STEM Occupations and Employment: A Brief Review for Oklahoma

"To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science." — Albert Einstein, physicist

The motivating force behind the most creative and visionary ideas in business and creating new industries comes from people in the science, technology, engineering and mathematics (STEM) occupations. These occupations are considered some of the most important parts of our economy. The occupational categories for STEM can range from computer science, engineering, etc. The educational requirement for entry to employment can range from a high school diploma to a doctoral degree. Some educational requirements consist of on-the-job training. Since the demand for innovation has increased, the demand for STEM workers will follow suit. However, there are not enough workers to meet these demands.

Figure 1, “represents Oklahoma’s portion of an in-depth nationwide look at more than 6 million high school students in the MyCollegeOptions® program in 2016. Overall, U.S. students’ college major/career aspirations were used to determine their interest in STEM-related fields. The survey reveals that nationwide, nearly 30% - more than 1.6 million students - would like to pursue STEM careers in their futures,” (The Alliance for Science & Technology Research in America, 2018).

Figure 1: Oklahoma High School Students’ Interest in STEM Careers: Class of 2018 by Gender & Ethnicity

The data in this report comes from the Occupational Employment Statistics (OES) program, a partnership between the U.S. Bureau of Labor Statistics (BLS) and the Oklahoma Employment Security Commission (OESC) and the Employment Projections Program produced by the Economic Research and Analysis Division of the Oklahoma Employment Security Commission (see Endnote 1, page 12). More information on the data can be found at the BLS website, http://www.bls.gov/oes/. Over 100 STEM Occupations were chosen within this study, including occupational groups from: Computer Science, Chemistry, Life Sciences, Engineering, Environmental Science, Physics/Astronomy and Mathematics. Because STEM occupations need
experience and education, this study includes managerial and postsecondary occupations. Healthcare occupations are not included in this study.

**Figure 2: Employment by occupation for the largest STEM occupations**

- Figure 2 displays the top ten of Oklahoma’s employment-based occupations.

- Computer User Support Specialists are at the top of the list with approximately 7,320 jobs.

- The other top five occupations include Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products, Software Developers, Applications, Computer and Information Systems Managers, Computer Systems Analysts.

- There is a 4,940 job difference between the top largest occupation (Computer User Support Specialists) and the smallest occupation (Petroleum Engineers).

Oklahoma had a total of approximately 83,860 STEM jobs in 2017, accounting for nearly 5 percent of state total employment.

The largest share of STEM occupations was Computer Science with 40,300 jobs, and 48 percent of the total STEM employment.

Engineering was the second-largest STEM occupation share with 42 percent and 35,160 jobs.

Life Sciences had the third-largest STEM occupation share with 13 percent of the STEM occupations and 10,500 jobs.

Other STEM employment shares include: Mathematics with 9,110 jobs, Physics/Astronomy with 6,290 jobs, Chemistry with 5,800 jobs, Geosciences with 4,780 jobs, and Environmental Science with 3,940 jobs.
Figure 4: Highest- and lowest-paying STEM occupations

- The STEM jobs’ average annual wage was $76,274; however, Oklahoma’s average annual wages for all occupations was $43,340.
- Physicists were the highest paying STEM occupation with an annual mean of $161,450.
- Soil and Plan Scientist was the lowest STEM occupation with an annual mean of $36,960.
- Other highest annual mean wages for STEM occupations include: Architectural and Engineering Managers, Petroleum Engineers, Geoscientists, Except Hydrologists and Geographers, and Computer and Information Systems Managers.
- Other lowest annual mean wages for STEM occupations include: Biological Technicians, Environmental Science and Protection Technicians, Including Health, Agricultural and Food Science Technicians, and Surveying and Mapping Technicians.

Figure 5: Selected STEM occupations, employment and mean annual wage

- Figure 5 shows the eight STEM occupations with the largest employment and highest annual mean wage.

- Computer and Information Systems Managers was included in the top eight for both the largest occupations and the highest mean annual wages.

- The top eight highest paid STEM occupations had a weighted average annual mean wage of $119,887, while the largest employment STEM occupations had an average annual mean wage of $73,448.

- The largest employment of STEM occupations had an average employment of 4,110 while the highest paid STEM employees had an average employment of 1,190.

The highest location quotients for STEM occupations by employment level

Note: Bubble size represents employment level


- The STEM occupations’ location quotients are calculated as a ratio comparing the STEM occupation employment concentration of Oklahoma to the U.S. (see Endnote 2, page 12-13).

- A location quotient less than 1.0 suggests that the STEM occupational employment is less concentrated in Oklahoma compared to the U.S., while location quotients larger than 1.0 suggests that STEM occupational employment is more concentrated in Oklahoma compared to the U.S.

- Figure 6 displays the highest eight STEM occupation location quotients in Oklahoma. Most of the occupations with the highest location quotients are technicians, scientists, or engineers.
Figure 7: Projected job growth by STEM occupational groups, 2016-26

- Figure 7 displays the projected job growth by major STEM occupational groups from 2016 to 2026. The Total Occupations at 7 percent are projected to grow slower than the STEM Occupations at 10 percent.

- Physics/Astronomy is predicted to be the fastest growing occupational group with a 13 percent growth rate from 2016 to 2026, while the slowest group was Chemistry with a 6 percent growth rate.

- Geosciences was the second-highest growth occupational group with a 12 percent growth rate between 2016 and 2026.

- Engineering, Computer Science and Life sciences rounded out the top five for projected growth between 2016 and 2026.

Note: Each STEM occupational group only includes STEM occupations.
Figure 8: Industries with the highest employment share of STEM occupations, 2016

- Figure 8 displays the top eight industries with the highest employment share of STEM occupations for Oklahoma with the employment share of STEM occupations for all industries being 5 percent in 2016 (see Endnote 3, page 13).

- Data Processing, Hosting, and Related Services topped the chart with 56 percent of the industry’s employment being a STEM job.

- Among the other top five industries with the highest employment share include: Computer and Electronic Product Manufacturing, Oil and Gas Extraction, Professional, Scientific, and Technical Services, and Lessors of Nonfinancial Intangible Assets (except Copyrighted Works).
Figure 9: The largest occupations in the Data Processing, Hosting and Related Services subsector

- Figure 9 shows the top six occupations in the Data Processing, Hosting and Related Services industry subsector.

- Computer User Support Specialists, Network and Computer Systems Administrators, and Software Developers, Applications were the top three largest occupations in the Data Processing, Hosting and Related Services subsector.


Note: Darker bars indicate STEM occupations

Figure 10: The largest STEM occupations in the Professional, Scientific, and Technical Services


- Professional, Scientific, and Technical Services had the largest STEM employment with 0.9 percent of the total industry.

- In Figure 10, above, the top 10 largest STEM occupations are shown for the Professional, Scientific, and Technical Services subsector.

- Within the Professional, Scientific, and Technical Services subsector, Software Developers, Applications had the largest STEM employment share with 10 percent.

- Five of the occupations with 3 percent of the STEM occupational share include: Computer Programmers, Architects, Except Landscape and Naval, Architectural and Engineering Managers, Computer Systems Analysts, and Surveyors.
Figure 11: Sectors with the largest employment of science, technology, engineering, and mathematics (STEM) occupations

- Figure 11 displays the largest STEM occupational employment within the industry sectors in Oklahoma.

- Professional, Scientific, and Technical Services had the most STEM jobs, about 25 percent of total STEM employment.

- For the Professional, Scientific, and Technical Services, the largest shares included Computer Science and Engineering occupations.

- Educational Services was the second-highest industry sector with nearly 22 percent STEM employment

- The highest share for Educational Services was Life Sciences and Physics/Astronomy occupations.
Summary

- According to the Alliance for Science & Technology Research in America, Asian American high school students are the most likely race to take an interest in STEM occupations at 33.6 percent in 2018.

- The overall annual mean wage for STEM occupations in 2017 was $76,274, while Oklahoma had an annual mean wage for Oklahoma of $43,340.

- The highest employment for STEM occupations in 2017 was Computer User Support Specialists with 7,320 workers.

- Physicists were the highest paid STEM occupations with an average annual wage of $161,450 in 2017.

- The largest share of STEM occupations in 2016 was in the Data Processing, Hosting, and Related Services subsector at 56 percent.

- The largest industry sector for the most STEM employment in 2016 was the Professional, Scientific, and Technical Services sector with 25 percent of STEM jobs.

- The largest shares of STEM occupations within the Professional, Scientific, and Technical Services sector were Computer Science and Engineering in 2016.

Endnotes

1) The Occupational Employment Statistics (OES) program estimates employment and wages for over 800 occupations based on semi-annual mail surveys. The survey is a cooperative program between the Bureau of Labor Statistics (BLS) and State Workforce agencies (for Oklahoma, it is the Oklahoma Employment Security Commission), covering all full-time and part-time wage and salary workers in nonfarm industries.

2) Location quotient shows the occupations share of an area’s employment relative to the national average. In the analysis, we compare the employment in Oklahoma to the U.S. average for each occupation. If an occupation in Oklahoma has a higher employment share than expected, compared to this occupational employment share at the U.S. average, there is evidence suggesting this occupational employment is more concentrated in Oklahoma relative to the national average, or the occupation has a comparatively competitive skills advantage in Oklahoma.

Take mechanical drafters for example, we compute the location quotient for mechanical drafters in Oklahoma by comparing it to national figures, based on the following statistics:
Table 1: Total and occupation employment, Oklahoma and the U.S., 2009

<table>
<thead>
<tr>
<th></th>
<th>Employment in mechanical drafters</th>
<th>Total Employment</th>
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<tbody>
<tr>
<td>Oklahoma</td>
<td>1,170</td>
<td>1,525,330</td>
</tr>
<tr>
<td>U.S.</td>
<td>71,890</td>
<td>130,647,610</td>
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</tbody>
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Table 2: Computation of the location quotient for Oklahoma for mechanical drafters

LQ part 1 = region occupation/ region total = 1,170/ 1,525,330 = 0.00076705
LQ part 2 = State occupation / state total = 71,890 / 130,647,610 = 0.00055026
LQ part 3 = region ratio / state ratio = 0.00076705 / 0.00055026 = 1.394

Therefore the location quotient in Oklahoma for mechanical drafters is 1.394, which is greater than 1.0 (the employment share for mechanical drafters in Oklahoma is greater than the U.S. average) suggesting that the employment of mechanical drafters was more concentrated in Oklahoma, compared with the U.S. average in 2009.

3) Sector, subsector and industry group: The North American Industry Classification System (NAICS) is a two- through six-digit hierarchical classification system, offering five levels of detail. Each digit in the code is part of a series of progressively narrower categories, and the more digits in the code signify greater classification detail.

**Sector**: Two-digit codes designate *economic sectors*, the highest level of aggregation.

**Subsector**: Three-digit codes designate *subsectors*, a more detailed level of aggregation.

**Note**: The STEM disciplines now include O’Net occupations, which is used throughout the paper. Occupations are divided into eight different disciplines. We have excluded the STEM occupations that require no formal educational credential. For more information on O’Net STEM occupations, see [http://www.onetonline.org/find/stem/?t=0](http://www.onetonline.org/find/stem/?t=0).
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