

2015-2015

WiSE Women Faculty: Going Above and Beyond for Women in STEM



Dr. Segraves works with the Science Horizons Program. By Ron Trinca Photography.

WOMEN IN
SCIENCE & 
ENGINEERING

SUPPORTING PERSISTENCE AND EXCELLENCE FOR **WOMEN IN STEM**

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2/18/2015

WiSE Women Faculty: Going Above and Beyond for Women in STEM

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In August 2014, WiSE conducted a survey to understand the ways in which women STEM faculty uphold excellence for women in STEM, foster a diverse and inclusive learning community, and impact the campus and society beyond their required role and expected service. We found that women STEM faculty are intensely involved in supporting pipeline persistence on campus for women and other underrepresented groups in STEM. In addition, they are deeply committed to encouraging women undergraduate students to participate in research and highly supportive of women graduate students on a formal and informal basis. Their work extends beyond the campus borders, motivating and empowering middle and high school young women and underrepresented minorities to pursue science and engineering. Much of this work goes unrecognized and unrewarded.



Figure 1: Dr. Bhatia and her research team encourage middle school students to pursue engineering with activities in lab.

Methods

Information was gathered through an online survey sent to 94 women faculty and leaders in STEM, 19 of whom responded. Participants provided their names, but the names and responses were kept in confidential storage and not shared in this report. Six departments (Mechanical – Aerospace Engineering, Biomedical – Chemical Engineering, Biology, Physics, and Psychology), the Graduate School, and the i-School were represented by women faculty participants. The composition included nine assistant professors (two not on the tenure track), six associate professors, three professors, and two in academic leadership positions.

The survey addressed five key areas of volunteerism. These included foci of undergraduate women, graduate

women, women faculty, disciplinary service and leadership, and community outreach to young women/girls and others. We asked for the names or description of the activity and an estimate of how often they engaged in volunteering during the past three years.

Allocation of Voluntary Time Dedicated to Women in STEM

The time WiSE women faculty allocated to these above and beyond activities varied a great deal with some choosing to participate in one to three discrete activities a semester while others devote time routinely or in concentrated periods to select activities. Four of the individuals take significant leadership roles in their volunteer efforts. Faculty were asked to rank voluntary/above and beyond activity participation from 0 for no participation to 5 for leadership and volunteering combined. It is hard to compare volunteer time commitments to undergraduate students vs graduate students vs faculty peers. However, some conclusions can be drawn. For example, faculty assign more time to students than to their women faculty colleagues which is quite understandable given that it is highly related to their primary work. Voluntary time devoted to undergraduates is slightly more than graduates (3.1 vs 2.85 out of 5 point scale) but given the difference in numbers of undergraduates versus graduates this difference is reasonable. More than half the faculty ranked their efforts with undergraduates as routine to leadership role/volunteering combined. Slightly under half indicated the same for graduates. For both sets of students, three people set aside concentrated time periods to focus their voluntary efforts. An additional three individuals indicated they do not allocate hours above and beyond their

already busy commitments to undergraduates and one indicated the same for graduate students. The remaining respondents participate anywhere from 1 to 6 times per year in activities.

In terms of voluntary time spent supporting women colleagues, six do so routinely and often take leadership roles. Three of the faculty noted that they have helped develop more formal peer and informal group mentoring circles and other formats for themselves and colleagues. The remainder participated in professional development and networking programs primarily through WiSE and SU ADVANCE which provide opportunities to share strategies for addressing challenges, informally mentor each other, and join in group discussions. None of the respondents report having formally assigned service obligations that have a goal to support women in STEM.

In summary, women faculty devote “above and beyond” time to mentor and support women and others from underrepresented groups in STEM in the following priority order – undergraduate students; graduate students; community & campus outreach, and women colleagues. 50% of the women faculty routinely devote time and leadership to this voluntary work.

Types of Programs and Activities

Women faculty are highly involved across campus participating in a variety of formal student programs on campus including McNair Scholars, PRIDE, REUs, C-STEP, LSAMP, Engineering’s Women’s Overnight, and WiSE (Learning Community, Norma Slepecky Undergraduate Research Award, panels, etc.). For graduate students, above and beyond hours appear to be focused on IGERT, LSAMP graduate students, professional development activities (visiting scholar programs, panels and presentations), supporting the Future Professoriate Program and other programs implemented by the Graduate School, and the WiSE Future Professionals Program/WiSE-FPP (advisory committees, presentations and panels, portfolio or resume reviews, networking and mentoring). For women faculty colleagues in STEM, respondents participate in SU ADVANCE and WiSE activities the most but some do take part in self-initiated peer mentoring groups, new faculty orientation program, and mentoring junior faculty.

Advising, Mentoring and Advocacy

All respondents take a significant amount of time to routinely advise, mentor, and advocate for women undergraduates, graduates, and post docs; many of whom are not formally assigned to them in an official capacity. Undergraduate women often directly ask women faculty to be their advisors. All but one of the women faculty reported that they are routinely asked by the women doctoral students themselves to mentor or advise them directly. One person wrote: “I constantly consult with female graduate students with regard to career and life situations. They normally request appointments to seek my advice as a female professor in STEM on many issues like whether to pursue academic PhD or industry track, work and family balance, and job interviews. Some female students specifically ask me, “As a woman, what would you do in my situation?” Faculty also make a point of including women undergraduates, graduates, and post docs in their labs and research groups as well as advocating their participation in awards and programs. One biology undergraduate ('15) wrote a note to her female professor, “Recently I was selected as a Travel Fellow for the National Association of Science Writers and was sent to report on the annual AAAS meeting in San Jose, California... I just wanted to thank you for always encouraging me to speak up and to not be afraid to ask questions. Your advice and encouragement really helped me to build my confidence and become more active in science communication over the past few months!” The extant literature clearly supports the importance of women faculty role models



Figure 2: Dr. Nangia volunteers for WiSE-FPP Workshop



Figure 3: Dr. Ivany mentors students on informal field trips.

for women undergraduate students' success in STEM (Rankins et al., 2014; Bettinger & Long, 2005). We also know that mentoring by someone of the same gender or the same race results in better career outcomes for STEM women at all stages through a stronger connection and resulting psychosocial support (O'Neill, 2002). Yet in most STEM departments, despite recent progress at SU, women faculty are still too few to be considered as a critical mass especially in engineering, physical sciences and mathematics. Table 1 details the percentage of women faculty and students in each department for 2014. In general, women faculty make up 24.4% of STEM faculty, up from 20.7% in baseline years of 2008-2010 prior to SU ADVANCE. In 1997, when WiSE first started, women faculty made up 6% of the College of Engineering and Computer Science faculty and 15% of the science department's

faculty in the College of Arts & Sciences. The problem is substantially worse for all STEM students of color. Thus, women students in STEM have insufficient access to women STEM faculty mentors, role models and advocates who can support their persistence and encourage excellence.

Department	% of Fulltime Women Faculty (2014)	Percentage of Enrolled, Full-time Women Undergraduates (Fall 2014)	Percentage of Full-Time Graduate Women (2014)
Biology	35%	67%	74%
Communication Sciences & Disorders	93%	95%	91%
Chemistry/Biochemistry	16%	52%	42%
Earth Science	31%	49%	67%
Mathematics/Statistics	21%	49%	37%
Physics (Physics BA,BS, MS, PhD, Bach Biophysical Science)	14%	28%	12%
Psychology	39%	77%	75%
Biomedical & Chemical Engineering	20%	44%	39%
Civil & Environmental Engineering	16%	26%	34%
Electrical Engineering & Computer Science	15%	13%	26%
Mechanical & Aerospace Engineering	10%	14%	17%
College of Engineering & Computer Science	17%	23%	26%

Data Sources: For faculty, SU ADVANCE, Four Year Report/Spring 2014; Student data primarily prepared from OIRA Fall Census Reporting plus ASEE Graduate Engineering Survey Data, 2014; and ECS Student Enrollment Records Office Fall 2014 Undergraduate Report. Undergraduate figures do not include undeclared students. The interdisciplinary programs are also not included (Biomedical Forensic Sciences; Biotechnology; Forensic Science; Neuroscience; and Structural Biology)

As a result of too few women faculty, there is a greater burden placed on women STEM faculty to advise and mentor. In addition, women students in STEM lack access to women faculty, especially those from underrepresented groups. The continued lack of diversity in the STEM faculty, an essential ingredient to thrive academically and to persist towards a degree, is an ongoing challenge. *In summary, women faculty on campus*

play a critical role in support of student excellence and retention through formal and informal advising, mentoring, and advocacy for women and other underrepresented groups in the STEM departments.

Broader Impact in Grant Proposals

Many faculty include outreach activities and student/teacher enrichment programs as a part of their grant proposals. Five women have current projects along these lines. One is an international project designed to broaden the participation of Papuan students and support university offerings in this volcanic and seismically hazardous region. A second targets students in introductory-level physics courses and high school juniors and seniors through the SUPA program (Syracuse University Project ADVANCE) with the goal of increasing diversity and retention of STEM students in introductory lecture physics courses. Another is designed to promote interest in experimental particle physics among students and high school teachers. They are very proactive in recruiting women and minorities. The fourth project is designed to increase the participation of underrepresented minorities and women in science. The fifth project involves the development of a citation opinion analysis tool with annual opportunities for librarians and STEM researchers to discuss citation behavior and evaluate the tool. It is expected to enrich our understanding of gender difference in the way researchers are citing/cited. *When writing NSF and other proposals, many women faculty in STEM include education and other outreach plans and broader impacts that focus on women in STEM.*



Figure 4: Dr. Bader's lab during activity with young women from Girls Inc.

Community Outreach

Women faculty in STEM also volunteer for the various science and engineering programs offered on campus that are focused on middle and high school students. These programs include Project Engage, Science Horizons, STEP, Say Yes to Education, and Biology Summer Science Institute. Some nurture individual high school women in their labs as well. Women faculty also reach directly into the community, volunteering for the MOST Museum, science fairs, presentations to and activities with groups of middle and high school students from local schools, and community agencies such as Girls Incorporated. These women faculty often recruit their undergraduate and graduate students to help.

Conclusion

Women STEM faculty spend a great deal of their time supporting persistence for women and other underrepresented groups in STEM on campus. They are also dedicated to promoting undergraduate research for women and to mentoring of women graduate students. In addition, they are committed to encouraging young women and underrepresented minority students in local secondary schools to pursue STEM fields in their futures. At many levels, women STEM faculty are devoted to increasing interest and participation among historically underrepresented groups in STEM.

Key findings of the study include:

- *Women faculty devote “above and beyond” time to mentor and support women and others from underrepresented groups in STEM in the following priority order – undergraduate students; graduate students; community & campus outreach, and women colleagues. 50% of the women faculty routinely devote time and leadership to this voluntary work.*

- *Formal and informal advising, mentoring and advocacy for women and other underrepresented groups in the STEM departments is one of the most critical roles, in support of student excellence and retention, that women faculty play on campus.*
- *There is insufficient access for women students in STEM to women STEM faculty who can support their persistence and encourage excellence demonstrated by the disparity between the percentages of women faculty to women student in the majority of the STEM departments.*
- *When writing NSF and other proposals, many women faculty in STEM include education and other outreach plans and broader impacts that focus on women in STEM.*

What Can WiSE Do To Help?

Women faculty proposed the following ideas as supportive to their efforts:

- These service activities would benefit from a program of incentives and awards.
- Bring more awareness among non-female students, faculty, and leaders about the unique challenges of women in STEM.
- Address the challenge in identifying all the organized resources already available that I could contribute to or use to support my students on campus. And identify communities of young women and other underrepresented groups in Syracuse area and the key contact person to broaden the outreach scope.
- Provide a centralized series of events where my efforts could be synergistic with others.
- Obtain additional funding to support the efforts of WiSE faculty both on and off campus.
- Establish or advocate for the establishment of an Education and Outreach Office to support pipeline persistence but also increase research funding because it enhances broader impacts for grants. Establish a clearinghouse (hopefully with dedicated staff) for researchers to share their education and outreach plans, and best practices/strategies. Establish a liaison (perhaps through the clearinghouse) between research folks and the Syracuse area at the college and K-12 levels.
- Funding for student research projects, seed funding.
- Funding for graduate professional development – attendance at conferences, meetings with visiting scholars and women faculty, etc.
- Continued networking events and community building activities among women faculty in STEM.
- More family-oriented activities can be held to show our kids that we are such a caring, fun, and geeky community.

Quotes of Appreciation

- Thank you for all that you have done. I feel much more connected and supported thanks to WiSE!
- I really appreciate SU ADVANCE and WiSE... I get more opportunities to talk to female faculty in other departments or universities by participating.