Fact Sheet 2012

THE STEM WORKFORCE: AN OCCUPATIONAL OVERVIEW

Science, technology, engineering, and math (STEM) workers stand at the forefront of innovation in the U.S. economy. As technological changes reshape the world of work, these professionals will continue to be in demand. Labor market trends are difficult to predict, but both the number and proportion of STEM jobs are expected to grow faster than average for all occupations from 2010 to 2020. This fact sheet will outline: the employment and earning trends in STEM occupations; unionization in STEM fields; the location of STEM jobs; gender, race, and ethnicity in STEM; and the challenges offshoring and U.S. guest worker visa programs pose for U.S. STEM workers.

Employment Outlook Statistics

- In 2011, 3,608,000 workers were employed in computer and mathematical occupations, while 2,785,000 were employed in architecture and engineering occupations and 1,303,000 in life, physical, and social science occupations. Together they accounted for 24.8 percent of the professional labor force.[1]
- From 2006 to 2011 the total number of people employed in professional and related occupations in the U.S. increased by six percent.[2] Meanwhile, the employment numbers for science and engineering occupations have varied. For that same period:
    - Employment of aerospace engineers increased 30 percent;
    - Employment of civil engineers increased 25 percent;
    - The number of mechanical engineers remained virtually the same;
    - The number of drafters decreased by over 18 percent;
    - Among the natural sciences, the number of chemists and materials scientists decreased 24 percent; and
    - The number of medical scientists decreased 4.8 percent.[3]
- From 2006 to 2011, the number of people employed in computer and mathematical occupations grew 12.4 percent. Within that occupation category, growth was uneven. For that same period:
    - Employment of computer programmers dropped over 18 percent;
    - The number of computer systems analysts dropped 37 percent;
    - Employment of software developers grew over 23 percent; and
    - Employment of network and computer systems administrators grew over 29 percent.
- Employment projections in STEM fields appear promising. According to the U.S. Bureau of Labor Statistics, employment in professional, scientific, and technical services is projected to

grow by 29 percent, adding about 2.1 million new jobs between 2010 and 2020. Employment in computer systems design and related services is expected to increase by 47 percent, driven by growing demand for sophisticated computer network and mobile technologies. And, employment in management, scientific, and technical consulting services is anticipated to expand 58 percent.

Median Weekly Earnings in 2011

Employees in STEM occupations typically have higher average salaries than other workers. In 2010, STEM workers earned 26 percent more than non-STEM workers, even after accounting for other factors that affect pay, such as age, gender, race, location, industry, and union status.[4] The wage ranges for median weekly income in 2011 for the STEM fields are generally seen to be higher than the 2011 average of $1,029 for workers in professional and related occupations.[5]

- Median weekly earnings for engineers ranged from a high of $1,757 for chemical engineers to a low of $1,336 for industrial engineers.
- For computer-related fields, median weekly earnings ranged from a high of $1,558 for computer software developers to a low of $915 for computer support specialists.
- In the sciences, environmental scientists earned a high of $1,388, while biological scientists earned the lowest, $1,031. Technicians in the sciences generally earn much less.[6]

Union Membership and the Union Advantage

Union members generally have higher wages, better benefits, and more stable working conditions. In 2011, the percentage of unionized workers in professional occupations was around 18 percent.[7] The STEM occupations generally have a lower rate of unionization.

- Union membership in STEM occupations fluctuated slightly between 2006 and 2011, increasing slightly among scientists and declining slightly in computer-related and engineering fields.[8]
- In 2011, 10.1 percent of professionals employed in life, physical or social science related occupations were union members, eight percent of professionals in architecture and engineering occupations were union members, and four percent of professionals in computer and mathematical occupations were union members.[9]
- The highest union membership rate in the sciences was among environmental scientists (16.3 percent); in engineering, it is environmental engineers (13.7 percent) and engineering technicians (15.7 percent); and in computer and mathematical fields, it is computer systems analysts (6.6 percent).[10]
- Unionization has great benefits for lower-paying jobs in the STEM fields. Among technologists and technicians for which data are available (engineering technicians other than drafters), unionized workers earned an average of $1211 a week, compared to an average weekly wage of $934 for non-unionized workers. Similarly, for computer support specialists, unionized workers earn $1421 a week compared to $1012 a week for non-unionized workers.[11]

Location Matters in STEM Employment

STEM job opportunities differ by state. States with large rural populations have fewer jobs in STEM fields. Regions with the strongest presence of STEM employment tend to benefit from major government funding.[12]

- California has more than 13 percent of the U.S. STEM workforce (just over one million estimated jobs). However, it lost 19,000 STEM jobs in the last decade (a 1.75 percent decline). Los Angeles County has the largest number of STEM jobs in the U.S. (more than 235,000).
- Washington, D.C. has more than two times the concentration of STEM jobs than the national average. Fairfax and Arlington counties—connected to D.C.'s economy—have helped Virginia expand its presence of STEM-related workers, on a per-capita basis, more than any other state in the last decade. Washington State, where over 70 percent of STEM workers are based in the Seattle area, experienced the second fastest growth.
- The two counties in the U.S. with the most STEM workers per capita—Los Alamos, N.M., and Butte, Idaho—are home to major Department of Energy national laboratories.
- By some definitions, there are just over eight million jobs in STEM fields as of 2011. Overall STEM employment has grown by 3.7 percent since 2001; there were significant dips in the early 2000s and during the 2008 economic downturn.[13]

Women, Black, and Hispanic Workers in STEM: Underrepresented and Underpaid

In the STEM fields, women and minorities are largely underrepresented and concentrated in lower-paying technical occupations.[14]

- Women's participation in STEM occupations increased from 1995–2011, although women are still underrepresented in many fields, particularly in mathematical and computer sciences and engineering.[15]
- While women made up 57.1 percent of all professional workers in 2011, they only comprise 47.3 percent of science professionals, 25 percent of computer and math professionals, and 13.6 percent of engineering and architecture professionals. [16]
- In 2011, women were well-represented in medical and biological sciences, where they were 54.4 percent and 48.2 percent, respectively, of all workers.[17]
- In almost every field, men's weekly median earnings were approximately 20 percent higher than women's.[18]
- The information technology industry has a spotty record of hiring Black and Hispanic workers. Hispanic workers were 15 percent of the labor force in 2011 and Black workers comprised 10.8 percent of the labor force. Only 5.7 percent of professionals in computer and mathematical occupations are of Hispanic descent and only 6.9 percent are Black.[19]
- Black professionals are underrepresented in life, physical, and social science occupations, comprising 7.3 percent of the workforce; and in architecture and engineering occupations at 5.2 percent of the workforce in 2011.[20]
- Participation in STEM occupations is even lower for workers of Hispanic origin. They comprise only 5.9 percent of life, physical and social scientists, 5.7 percent of workers in computer and mathematical occupations, and 6.4 percent of engineers.[21]

- Black professionals were more proportionally represented in relatively lower-paying technician positions. They held 11.3 percent of engineering technician positions in 2011 and accounted for 9.1 percent of chemical technicians.[22]
- Hispanic professionals were slightly more proportionally represented in technician and technologist occupations as well, at 14.3 percent of chemical technicians, and 9.4 percent of engineering technicians in 2011.[23]
- In nearly every science and engineering occupation, white men's median weekly earnings were higher in 2008 than those of Black men and women, Hispanic men and women, and white women.[24]
- Among math and computer scientists, white men earned 10.2 percent more than Black men, almost 13.2 percent more than Hispanic men, 16.2 percent more than white women, 26.2 percent more than Black women, and 39.4 percent more than Hispanic women.[25]

Offshoring and Immigration Challenges for U.S. STEM Workers

An array of skilled worker visas, including the H-1B, L, and J, is available to employers seeking guest workers. In fiscal year (FY) 2010 alone, over 350,000 guest worker visas, as well as Optional Practical Training (OPT) for foreign STEM students, were approved for employers hiring skilled workers. The U.S. guest worker visa system largely benefits employers and harms workers by depressing wages and labor standards. STEM professionals are disproportionately affected by these temporary visas.

- Although skilled guest workers make up a very small percentage of the overall U.S. workforce, they are disproportionately concentrated in the STEM industries. Assuming all H-1B beneficiaries between FYs 2008 and 2011 remained employed six years (the maximum time allowable), H-1B workers would account for nearly 22 percent of the computer-related workforce and nearly five percent of the engineering workforce.[26] Additionally, there are tens of thousands of L, OPT, and other guest workers in those industries.
- Tech industry lobbyists often claim that these visas are needed to bring in the "best and brightest" workers to combat shortages of U.S. workers in STEM industries. Yet, there is no labor market test to ensure that qualified U.S. professionals are not available for work. According to the Alfred P. Sloan Foundation: "no one who has come to the question with an open mind has been able to find any objective data suggesting general 'shortages' of scientists and engineers."[27] Labor market indicators do not demonstrate a supply shortage and the evidence suggesting a need for more H-1B workers is anecdotal.[28] Furthermore, as Harold Salzman of the Urban Institute points out, "the United States' education system produces a supply of qualified [science and engineering] graduates in much greater numbers than the jobs available."[29]
- As far back as 2001, the National Research Council (NRC) of the National Academy of Sciences and the National Academy of Engineering observed that the "size of the H-1B workforce relative to the overall number of IT professionals is large enough to keep wages from rising as fast as might be expected in a tight labor market."[30] Current wage data shows the continuing accuracy of the NRC observation:
    - From 2005 to 2010, the median weekly earnings for computer systems analysts and scientists increased from $1,210 to $1,220. This represents an annual average

increase of only 0.1 percent and a 9.6 percent loss in buying power, after adjusting for inflation.[31]

- Similarly, for computer programmers, the average weekly wage increased from $1,205 in 2005 to $1,218 in 2010, which, after adjusting for inflation, represents a 10.4 percent loss in buying power.[32]
- A 2009 study from the Council on Foreign Relations shows that H-1B admissions at current levels are associated with about a five to six percent drop in wages for computer programmers and systems analysts.[33]
- In 2011, Georgetown University's Center on Education and the Workforce reported that engineering wages grew more slowly over the last three decades than any other occupational category, only 18 percent.[34]

- The Department for Professional Employees, AFL-CIO supports comprehensive immigration reform, especially the creation of an independent commission that would ensure foreign and domestic workers fair access to jobs and protection from employer abuse. For more information on guest worker programs and professional and technical workers, see DPE's 2012 publication "Gaming the System" (http://dpeaflcio.org/wp-content/uploads/Gaming-the-System-2012-Revised.pdf).

[1] U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, 2011, Annual Averages, Table 11. http://www.bls.gov/cps/cpsaat11.htm
[2] U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, Annual Averages, 2011, Table 11; U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, 2006, Annual Averages, Table 11.
[3] Ibid.
[4] "STEM Education: Preparing for the Jobs of the Future," A Report by the Joint Economic Committee Chairman's Staff Senator Bob Casey, Chairman, April 2012.
[5] U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, 2011, Table 39. http://www.bls.gov/cps/cpsaat39.htm
[6] Ibid.
[7] U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, Annual Averages, 2011, Table 42. http://www.bls.gov/news.release/union2.t03.htm
[8] U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, Annual Averages, 2011, 2006, Table 11.
[9] U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, Annual Averages, 2011, Table 42.
[10] BNA Plus, Union Membership and Earnings: Compilations from the Current Population Survey, 2012 edition.
[11] Ibid.
[12] Joshua Wright, "States with Largest Presence of STEM-Related Jobs," *NewGeography*, September 30, 2012. http://www.newgeography.com/content/002463-states-with-largest-presence-stem-related-jobs
[13] Ibid.
[14] U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, 2010, Table 39.
[15] U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, Annual Average 2011, Table 11.
[16] Ibid.
[17] Ibid.
[18] Sally Gregory Kohlstedt, "Sustaining Gains: Reflections on Women in Science and Technology in 20th-Century United States," *NWSA Journal*, 16, (Spring, 2004): 1.

[19] U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, Annual Average 2011, Table 11.
[20] Department of Labor, "The African-American Labor Force in the Recovery," 2012. http://www.dol.gov/_sec/media/reports/blacklaborforce/
[21] U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, Annual Average 2011, Table 11.
[22] Ibid.
[23] Ibid.
[24] U.S. Department of Labor, Bureau of Labor Statistics, Table A-2 (unpublished).
[25] Ibid.
[26] DHS. *Characteristics of H-1B Specialty Occupation Workers, Fiscal Years 2008; 2009; 2010.*
[27] Michael Teitelbaum, Untitled Testimony. Subcommittee on Technology and Innovation of the Committee on Science and Technology U.S. House of Representatives. Washington. Nov. 6, 2007. Testimony. 1. Web. March 7, 2012. http://science.house.gov/sites/republicans.science.house.gov/files/documents/hearings/110607_teitelbaum.pdf
[28] Lindsay B. Lowell, and Hal Salzman. The Urban Institute. *Into the Eye of the Storm: Assessing the Evidence on Science and Engineering Education, Quality, and Workforce Demand*. The Urban Institute, 2007.
[29] *Globalization of R&D and Innovation: Implications for U.S. STEM Workforce and Policy*, 110th Congress, 2007.
[30] National Research Council. *Building a Workforce for the Information Economy*. Washington: National Academy, 2001, 187.
[31]U.S. Department of Labor, Bureau of Labor Statistics, Current Population Survey, *Median weekly earnings of full-time wage and salary workers by detailed occupation and sex*. 2010.
[32] Ibid.
[33] Prasanna Tambe and Lorin Hitt, Council on Foreign Relations. *H-1B Visas, Offshoring, and the Wages of U.S. Technology Workers*, working paper. CFR, April 14, 2009.
[34] Anthony P. Carnevale, Nicole Smith, and Michelle Melton. Georgetown University, Center on Education and the Workforce. *STEM*. Washington: Georgetown University, 2011.

For more information on professional and technical workers, check DPE's website: www.dpeaflcio.org.

The Department for Professional Employees, AFL-CIO (DPE) comprises 21 AFL-CIO unions representing over four million people working in professional and technical occupations. DPE-affiliated unions represent: teachers, college professors, and school administrators; library workers; nurses, doctors, and other health care professionals; engineers, scientists, and IT workers; journalists and writers, broadcast technicians and communications specialists; performing and visual artists; professional athletes; professional firefighters; psychologists, social workers, and many others. DPE was chartered by the AFL-CIO in 1977 in recognition of the rapidly growing professional and technical occupations.

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May 2012