STEM Occupations and Employment: A Brief Review for Oklahoma

“Science, for me, gives a partial explanation for life. In so far as it goes, it is based on fact, experience and experiment.” - Rosalind Franklin, chemist, molecular biologist, and one of the key figures behind unlocking the structure of human DNA.

Science, technology, engineering and mathematics (STEM) occupations can be the inspiration behind creative and innovative ideas in business and new industries. The STEM occupations are considered a significant part of our economy. The occupational categories for STEM include mathematics, 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. Due to the increased demand for innovation, the demand for STEM workers has also increased.

Figure 1: Employment in STEM occupations, 2018 and projected 2028

<table>
<thead>
<tr>
<th>Occupation category</th>
<th>Employment</th>
<th>Change, 2018-28</th>
<th>Median annual wage, 2018¹</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2018</td>
<td>2028</td>
<td>Number</td>
</tr>
<tr>
<td>Total, all occupations</td>
<td>161,037.7</td>
<td>169,435.9</td>
<td>8,398.1</td>
</tr>
<tr>
<td>STEM occupations</td>
<td>9,708.3</td>
<td>10,566.8</td>
<td>858.5</td>
</tr>
<tr>
<td>Non-STEM occupations</td>
<td>151,329.4</td>
<td>158,869.1</td>
<td>7,539.6</td>
</tr>
</tbody>
</table>

Table 1.1 United States Employment in STEM occupations, 2018 and projected 2028
(Numbers in thousands)

Footnotes:
¹ Data are from the Occupational Employment Statistics program, U.S. Bureau of Labor Statistics. Wage data cover non-farm wage and salary workers and do not cover the self-employed, owners and partners in unincorporated firms, or household workers.
² Science, technology, engineering, and math (STEM) occupations include computer and mathematical, architecture and engineering, and life and physical science occupations, as well as managerial and postsecondary teaching occupations related to these functional areas and sales occupations requiring

Table 1.2 Oklahoma Employment in STEM occupations, 2018 and projected 2028

<table>
<thead>
<tr>
<th>Occupation category</th>
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<th>Mean annual wage, 2018¹</th>
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<tbody>
<tr>
<td></td>
<td>2018</td>
<td>2028</td>
<td>Number</td>
</tr>
<tr>
<td>Total, all occupations</td>
<td>1,802,040</td>
<td>1,876,530</td>
<td>74,490</td>
</tr>
<tr>
<td>STEM occupations</td>
<td>92,480</td>
<td>98,070</td>
<td>5,590</td>
</tr>
<tr>
<td>Non-STEM occupations</td>
<td>1,709,560</td>
<td>1,778,460</td>
<td>68,900</td>
</tr>
</tbody>
</table>

Footnotes:
Figure 1 represents how U.S. and Oklahoma STEM occupations compare with Non-STEM occupations projected employment change. The projected percent change for STEM occupations in Oklahoma is two percentage point lower than the national projected growth. However, for the total occupations the projected percent change was 4.1, which was 1.1 less in Oklahoma than the national. While the average wage for the STEM occupations was $78,322 in Oklahoma and the median annual wage was $84,880 for the national. The median wage of Non-STEM occupations was $37,020 for the national and the mean annual wage was $42,132 in Oklahoma in 2018. For more information on STEM occupations on the BLS, see https://www.bls.gov/oes/topics.htm#stem and check out O’NET STEM occupations at https://www.onetonline.org/find/stem?t=0.

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/. More than 100 STEM Occupations were chosen within this study, including occupational groups from: Chemistry, Computer Science, Engineering, Environmental Science, Life Sciences, Mathematics and Physics/Astronomy. Because STEM occupations need education and experience, this study includes managerial and postsecondary occupations. This study doesn’t include Healthcare occupations.

Figure 2: Employment by occupation for the largest STEM occupations

- Figure 2 displays the top ten of Oklahoma’s largest STEM occupations.

- Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products are at the top of the list with approximately 6,610 jobs.

- The other top five occupations include Computer User Support Specialists, Software Developers, Applications, Computer and Information Systems Managers, and Computer Systems Analysts.

- There is a 4,250 job difference between the largest occupation (Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products) and the smallest occupation (Civil Engineers).

**Figure 3: Employment share of STEM occupational groups**


*Note: The sum of disciplines shares are more than 100% due to the occupations being in multiple disciplines.*

Oklahoma had a total of approximately 85,340 STEM jobs in 2018, accounting for nearly 5.4 percent of state total employment.
The largest share of STEM occupations was Computer Science with 39,610 jobs, and 46.4 percent of the total STEM employment.

Engineering was the second-largest STEM occupation share with 43.0 percent and 36,700 jobs.

Life Sciences had the third-largest STEM occupation share with 13.1 percent of the STEM occupations and 11,200 jobs.

Other STEM employment shares include: Mathematics with 8,600 jobs, Geosciences with 7,200 jobs, Physics/Astronomy with 6,400 jobs, Chemistry with 5,990 jobs, and Environmental Science with 4,140 jobs.

**Figure 4: Highest- and lowest-paying STEM occupations**


- The STEM jobs’ average annual wage was $78,322; however, Oklahoma’s average annual wages for all occupations was $44,220.
• Physicists were the highest paying STEM occupation with an annual mean of $164,190.

• Agricultural and Food Science Technicians was the lowest STEM occupation with an annual mean of $33,970.

• Other highest annual mean wages for STEM occupations include: Petroleum Engineers, Architectural and Engineering Managers, Geoscientists, Except Hydrologists and Geographers, and Natural Sciences Mangers.

• Other lowest annual mean wages for STEM occupations include: Environmental Science and Protection Technicians, Including Health, Soil and Plant Scientists, Biological Technicians, Animal Scientists.

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


• Figure 5 displays 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 $127,133, while the largest employment STEM occupations had an average annual mean wage of $76,713.

- The largest employment of STEM occupations had an average employment of 4,050 while the highest paid STEM occupations had an average employment of 1,180.

**Figure 6: 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 in 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 occupations 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, 2018-28**

- Figure 7 displays the projected job growth by major STEM occupational groups from 2018 to 2028. The Total Occupations at 4.1 percent are projected to grow slower than the STEM Occupations at 6.0 percent.

- Life Sciences is predicted to be the fastest growing occupational group with an 8.2 percent growth rate from 2018 to 2028, while the slowest group is Mathematics with a projected 4.0 percent growth rate.

Note: Each STEM occupational group only includes STEM occupations.
• Physics/Astronomy is the second-highest growing occupational group with a projected 7.1 percent growth rate between 2018 and 2028.

• Computer Science and Engineering, and Geosciences round out the top five for projected growth between 2018 and 2028.

Figure 8: Industries with the highest employment share of STEM occupations, 2018

<table>
<thead>
<tr>
<th>Industry</th>
<th>Employment Share of STEM Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Processing, Hosting and Related Services</td>
<td>51.2%</td>
</tr>
<tr>
<td>Other Information Services</td>
<td>39.2%</td>
</tr>
<tr>
<td>Oil and Gas Extraction</td>
<td>27.0%</td>
</tr>
<tr>
<td>Computer and Electronic Product Manufacturing</td>
<td>26.5%</td>
</tr>
<tr>
<td>Professional, Scientific, and Technical Services</td>
<td>25.7%</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>21.9%</td>
</tr>
<tr>
<td>Wholesale Electronic Markets and Agents and Brokers</td>
<td>20.6%</td>
</tr>
<tr>
<td>Chemical Manufacturing</td>
<td>20.3%</td>
</tr>
</tbody>
</table>


• 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 5.2 percent in 2018 (see Endnote 3, page 13).

• Data Processing, Hosting and Related Services topped the chart with 51.2 percent of the industry’s employment being a STEM job.
• Among the other top five industries with the highest employment share include: Other Information Services, Oil and Gas Extraction, Computer and Electronic Product Manufacturing, and Professional, Scientific, and Technical Services.

Figure 9: The largest occupations in the Data Processing, Hosting and Related Services subsector

Note: Darker bars indicate STEM occupations


• Figure 9 shows the top five occupations in the Data Processing, Hosting and Related Services subsector.

• Computer User Support Specialists were the top largest occupations in the Data Processing, Hosting and Related Services subsector with 10.3 percent of the occupations in 2018.
• The second largest occupations within the Data Processing, Hosting and Related Services were Software Developers, Applications with 8.9 percent of the occupations.

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

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Developers, Applications</td>
<td>8.3%</td>
</tr>
<tr>
<td>Civil Engineers</td>
<td>7.1%</td>
</tr>
<tr>
<td>Computer User Support Specialists</td>
<td>6.2%</td>
</tr>
<tr>
<td>Computer Systems Analysts</td>
<td>6.0%</td>
</tr>
<tr>
<td>Architectural and Civil Drafters</td>
<td>5.3%</td>
</tr>
<tr>
<td>Architects, Except Landscape and Naval</td>
<td>3.6%</td>
</tr>
<tr>
<td>Software Developers, Systems Software</td>
<td>3.5%</td>
</tr>
<tr>
<td>Computer and Information Systems Managers</td>
<td>3.3%</td>
</tr>
<tr>
<td>Network and Computer Systems Administrators</td>
<td>3.2%</td>
</tr>
<tr>
<td>Surveying and Mapping Technicians</td>
<td>3.0%</td>
</tr>
</tbody>
</table>


• Professional, Scientific, and Technical Services had the largest STEM employment with 1.0 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 8.3 percent in 2018.

• Out of the 10 occupations, four of the occupations had around 3.0 percent of the STEM occupational share include: Surveying and Mapping Technicians, Network and Computer Systems Administrators, Computer and Information Systems Managers, and Network and Computer Systems Administrators.

10

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 28 percent of total STEM employment.

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

• Government was the second-highest industry sector with nearly 21 percent STEM employment

• In the highest share for Government was Computer Sciences and Engineering occupations.

Summary

• The projected percent change for STEM occupations in the U.S is 8.8 percent compared to the Non-STEM occupations, which is 5.0.

• The Oklahoma’s STEM jobs’ average annual wage was $78,322; however, the average annual wages for all occupations was $44,220.

• The highest employment for Oklahoma’s STEM occupations in 2018 was Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products with 6,610 jobs.

• Physicists were the highest paid STEM occupations in Oklahoma with an average annual wage of $164,190 in 2018.

• Data Processing, Hosting and Related Services topped the chart with 51.2 percent of the industry’s employment being a STEM job.

• The largest industry sector for the most STEM employment in Oklahoma in 2018 was the Professional, Scientific, and Technical Services sector with 28 percent of STEM jobs.

• The largest shares of STEM occupations in Oklahoma within the Professional, Scientific, and Technical Services sector were Computer Science and Engineering in 2018.

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>Employment in mechanical drafters</th>
<th>Total Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oklahoma</td>
<td>1,170</td>
</tr>
<tr>
<td></td>
<td>1,525,330</td>
</tr>
<tr>
<td>U.S.</td>
<td>71,890</td>
</tr>
<tr>
<td></td>
<td>130,647,610</td>
</tr>
</tbody>
</table>

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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