

### National Context of Women in STEM

In the global economy of the 21<sup>st</sup> century, the need for professionals skilled in science, technology, engineering, and mathematics (STEM) continues to grow. If the United States is to remain competitive in this economy, there is an urgent need to improve and expand the STEM education-to-career pipeline to meet the workforce needs of our nation.<sup>1,2</sup> A key strategy for growing the STEM workforce is to broaden participation in STEM among underrepresented groups, including women. While women compose about half of the total U.S. population and represent half of both the overall and the college-educated workforce, they represent only about a quarter of the overall STEM workforce.<sup>3</sup>

One of the ways in which the STEM workforce can be defined is by the number of people holding STEM degrees,<sup>4</sup> and the gender gap in the number of degrees awarded varies widely across STEM fields. While women earn approximately half of all undergraduate STEM degrees awarded in the U.S., they are overrepresented in psychology (76.7%), biological sciences (59.1%), social sciences (54.6%), and agricultural sciences (53.9%), and they are underrepresented in mathematics and statistics (42.8%), the physical sciences (39.7%), earth/atmospheric/ocean sciences (38.6%), engineering (19.8%), and computer science (18.1%). Overall, women earn fewer graduate degrees in the STEM disciplines than their male counterparts, with less than half of STEM master's degrees (46%) and doctoral degrees (41%) awarded to women. The pattern of over- and underrepresentation of women by STEM discipline generally persists at the master's and doctoral levels. For example, women earn nearly three-quarters (73.5%) of doctoral degrees in psychology and less than a quarter of the doctoral degrees in engineering (22.8%) and computer science (20.8%).

A variety of social and environmental factors have been shown to contribute to women's underrepresentation in some STEM disciplines. For example, negative stereotypes about girls' cognitive abilities in mathematics are associated with decreased learning and interest in STEM disciplines that require quantitative skills, and even when such stereotypes are consciously rejected, implicit cultural biases about women in STEM often remain. Thus, even those girls and women who demonstrate ability and interest in the STEM disciplines often encounter implicit biases—both in themselves and among their peers and colleagues—that undermine their persistence and participation in the STEM disciplines.<sup>5</sup>

Indicators of potential implicit bias in the workplace include gaps in pay and advancement between women and men of similar education, experience, and abilities. Studies of the gender pay gap in the U.S. show that, overall, women are paid less than men for the same work. A recent analysis of median annual earnings in 2015 across job sectors showed that women working full-time, year-round jobs in the U.S. earned about 20% less than their male counterparts.<sup>6</sup> A study of earnings among women and men with a bachelor's degree one year after graduation indicate a similar pay gap overall, with women earning about 82% of what their male counterparts earn.<sup>7</sup> The pay gap differs across fields, with some professions showing greater pay equity than others,<sup>7</sup> and the pay gap tends to increase based on the number of years in the workforce. For example, data published by the National Center for Science and Engineering Statistics (NCSES) include a recent summary of median salaries of doctoral scientists and engineers employed fulltime in four-year academic institutions based on the number of years since the doctorate was earned.<sup>8</sup> The study shows that salaries are fairly similar across genders and racial groups in the first six years following completion of the doctorate, with the overall gender pay gap ranging from one to five percent and slightly favoring women. Among those faculty who have been working between seven and fourteen years since earning their doctorate, however, men have the pay advantage across all racial and ethnic groups with an average gender pay gap of ten percent. The greatest gender gap is seen among Asians who have worked thirteen to fourteen years since earning their doctorate, with Asian men earning a median salary of \$93,357 and Asian women earning a median salary of \$68,929—a pay gap of more than twenty-six percent.

The NCSES data also show that, since 1993, the number of women with science, engineering, and health doctorates who are employed as full professors in academic institutions has more than doubled. Despite this increase, women only occupy about one-fourth of senior faculty positions—which is slightly less than the national average across all disciplines (31%) for women holding full professor positions at degree-granting postsecondary institutions.<sup>9</sup> According to NCSES, one reason why women are more likely to hold full-time associate and assistant professorships than full-time, full professorships is because older cohorts of academically employed doctorate holders in science, engineering, and health are disproportionately male.<sup>10</sup> Other contributing factors include those related to job satisfaction. According to surveys of faculty conducted by the Collaborative on Academic Careers in Higher Education (COACHE) at Harvard University, the most important factors in job satisfaction among both men and women are the nature of the work they do and the climate of the department in which they work.<sup>5</sup> Faculty who are satisfied with the nature of their work may nonetheless consider leaving a position because of negative factors in their work climate. To assess faculty satisfaction, COACHE researchers surveyed faculty on ten dimensions of departmental climate and found that female STEM faculty were less satisfied than their male counterparts across all ten dimensions. Among these dimensions, “sense of fit”—or one’s sense of belonging in the department—is one that female STEM faculty members are significantly less satisfied with than their male peers.

## **Recommendations for Supporting Women in STEM**

COACHE researchers have identified sense of fit as the single most important factor for predicting job satisfaction, and their recommendations for improving job satisfaction, especially among women in STEM, focus on improving women’s sense of belonging in STEM departments.<sup>5</sup> Key recommendations for improving faculty satisfaction and the experiences of women in STEM departments, as recommended by COACHE and summarized by the AAUW, include conducting departmental reviews to assess the climate for female faculty, creating an environment that supports retention, ensuring mentoring for all faculty, and supporting faculty work-life balance.<sup>5</sup> Similar themes are reflected in recommendations about how best to support women in medicine<sup>11</sup> and in leadership positions in business, politics, and education.<sup>12,13</sup> At the institutional level, implementing such recommendations requires ongoing, coordinated, efforts to assess organizational culture, resources, and opportunities and to plan and implement programming and policies that are responsive to identified needs. While some of these efforts may occur as part of existing institutional planning processes, focused cross-campus coordination is often lacking. Establishing a formal group of interested faculty and staff can provide the infrastructure necessary to effectively coordinate and expand upon institutional efforts that support gender equity and diversity in STEM. For example, many academic medical centers have established Women in Medicine and Science (WIMS) groups based on recommendations of the American Association of Medical Colleges (AAMC) Group on Women in Medicine and Science (GWIMS), which has published a toolkit that includes information about how to start and maintain a robust WIMS group.<sup>14</sup>

## **Existing Resources for Supporting Women in STEM at UNO**

UNO has several existing resources and initiatives that promote gender equity across campus. For example, the following organizations provide resources and services to support all women on campus:

- **Gender and Sexuality Resource Center**—The mission of the Gender and Sexuality Resource Center is to foster and promote equity, access, and inclusion for all genders and sexualities through education, resources, advocacy, and activism.
- **Women’s Resource Center**—The Women’s Resource Center is a student-run, multi-service agency offering opportunities to explore and discover resources pertaining to women’s lives. The center’s goal is to promote gender wellness and equality in the UNO community through campus events, outreach, and initiatives.
- **Chancellor’s Commission on the Status of Women**—The Chancellor’s Commission on the Status of Women (CCSW) is an advisory council to the chancellor and other university

administrators on issues that relate to women students, faculty, and staff at UNO. The CCSW offers networking events, scholarships, and awards.

- **UNO Women’s Club**—This organization provides opportunities for social interactions among women connected to UNO and raises funds to support scholarships for non-traditional students attending UNO.

Organizations also exist to support recruitment and retention of female students in the STEM disciplines, as follows:

- **Women in IT Initiative**—The Women in IT Initiative is part of a community-driven task force designed to recruit and retain women in UNO’s College of Information Science and Technology programs. The group’s goal is to help address the IT workforce deficit and create a diverse IT talent pool. Group activities include a mentorship program for IS&T female students, participation in nationally recognized conferences and activities, support for the UNO chapter of the Association for Computing Machinery-Women Student Chapter, and an immersion experience for middle and high school students. The group’s endowment will also fund scholarships for IS&T undergraduate, graduate and post-graduate students.
- **(we)STEM Student Organization**—The mission of (we)STEM (Women Engaged in Science, Technology, Engineering, and Mathematics) is to promote and maintain an inclusive environment that fosters the education and development of women in the STEM communities at UNO. The ultimate goal of the program is to promote gender equality as well as to retain women in STEM majors.
- **UNO Chapter of Women in Aviation, International**—Women in Aviation, International is a professional organization that encourages women to seek opportunities in aviation. The mission includes providing resources year-round to assist women in aviation and encouraging students to consider aviation as a career. The organization sponsors scholarships and promotes public understanding of women’s roles in aviation. The UNO Chapter furthers these causes on campus and in the local community.

Broad support for UNO faculty, staff, and students in the STEM disciplines is provided through several organizations on campus. For example, professional development opportunities are provided to faculty and staff through the UNO Center for Faculty Development, Human Resources, and individual departments. In addition, UNO is actively increasing its organizational capacity to prepare STEM-literate citizens and STEM professionals, as evidenced by several recent developments on campus, including the elevation of UNO’s Carnegie Classification from “Master’s Large” to “Doctoral/Research” (2010), the formation of a new Fund for Undergraduate Scholarly Experiences (FUSE) supporting undergraduate students engaged in research (2011), and the creation of four named professorships with leadership responsibilities in STEM (2010, 2011, 2013, and 2014). In addition, UNO has recently established STEM education as one of five campus priorities. Dr. Neal Grandgenett chairs the STEM Priority Leadership Committee, which led the campus-wide effort to develop a strategic plan to guide the ongoing development of STEM education initiatives at UNO and in the Omaha community. The mission of the UNO STEM Priority is to advance student understanding and success in STEM education by aggressively leading collaborative partnerships focused on increasing STEM capacity, competency, innovation, and literacy for the betterment of our metropolitan, regional, national, and international communities. Goals of the UNO STEM Strategic Plan focus on four overarching areas—teaching/learning, research, service/community engagement, and STEM infrastructure. In 2016, UNO’s commitment to collaborative citywide STEM partnerships was nationally recognized when the STEM Funders Network selected the Omaha Citywide STEM Ecosystem—led by the Henry Doorly Zoo and Aquarium and UNO, in collaboration with more than 30 other Omaha organizations—as one of the 10 STEM Learning Ecosystems to join the STEM Learning Ecosystems Initiative.<sup>15</sup>

## New Women in STEM Organization at UNO

In the fall of 2015, a group of about 15 faculty and staff members representing various academic and non-academic units at UNO began to gather monthly to discuss how best to support women in STEM roles at UNO. After reviewing the national literature about how best to support women in STEM, existing campus resources, and the goals articulated in the UNO STEM Strategic Plan, the group determined that there was a need to establish a formal group to coordinate existing efforts and expand programming focused on supporting women faculty and staff in the STEM disciplines. Using information from the GWIMS toolkit, this grassroots group established a new campus organization—WiSTEM Pro<sup>2</sup>—with WiSTEM standing for Women in Science, Technology, Engineering and Mathematics and Pro<sup>2</sup> representing the PROMotion and PROfessional development goals of the organization. This new endeavor builds upon and is supported by ongoing cross-campus efforts to support STEM learning, research, and professional development at UNO and in Omaha, as articulated in the UNO STEM Strategic Plan.<sup>16</sup>

In keeping with the recommendations outlined above and the goals of the UNO STEM Strategic Plan, WiSTEM Pro<sup>2</sup> will serve as a coordinating hub for the existing network of UNO and community resources related to supporting women in STEM, and it is open to all individuals in the UNO community who are interested in advancing careers and leadership opportunities for women in STEM. The purpose of WiSTEM Pro<sup>2</sup> is to advance the full and successful participation and inclusion of women within STEM academic professions by addressing gender equity, recruitment and retention, awards and recognition, and career advancement and satisfaction. The group's mission is to support UNO's increasing STEM capacity in teaching/learning, research, and community engagement by cultivating an inclusive culture in STEM departments and advocating for the recognition, promotion, and professional development of women faculty and staff in STEM positions. The goals of WiSTEM Pro<sup>2</sup> are as follows:

- Advocate for the advancement of women in STEM.
- Provide ongoing professional development of women in STEM through mentoring and programming for all STEM faculty and staff.
- Promote policies that facilitate work-life balance for all STEM faculty and staff.
- Improve job satisfaction among all faculty and staff in STEM positions.
- Retain women faculty and staff in STEM positions.

To support these goals, WiSTEM Pro<sup>2</sup> has established the following committees:

- **Program Committee**—The focus of the program committee is to plan all events sponsored by the WiSTEM Pro<sup>2</sup> organization. Current goals of this committee are to organize an annual event (e.g., speaker, workshop), noon-time professional development (e.g., presentations and talks), and networking lunches. Future goals are to establish a book club and lead Lean In Circles.
- **Recognition Committee**—The focus of the recognition committee is to establish ways to recognize and honor women faculty, staff, and alumni of UNO. Current goals of this committee are to organize information about existing awards, develop efficient nomination strategies, and advocate for women to be nominated for such awards. Future goals are to establish new awards and scholarships.
- **Data/Research Committee**—The focus of the data/research committee is to investigate, collect, and analyze metrics related to women faculty and staff in STEM and related fields at UNO. The data collected will be used to identify trends related to promotion and retention of women in STEM fields at UNO. In addition, the data collected will inform the professional development and mentoring activities provided through WiSTEM Pro<sup>2</sup>. The committee will focus on data collection to answer two questions:
  - What is the current status of UNO women in STEM and related fields as determined by employment, salary, promotion, and retention?
  - What types of mentoring and programming are most needed by current WiSTEM Pro<sup>2</sup> members?

Going forward, the committee will work with UNO leadership to ensure that campus-wide faculty satisfaction surveys include questions relevant to “sense of fit” and other dimensions of departmental climate that are particularly relevant to the satisfaction of women faculty and staff in STEM departments.

In fall of 2016, WiSTEM Pro<sup>2</sup> formally defined its organizational structure, establishing an executive board composed of officers and committee chairs. The composition and current membership of the executive board is shown in Table 1. The executive board is currently working on developing the WiSTEM Pro<sup>2</sup> bylaws. WiSTEM Pro<sup>2</sup> currently has about 50 members and continues to grow. Going forward, the organization plans to expand its membership to include colleagues across the UNO community, including all faculty, staff, or alumni who support the group’s mission. Information about WiSTEM Pro<sup>2</sup>—including meeting dates, times, and locations each of its committees—is published on the WiSTEM Pro<sup>2</sup> website ([wistempro2.unomaha.edu](http://wistempro2.unomaha.edu)).

**Table 1. WiSTEM Pro<sup>2</sup> Executive Board Members, 2016–2017**

Position	Name, College, Department/Office, Title
President	Jenna Yentes, College of Education, Biomechanics, Assistant Professor
President-Elect	Kelly Gomez Johnson, College of Education, Teacher Education, STEM Instructor
Secretary	Amelia Squires, College of Education, Teacher Education, Office of STEM Education, STEM Outreach Coordinator
Treasurer	Sheryl McGlamery, College of Education, Teacher Education, Professor and Co-Director of the Office of STEM Education
Programming Committee Chair	Anne Karabon, College of Education, Teacher Education, Early Childhood Education, STEM, Assistant Professor
Recognition Committee Chair	Sandra Vlasnik, College of Information Systems & Technology, Information Systems and Quantitative Analysis, Lecturer
Data/Research Committee Chair	DeeDee Bennett, College of Public Affairs and Community Service, School of Public Administration, Emergency Services Program, Assistant Professor

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