COE -- suggest a message of progress, but hesitate to over-emphasize the importance of these results. One reason is that hiring numbers are small due to the size of the university and slow turnover rates among the faculty. Furthermore, the unstable economy has slowed faculty hiring at UD and nationwide, so these numbers may not increase for several years. Thirdly, we cannot separate the effects of our workshops from other factors (such as efforts in individual departments or units) that may have driven the results.

4b. Qualitative Successes

As the UD ADVANCE program continues to grow and expand, we will continue to collect hiring statistics. This, in turn, will allow us to draw stronger conclusions about the impact of our recruitment workshops. In the meantime,

we turn to our qualitative measures of success – which we take as preliminary evidence of institutionalization. While this type of change is more difficult to measure, we feel that the following are indicators of success in this area: (a) positive feedback, both formal and informal, (b) the number of invitations we have received within and outside UD, (c) honors and awards, (d) the successes of UD ADVANCE faculty to rise into senior administrative positions.

We have received significant positive feedback – both formal and informal -- from workshop participants. In the last 15 minutes of our workshop, participants are asked to fill out a formal workshop evaluation. The evaluation form asks participants to comment on the aspects of the workshop that were most and least useful as well as suggestions for improvement. The majority of comments on these evaluations have been constructive and favorable. Examples include: “[A]ll faculty should attend this workshop...I would welcome seeing some measure of accountability in search committees to implement the practices reviewed today” and “...I wish all engineering faculty participated in it. If only a few do, it’s hard for them to get the others on board during the actual search process. I wish it could be a little longer to give more time for discussion.” We keep an aggregated list of all of the comments we receive on our formal evaluations. Our interpretation of these comments, considered as an aggregate, is that the faculty want to be fair -- but have difficulty with and perhaps least interest in discussions of unconscious bias. What they most appreciate are the concrete suggestions on how to recruit for excellence.

Among informal feedback, we include unsolicited comments and requests sent from faculty participants. One example is follow-up emails indicating that certain departments benefitted by following the practices we recommend. We have also received emails from participants with suggestions for further reading on topics related to our workshops. Furthermore, we have received multiple requests from faculty to extend our workshop to include more and different types of faculty – such as all STEM faculty in COE and CA&S -- not just the ones currently serving on search committees, the STEM faculty in other colleges, as well as to the non-STEM faculty at UD. We acknowledge that these results are anecdotal. However when aggregated with our modest quantitative evidence and the other qualitative measures of success (described above and below) suggest that our recruitment workshop is making an impact on the hiring practices in the STEM departments.

A second indicator of success comes in the form of unsolicited invitations for more recruitment workshops. In fall 2011 we did not schedule workshops because UD had limited hiring plans. However, a few

searches for STEM faculty were taking place within CA&S. The associate dean for the natural sciences, disappointed that no workshops were planned, requested one specifically for these departments. This was an instance, as noted above, when we were able to tailor our presentation to fit the needs of our audience by choosing examples and research papers that we thought were particularly relevant to the natural sciences faculty.

We were also invited by the convener of the UD Chairs' Caucus (comprised of the chair of every department on campus) to give a workshop during one of their monthly meetings. Since we would not have time to present a full workshop during a 90-minute meeting, we arranged to offer three shorter presentations: one on implicit bias in spring 2012; one on faculty recruitment in fall 2012; and one on faculty mentoring in spring 2013. Approximately 15 department chairs attended the spring 2012 presentation on implicit bias. (The other two presentations will occur this academic year.) The chairs were engaged in the presentation. Several felt that a workshop on implicit bias should be required for faculty search committees across campus. Some thought the presentation should be incorporated into faculty meetings or new-faculty orientations. The Chairs' Caucus meeting was an energizing, affirming experience that seeded ideas for future expansions and adaptations.

It is a particular indication of progress that word of our program has reached beyond our campus. Notably, we were asked to consult at Delaware County Community College (DCCC), a two-year college in nearby Media, PA, which is taking active measures to increase the representation and status of faculty of color on their campus. We developed a "train the trainers" workshop for members of their faculty diversity committee, who would go on to present recruitment workshops to their search committees. We modified our workshop to reflect their specific needs and interjected best practices for successful workshop delivery, as WISELI did for us early in the UD ADVANCE project. It speaks to our program's growth that we have matured to the point of helping to seed programs at other institutions. We were also invited to consult with faculty at Delaware State University (DSU), which holds an NSF ADVANCE IT-Catalyst¹⁴ award (now expired). We met with their project PI to exchange ideas and gave a seminar on recommended practices based upon our experiences. We continue to consider ways of collaborating and exchanging best practices with DSU.

We are also receiving considerable recognition in the form of awards. UD ADVANCE recently won the University of Delaware's Trabant Award for Women's Equity in recognition of its work on behalf of women faculty. Associate Dean of Engineering Pam Cook, UD ADVANCE director and co-PI, also won the national 2012 WEPAN

(Women in Engineering Pro-Active Network) University Change Agent award. In addition, the UD ADVANCE group was cited in the 2011 Report on the Evaluation Team representing the Middle States Commission of Higher Education (Middle States Report). It was applauded as one of the distributed efforts that have “begun to make progress” toward “growing the percentage of women faculty in science and engineering...”

More than the positive feedback, invitations, and awards, we believe our strongest success is in what we see as evidence of institutionalization. By this we mean that there is evidence to suggest that UD ADVANCE has been effective in changing the climate and improving the policies and practices at UD. For example, we have seen considerable upward mobility in the careers of the core faculty committee. Of the original UD ADVANCE faculty (including project PI and co-PIs), six have risen through the ranks to higher administrative positions. In total, at present two are department chairs; one is associate dean of engineering; one is deputy dean of engineering; one is vice provost for graduate and professional education; one (female) is dean of engineering at another institution; and one is chancellor at another institution. These faculty members take their ADVANCE education and experiences into their administrative work. Indeed, one UD ADVANCE administrator reports that what he learned through ADVANCE “pervades 80% of [his] interactions in the new position.” We are expanding and rotating this valuable cohort of involved faculty as we train new members, spreading the influence of ADVANCE throughout the STEM departments and the greater university.

As direct evidence of institutionalization, we recently received funding from the University of Delaware’s President’s Diversity Initiative (PDI) to continue UD ADVANCE activities beyond the NSF-funded years. Through the PDI program we will expand our reach to include faculty in STEM departments beyond the Colleges of Engineering and Arts and Sciences. We will broaden our workshops to include racial and ethnic diversity as well as gender. We are convening a new UD ADVANCE reading group to expand the number of faculty members who are well versed in studies on unconscious bias in academia. These are the faculty who move up the leadership ranks, taking their ADVANCE experiences with them to change policies and practices.

5. Conclusion

Is UD ADVANCE making a difference? We believe it is. STEM women faculty are being hired, especially in COE, at rates unprecedented in the University’s history. Women are also moving up through the academic ranks. Through the PDI we are taking steps to broaden the impact of our program at UD. Progress is being made, but

work is still needed to transform the climate for women in STEM at UD. UD ADVANCE needs to be broadened to include a wider range of faculty. ADVANCE initiatives have the potential to benefit faculty of color as well as to apply to non-STEM departments. We also know that retention is just as important as recruitment – we will address this aspect of our program in a separate publication.

Through the PDI and the UD Chairs' Caucus we are taking steps toward institutionalizing UD ADVANCE. All faculty will benefit from inclusive and fair recruitment practices and strong mentoring. As Ward (2006) quotes the ADVANCE program Committee of Visitors, ADVANCE "is neither a program for women only, nor for science only—this is a program that transforms an institution for the betterment of all."

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TABLE 1

	2008	2008	2009	2009	2010	2010	2011	2011
	Men	Women	Men	Women	Men	Women	Men	Women
Engineering	3	1	3	0	8	4	3	1
Arts & Sciences	1	0	3	6	4	1	1	4

Table 1: Men and women t/tt faculty hired in engineering and the natural sciences at the University of Delaware.

The first two columns (2008 and 2009) are before UD ADVANCE workshops began. The last two columns (2010 and 2011) are after the workshops began.

Appendix I: Recruitment workshops

The emphasis of the UD ADVANCE recruitment workshops is on increasing and retaining the *overall* talent pool. Searching broadly for talent and focusing on fair recruitment practices will benefit women and other under-represented groups. Likewise, improving the culture for women and minorities improves the culture for all (Moody 2004).

The recruitment workshop audience comprises members and chairs of faculty search committees. Guided by participant feedback and observations made by committee members during the beta test and subsequent workshops, the recruitment presentation has evolved over time but remains heavily based on the WISELI model.

The UD ADVANCE recruitment workshops lasts 2.5 hours, including brief breaks. Following practices used by WISELI and STRIDE, participant activities such as case studies or group discussions take place between brief periods of lecture-style presentations. UD ADVANCE committee members facilitate the small-group discussions to keep conversations moving and on target.

Workshop participants complete a survey upon completion of each workshop. The surveys are anonymous and sent directly to the program's external evaluator, who compiles the results into a report that is included with the program's annual report to the NSF. The report of the external evaluator helps project leadership refine the workshops based upon participant feedback.

Workshop content includes units on:

- forming and running an effective search committee;
- building a large and diverse pool of candidates through active recruitment;
- implicit bias (sometimes called cognitive shortcuts) and its influence on evaluation of candidates;
- UD and national facts and figures on women faculty in STEM;
- ensuring a fair and thorough evaluation of candidates; and
- interviewing and following up with a candidate to close the deal.

The workshop concludes with a reminder that hiring diverse candidates is not enough—departments must provide their new hires with support and mentoring since retention is also a concern.

Accompanying materials include the manual *Faculty Recruitment: Best Practices in Searching for Excellence*, which we adapted, with permission, from the WISELI recruitment handbook *Searching for Excellence and Diversity: A Guide for Faculty Search Committee Chairs*. Participants also receive workshop materials including a detailed agenda, copy of the workshop slides, and discussion questions and case studies. Finally, participants receive reference materials such as a sample evaluation rubric, an example search committee meeting agenda, and a guide to questions that may or may not be asked during an interview. Future workshop participants will receive a copy of a brochure on countering implicit bias in evaluation entitled *Best Practices For Fair Evaluation of Candidates*, created by UD ADVANCE in collaboration with the UD Office of Equity and Inclusion. All resources are available for download on the UD ADVANCE website: www.engr.udel.edu/advance.

Appendix II: Workshop Useful Practices

A great value of the NSF ADVANCE PAID program is in the spread of tested, successful practices from IT programs to other universities. Here we elaborate on some useful practices UD ADVANCE adopted from STRIDE and WISELI, as well as others we established as our program developed.

Faculty presenters: One useful practice, adopted from the STRIDE and WISELI, is a “by faculty, for faculty” model of presentation. That is, the workshops are run for faculty by respected senior faculty presenters. Because the content and message of the workshops may be new – or some faculty may be resistant to the idea of implicit biases – the feel of the workshops is of colleagues talking to colleagues, rather than administrators lecturing to faculty. Faculty members tend to find the arguments and social science data presented more compelling and accessible if their peers -- highly respected in their own respective research fields -- speak to their relevance and importance.

Dean’s introduction: The workshop presentations may come from faculty colleagues, but the introduction comes from above. The dean of engineering and the associate dean for the natural sciences provide brief introductions and words of support at the beginning of each workshop. This introduction tells faculty participants that the deans endorse and support the message, and frontloads the expectation that the participants will take the workshop content seriously.

Beta Test: Another good practice is to beta-test the workshops prior to offering them in a final form. This allows for the collection of formative feedback and, thus, targeted workshop revision. At UD, beta test participants included invited senior faculty members, administrators, and human resources personnel who were already known to be supportive of the ADVANCE mission – which increased the likelihood that they would offer useful suggestions and constructive criticisms on how to improve the workshops.

Deans invite participants: Having workshop invitation come from the dean increases the acceptance rate among invitees. An especially effective method of soliciting participants is to ask invitees to choose one of two workshop dates in a two-week span. Invitees are not therefore responding “yes” or “no,” but rather choosing the time that is more convenient for them. Scheduling the two workshops so that one is on a Monday, Wednesday, or Friday and the other is on a Tuesday or Thursday accommodates more faculty members’ teaching schedules.

Avoid the word “bias”: People don’t like to think of themselves as biased, so we use the phrase “cognitive shortcuts” in our workshops instead of “unconscious or implicit bias.” We use neutral examples to introduce the topic before we discuss cognitive shortcuts relating to gender in academia.

Resources: Faculty members are very busy with research and teaching. We therefore have resources to help facilitate their participation in the program. We often schedule UD ADVANCE meetings to include a meal, both to incentivize attendance and for ease of scheduling. We provide breakfast for participants at our long morning workshops. We have a budget to pay staff, both secretarial and professional, to support our program. We pay UD ADVANCE faculty members a small amount of discretionary money each year that they participate. This money—associated with a National Science Foundation project--helps legitimate their involvement to their colleagues and department chair.

Use of scripts and timer: Project staff develop and supply the faculty presenters with detailed scripts and copies of the workshop slides prior to the workshops. We stress the importance of crisp presentations and strict timing. We provide the participants a detailed workshop agenda including the timing of each unit, and use a large digital timer to keep on track.

Participant involvement: Following the STRIDE and WISELI models, our workshops include brief sections of lecture-style presentation interspersed with case studies and group discussions. This keeps the participants actively involved and allows them to share their own experiences with their colleagues.

Name recognition: We advertise that our program is funded by the National Science Foundation and based upon work at the Universities of Michigan and Wisconsin-Madison. These affiliations impress the STEM faculty and increase their willingness to participate in the dialogue.

Consultants: We rely on the expertise of consultants to help us form and develop our program. Initial consultations with STRIDE and WISELI leadership were instrumental in establishing UD ADVANCE. Dr. Geri Richmond of the University of Oregon has visited twice as an external consultant and offered outstanding support and feedback.

ENDNOTES

¹ A notable exception is the Department of Chemistry, where efforts continued under the Department Chair Steve Lippard (Hopkins 2006).

² It is worth noting that Virginia Valian was the P.I. on CUNY-Hunter IT award.

³ STRIDE is an acronym for “Strategies and Tactics for Recruiting to Improve Diversity and Excellence” and WISELI stands for “Women in Science and Engineering Leadership Institute.”

⁴ Four other UD colleges that house STEM departments were not included in this ADVANCE initiative. The main reason was a desire to start with a smaller, more well-defined audience when getting the program off the ground – with a plan to further institutionalize over time. As discussed in the main body of this paper, we are in the process of doing so by extending our program into other colleges.

⁵ Notable exceptions include papers based on PAID projects including Bakian, et al. 2010, Lincoln et al. 2012, Mavriplis, et al. 2010, Page, et al. 2009, and Shields, et al. 2011.

⁶ see www.engr.udel.edu/wie/faculty/family_friendly.pdf for details

⁷ To our knowledge, the other colleges were relying on the university efforts and did not develop their own programs.

⁸ A list of readings, including those studied by the original reading group, is on the UD ADVANCE website at www.engr.udel.edu/advance/reading.html.

⁹ In this figure we include participants from both the mentoring and recruitment workshops – mainly because there is some resistance to an expectation that they would attend both workshops.

¹⁰ While the target audience was senior (full) professors, a small number of workshop participants were associate and assistant professors serving on departmental search committees.

¹¹ Many ADVANCE programs offer similar resources (including WISELI and U of M).

¹² Data sources included the UD Office of Institutional Research, as well as department chairs and associate deans. The COE departments are Electrical and Computer Engineering, Materials Science and Engineering, Computer and Information Sciences, Mechanical Engineering, Civil and Environmental Engineering, and Chemical Engineering. The

ADVANCE departments in CA&S are Physics and Astronomy, Mathematical Sciences, Chemistry and Biochemistry, and Biological Sciences.

¹³ Both groups caution, as we do, that it is difficult to measure the impact of the recruitment presentations relative to other factors that may have influenced hiring statistics and other quantitative results. However, both STRIDE and WISELI also report other achievements.

¹⁴ IT-Catalyst grants are a separate category of ADVANCE awards designed to help universities assess their needs in terms of recruitment and retention and promotion of women faculty.