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Utah Women and STEM

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Employment opportunities in Science, Technology, Engineering, and Math (STEM) sectors in Utah are estimated to reach 101,000 by 2018 (Carnevale, Smith, & Melton, 2011). These jobs are recognized nationwide as being well-compensated and generally recession-proof. Yet Utah women continue to hold a lower percentage of STEM-sector jobs than women nationally; in fact, Utah is ranked last in the United States in terms of the percent of women employed in STEM. In addition, Utah women work in STEM occupations at a rate that is less than half that of Utah men (Institute for Women's Policy Research (IWPR), 2013). Recognizing the role women must play as an integral part of a strong statewide workforce, Utah educational and civic leaders are working to increase opportunities and pathways for more Utah women to enter and thrive in STEM fields. Such efforts, including educational support and labor force incentives, will allow women to have greater success in their intellectual and financial health and overall well-being. This research report reviews three key areas:

1. Current STEM employment data in Utah and nationwide,
2. Possible explanations for the persistent gender gap in STEM, and
3. A discussion of ongoing efforts in Utah to increase female participation and success in STEM fields.

Employment Data

The U.S. Bureau of Labor Statistics has projected that, between 2014 and 2024, total employment in science and engineering will increase (Fayer et al, 2017). While Utah currently boasts a 3.1% unemployment rate (compared with a 4.0% unemployment rate in the United States) (Lee, 2019), STEM occupations have accounted for only 4.56% of Utah's workforce, slightly below the 4.58% national average (Prosperity Through Education, 2015). More recently, the National Science Foundation has documented higher rates in Utah for science and engineering occupations as a percentage of all occupations (National Science Foundation, 2018). Yet, Utah women are not necessarily part of this growth, as they may be lagging behind men in STEM participation. A 2011 study by the Georgetown University Center on Education and the Workforce highlighted the persisting lack of gender diversity across the nation within both STEM education and the STEM occupations that are acknowledged as being among the most influential and high-paying sectors (Carnevale et al., 2011).

Nationally, a 2015 report by the U.S. Bureau of Labor Statistics illustrated marginalization of women within STEM, both in management (from 0% for natural sciences, 7.6% for engineering, to 26.7% for information technology) and in professional occupations (15.4% for engineering and 25.6% for computers and math) (Bureau of Labor Statistics, 2015). This situation is likely even worse in Utah, as is shown by a report from the Institute

for Women's Policy Research that estimates that women comprise only 23.5% of all STEM-sector workers in Utah, compared to 28.8% for women nationwide. That amounts to only 5.2% of Utah women being employed in STEM occupations, compared to 13.2% of men. Utah is ranked 51st out of 50 states and D.C. in this category (IWPR, 2019).

Possible Explanations for the Gender Gap

The U.S. Department of Commerce recognizes STEM education as the clear pathway to STEM-sector jobs (U.S. Department of Commerce, 2011), yet educational statistics demonstrate an inadequate supply of talent in the STEM jobs pipeline among workers both in Utah and nationwide. In 2012–2013, 16.6% of bachelor's degrees conferred by Utah's post-secondary institutions were in STEM disciplines, a sliver above the national average of 16.5% (National Center for Education Statistics, 2014). Overall, STEM career progression is frequently referred to as a "leaky pipeline" because of a diminishing interest in science and math as students move through the educational system (Prosperity Through Education, 2015). However, the decline is particularly true of female students, as gender stereotypes and a scarcity of female STEM role models continue to affect decisions made by girls and women in regards to their education and future career (Carnevale et al., 2011).

In the United States, only 12% of women with bachelor's degrees choose STEM majors, compared to 28% of men (Hill, Corbett, & St. Rose, 2010). A recent survey of high school students showed that males expressed much higher interest in pursuing careers in STEM. The Utah graduating class of 2017 showed the highest gap compared to previous years between male and female aspirations to enter STEM careers, at almost 30%—38.8% male vs. 12.6% female (Alliance for Science and Technology Research in America, 2018). In 2012, women in Utah received only 20% of the total number of degrees or certificates awarded in seven STEM fields across the public colleges and universities in

the state. The fields that had the lowest percentage of female graduates were engineering tech (11% female), engineering (12%), and computer/information sciences (13%). The STEM fields with the highest percentage of female graduates were math and statistics (36%), biological/biomedical (38%), and science technicians (39%) (Hanewicz & Thackeray, 2013). In addition, the graduation rate in certain STEM fields is increasing rapidly among young men in Utah but is increasing only modestly among young women. For example, between 2010 and 2015, the number of computing degrees and certificates earned by men in Utah more than tripled, from 1,027 to 3,413. In contrast, the number of degrees women earned increased at a much slower rate, from 321 to 431, during the same time period (Change the Equation, 2015).

Finally, even when women graduate and begin to work in STEM fields, they tend to divert from STEM sectors at a higher rate than men do, and for different reasons. For instance, in the nation, 22% of women (vs. 7% of men) decide to leave STEM positions for family-related reasons, and only 15% (vs. 31% of men) leave based on pay or promotional opportunities, which can often be greater outside of STEM occupations as a career progresses (Carnevale et al., 2011). Consequently, focused measures are needed, at both national and state levels, to attract, retain, and support the integration and success of students, particularly females, in STEM education and employment.

Efforts to Increase Participation

In order to ensure a sufficient local supply of qualified employees to fill future STEM jobs, Utah stakeholders are focusing increased efforts in promoting STEM fields (specifically to women in STEM) at all levels, including K–12, higher education, and professional employment. To that end, in 2013 the Utah legislature appropriated \$10M for the creation of a STEM Action Center (Utah State Legislature, 2013) to promote science, technology, engineering, and math through best practices in K–12 education. The Center's goal is to "produce

a STEM-competitive workforce to ensure Utah's continued economic success in the global marketplace" (STEM Action Center, n.d.). Additionally, in 2015 the Utah legislature approved \$4.5M for an engineering initiative (Salt Lake Chamber, 2015), as well as a one-time appropriation of \$280,000 for each of two schools in support of the Southern Utah STEM Initiative at Southern Utah University and of Dixie State University, as both target underserved and disadvantaged rural communities (Burt, 2015; Salt Lake Chamber, 2015). These state-appropriated funds could be utilized, directly or indirectly, to develop initiatives steering female students towards STEM education, and to support women in STEM occupations. For instance, Dixie State University was selected to host one of only 22 "Tech-Savvy" conference pilot programs nationwide; the conference features a day-long STEM event for girls (Applegate, 2016).

Overall, Utah is taking positive steps and investing heavily in raising support and awareness for STEM education as a gateway to high-paying job opportunities, and many of these efforts are aimed specifically at overcoming STEM-gender challenges. For instance, Utah is one of 19 states to participate in the National Alliance for Partnerships in Equity (NAPE) STEM Equity Pipeline Project, which is a collaborative effort between higher education institutions and Utah school districts to increase female participation in STEM. This is a research-based program with specific quantitative goals that allows stakeholders to measure increased involvement among Utah girls (see <http://www.napequity.org/stem/stem-equity-project/> for more information on this national project). In addition, the STEM Action Center now offers a dedicated STEM-girls webpage that features links to women-led scientific and engineering projects nationwide. The Center also hosts "girls only" events, which can allow girls to explore and learn in a comfortable environment (see <http://stem.utah.gov/stem-girls/>). Likewise, many institutions in the Utah System of Higher Education organize K-12 girls-only STEM summer camps to encour-

age higher participation in STEM fields. See, for example, SheTech (various locations), eSMART camp (Dixie State University), Girls Go Digital (various locations), and Hi-Gear (University of Utah) (Utah System of Higher Education, 2015).

In addition to university outreach programs aimed at K-12 students, the major universities and colleges in the state offer numerous programs and organizations for post-secondary female students in STEM. These groups provide mentoring, networking, competitions, community outreach, training, and other support. For example, the Society for Women Engineers, a national organization, has chapters at Weber State University, Utah State University, the University of Utah, Brigham Young University and Neumont University, as well as a Greater Salt Lake chapter which encompasses all of Utah. In 2001, only Utah State University had a chapter of the Association for Computing Machinery—Women, a national organization; in 2016, Dixie State University, Snow College, the University of Utah, Brigham Young University, and Southern Utah University formed chapters. Other groups include Women in Engineering and Technology at Brigham Young University and the ACCESS Program for Women in Science and Mathematics at the University of Utah, among many others. Interested female students at any Utah post-secondary institution can consult STEM departments or check the programs' websites in order to locate and participate in these programs.

Finally, at the professional level, various statewide associations for women, including the American Association of University Women—Utah, Utah Women in Higher Education Network, and the Women Tech Council, offer visibility (such as the annual Women Tech Awards), networking, and mentoring on various issues of personal and professional growth both for career professionals in the STEM sector and for women in technology occupations in other industry sectors. In addition to supporting women individually, these organizations can also advocate for improved corporate culture among STEM companies and in career

paths. Industries and their various pipelines will have to continue to make significant changes to better recruit, develop, and retain women in STEM fields, as women currently hold such a small percentage of these jobs. For more details about these organizations, please refer to the Utah Women & Leadership Project's extensive list of Utah Women's

Networks and Groups (<http://www.uvu.edu/uwlp/resources/groups.html>), which includes many associations and chapters for women in STEM. In addition, see the list of STEM programs and offerings through Utah school districts, schools, colleges, networks, associations, and beyond (http://www.uvu.edu/uwlp/education/programs_support.html).

Conclusion

Mirroring national trends, the growing number of employment opportunities in Utah's STEM sector requires both more STEM talent overall and more equitable gender representation within the sector. Accordingly, Utah needs to continue its significant investments into programs that encourage and mentor Utah girls and women to pursue STEM education and careers, and industries must continue to improve corporate climate to attract and retain top women in STEM fields. STEM careers can provide solid opportunities for increased knowledge and intellectual growth, secure employment, and financial stability—all key areas to a woman's overall health and well-being. Successful efforts to increase female participation in STEM fields will strengthen the positive impact of women in the state of Utah.

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