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Championing Institutional Goals: Academic Libraries Supporting Graduate Women in STEM

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ABSTRACT

Academic libraries are well-positioned within their scientific research communities to assist with the retention of women in STEM fields. Librarians have an opportunity to find new ways to match collections and services to student needs and institutional goals by providing resources and programming in support of women in STEM. This paper will focus on the ways in which academic librarians can help support female graduate students in STEM, beginning with a review of the literature to determine the causes for the under-representation of women graduate students in some STEM fields. Next, it will review interventions conducted by institutions to address the uneven distribution, including a scan for resources or services provided by the library. Finally, it will use the findings presented in the literature to propose services and resources that libraries and librarians can provide to help address the issues that contribute to the low number of women in STEM fields.

INTRODUCTION

In "The Value of Academic Libraries", Megan Oakleaf exhorts librarians to align their goals with those of their institution, and to seek ways to demonstrate impact via library services (Association of College and Research Libraries, 2010, p. 11). This is necessary, Oakleaf contends, as the government increasingly focuses on the economics of higher education (ACRL, 2010, p. 27). As a result, administrators will view academic libraries as cost centers rather than "value centers", unless they reflect the business model of the institution (Basefsky, 2006). By adopting institutional goals as their own, and by adjusting services to meet changing needs, libraries and librarians will function in ways that are not only meaningful to their educational communities, but which are also highly visible and impactful (ACRL, 2010, p. 13).

One such highly visible issue facing academic institutions, and one with much national focus, is the ongoing lack of female representation in Science, Technology, Engineering, and Math (STEM) fields. The National Science Foundation (NSF) has long sponsored grants to academic institutions for the creation of programs aimed at the promotion of women in STEM, with efforts dating back to at least 1982 (Kirkpatrick, 2014). However, according to recent data by the NSF, only 20.0% of doctoral degrees in physics are awarded to females, 22.6% of engineering doctorates are earned by women, 21.4% of computer science doctorates, and 28.2% of mathematics doctorates. The disparity inherent in these numbers is further highlighted when compared with the 60.8% of total doctoral degrees awarded to women in fields outside of science and engineering (National Science Foundation, 2013, Table 7-2). Among the recent efforts to contribute to gender equity is a five-year Federal Science, Technology, Engineering, and Mathematics Education Strategic Plan outlining proposals to address under-representation by women through a variety of avenues, including additional funding to NSF to assist in "…designing graduate education for tomorrow's STEM workforce" (US Department of Education, 2015, p. 1).

Some would argue that these efforts to retain women in STEM are not appropriate, and have certainly not been effective. While the latter part of this assertion is undeniably true, one reason for the resistance to programming in support of STEM women is a belief that such efforts give an unfair advantage to women, based on gender rather than merit (Van den Brink & Stobbe, 2014, p. 187). Van den Brink and Stobbe contend that this misconception is due to the more public nature of the support for women. "The support that men receive during their academic careers tends to be taken for granted, while women are expected to advance on their own to prove they are sufficiently qualified. In contrast, women's programs were noticed, leading to the perception that women cannot succeed on their own merits." (2014, p. 199). Such perceptions reinforce biases, which are discussed below. Possibly as a result of the negative attention to this kind of support, some faculty are reluctant to take on the implementation of the necessary outreach, programming, and education to retain women graduate students (University of Wisconsin-Madison, 2000, p. 15). Programs and resources provided by libraries may counter these hesitations, and can be a way to engage both men and women in a dialogue about these issues. Libraries offer sources of trusted information, and are safe spaces that provide a neutral platform of discourse for academics of differing

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viewpoints. Librarians, who already support STEM departments through collections, instruction, and liaison and outreach activities, can take up this challenge as part of their ongoing workflow.

Academic diversity officers, departments, and residential services have already integrated efforts at a variety of institutional levels to aid in the retention of women in STEM fields. Although multiple resources support women in STEM within single institutions, often these programs operate as separate silos, unaware of others concurrently addressing the same concerns. The Committee on Institutional Cooperation Women in Science and Engineering Initiative (CIC WISE) Evaluation of Outcomes found that efforts aimed at female STEM retention are better accomplished when centrally organized within an institution (University of Wisconsin-Madison, 2000, p. 46). Academic librarians, as departmental liaisons, can span boundaries across these divides by joining these efforts and acting as communication bridges between offices and departments. A review of NSF-funded programs confirms that "widespread and synergistic participation across campus and the existence of visible actions and outcomes" were among the factors that contribute to the success of efforts to support women in STEM (Bilimoria and Liang, 2012, as cited in Society of Women Engineers, 2015, p. 228). Libraries have an opportunity to contribute to their campus-wide initiatives by partnering across units to improve female STEM retention, and by using their liaison relationships to engage with faculty to meet this common goal. Diaz speaks of this kind of relationship in his thoughtful commentary on the new roles of librarian engagement, noting that "Because the librarian knows his institution's story and its new directions, he can commit, in partnership with his constituency, to build a different future cemented by new initiatives, programs, and resources his library or university support." (Díaz, 2014, p. 230).

Academic libraries must embrace institutional and national goals and demonstrate positive impacts on these goals in measurable ways. Given the nationwide urgency to retain women in all STEM fields, academic libraries are well situated to seize opportunities to join this pressing need. The time has come for academic librarians to champion this national and institutional goal and to lend their support to women in STEM fields. First, though, it is essential to investigate the nature of the problem of under-representation.

LITERATURE REVIEW

The long history of under-representation of women in STEM fields has generated plentiful literature around this topic. A review of this literature primarily from the past fifteen years reveals some common themes. The issues identified that seem to most affect female graduate students are the persistence of bias about women in STEM fields within academia; the lack of self-efficacy among females in STEM fields; and the difficulty in achieving work–life balance for some female STEM academics. There was also significant evidence found for the acceptance of the stereotype of STEM fields as being inherently masculine; however, as this seems to contribute mostly to the enrollment of undergraduate women (Society of Women Engineers, 2015), this topic will not be addressed.

BIAS

We would like to believe that institutions of higher learning have all but eradicated bias, but ongoing research does not confirm this. While outright discrimination and harassment are infrequent, more subtle or covert biases have taken their place (McCullough, 2011, p. 2). To counteract this often unrecognized form of bias, Sevo and Chubin (2008) have reviewed the literature concerning bias literacy, and offer definitions of conscious and unconscious discrimination, implicit bias, and overt versus covert discrimination. Unconscious discrimination can occur when biases against a particular group are unknown to the person who holds them (Sevo and Chubin, 2008, p. 7). This can be the result of implicit bias, which is the product of traditionally held views that are assimilated beginning at a very young age; for example, the belief that boys are naturally better at math than girls (Sevo and Chubin, 2008, pp. 2–3, 10). Overt bias is blatant, whereas covert bias is carried out in an unobservable way. People may recognize their covert biases or they may hold them unconsciously (Sevo and Chubin, 2008, p. 8).

The National Academy of Science published a report documenting gender bias in science disciplines entitled *Beyond bias and barriers: Fulfilling the potential of women in academic science and engineering* (2007). It found that "women are very likely to face discrimination in every field of science and engineering" and "a substantial body of evidence establishes that most people—men and women—hold implicit biases." (National Academy of Science, US, National Academy of Engineering, US, and Institute of Medicine, US, 2007) In 2012, Lincoln, Pincus, Koster, and Leboy found that female scientists' work does not get as much recognition as that of men and designate this the "Matilda effect". This is opposed to the "Matthew effect", wherein a male scientist's good reputation enhances his ability to garner more awards and prestige. In an analysis of data over a nine-year period from thirteen disciplinary societies, the authors found that women were frequent winners for teaching and service, but not for research. The "findings suggest that the 'Matilda Effect' persists—men receive an outsized share of scholarly awards and prizes compared with their representation in the nomination pool, despite efforts to increase nominations of women." (Lincoln, et al., 2012, p. 316).

Not all studies corroborate these findings. A controversial article by Ceci and Williams in the Proceedings of the National Academy of Science (PNAS) found that "Women's current underrepresentation in math-intensive fields is not caused by discrimination in these domains, but rather to sex differences in resources, abilities, and choices (whether free or constrained)." (2011, p. 1). The authors attribute the current imbalance of women in these fields in part to a lack of accommodation of family demands, and the possibility that women therefore choose to opt out of these positions (p. 1). The article was criticized, and subsequent work favored the existence of subtle biases rather than outright discrimination. Moss-Racusin, Dovidio, Brescoll, Graham, and Handelsman (2012) refute the Ceci and Williams findings in a *PNAS* article titled, "Science faculty's subtle gender biases favor male students". In a double-blind study, participants were asked to rate applications for a lab manager position, who had been randomly assigned to either a male or female name. "Faculty participants rated the male applicant as significantly more competent and hireable than the (identical) female applicant. These participants also selected a higher starting salary and offered more career mentoring to the male applicant." (p. 1). Gender of the faculty member had no influence on the results, leading the authors to conclude that both female and male faculty show bias against female graduate students.

Recently follow up articles were written by Williams and Ceci, as well as by Handley, Brown, Moss-Racusin, and Smith in *PNAS*. Williams and Ceci conducted randomized experiments involving nearly 900 tenure-track male and female faculty from across the US, to determine if there was a hiring preference for male or female applicants for a tenure-track position in the fields of biology, economics, engineering, and psychology (2015, p. 5360). They concluded that both male and female tenure-track faculty gave preference to female identified applicants. However, they do admit that "faculty members may be eager to hire women, but they and their institutions may be inhospitable to women once hired." (Williams and Ceci, 2015, p. 5365). In their follow up on gender bias, Handley et al. come to the disturbing conclusion that not only does gender bias exist against women in STEM, but also that there is a bias against research which confirms the existence of gender bias. This study, using three randomized, double-blind experiments found that men, and particularly male STEM faculty, tend to devalue research which demonstrates a gender bias in STEM fields (Handley, Brown, Moss-Racusin, & Smith, 2015, p. 13,201).