

STEM Occupations and Employment:

A Brief Review for Oklahoma



Oklahoma Employment Security Commission
Economic Research and Analysis



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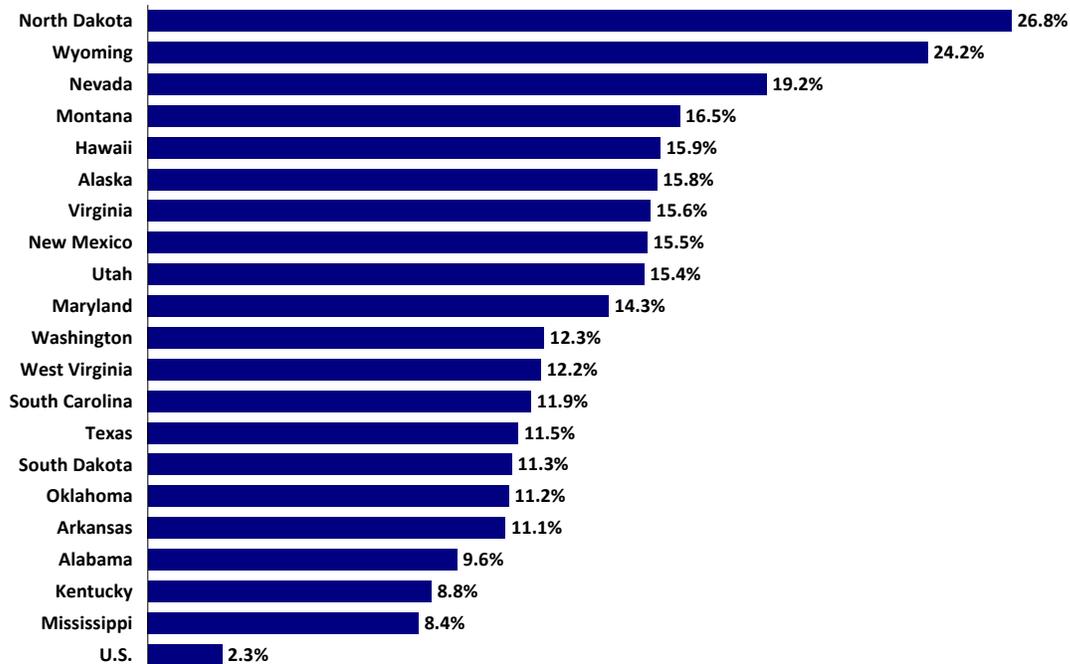
STEM Occupations and Employment: A Brief Review for Oklahoma

Science, technology, engineering and mathematics (STEM) workers drive innovation and competitiveness by generating new ideas, new companies and new industries. STEM occupations include a wide range of scientific and technical job categories. Educational requirements for STEM occupations vary from a high school diploma and on-the-job training to a Ph.D. Growing demand for technological advances means more jobs for STEM workers in the future.

Based on a recent study from the U.S. Chamber of Commerce, *Enterprising States 2011*, Oklahoma's STEM job growth rate between 2001 and 2010 was 11.2 percent, and ranked 16th among all other states. See Figure 1 below.

Figure 1

STEM Job Growth, Top Twenty States, 2001-2010

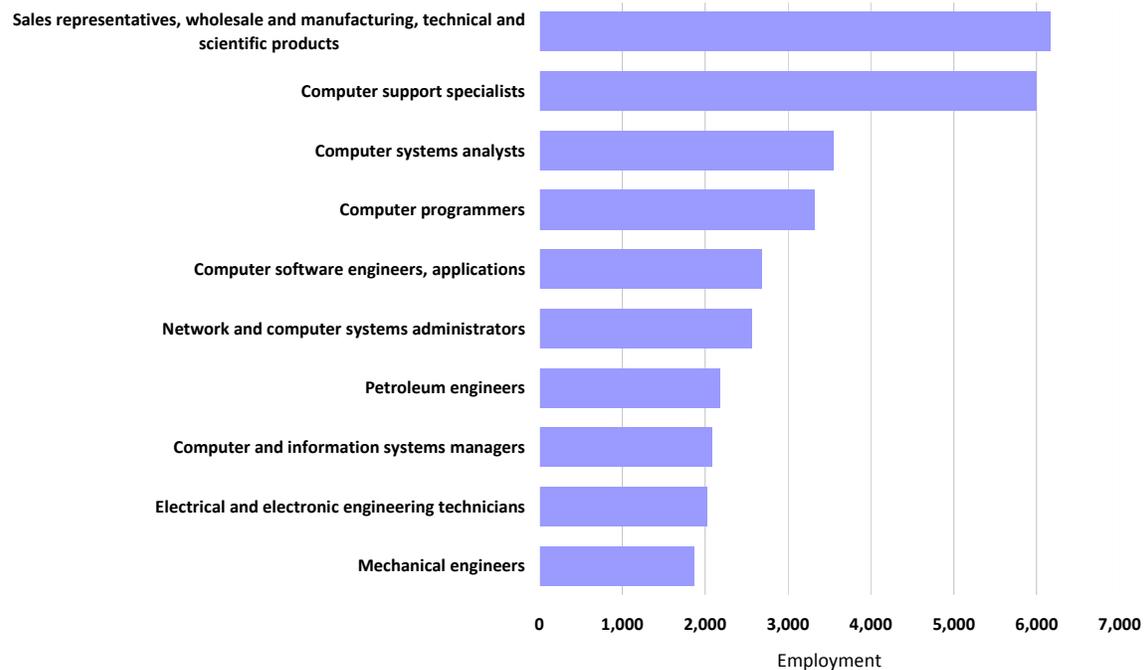


Source: *Enterprising States 2011*, U.S. Chamber of Commerce and National Chamber Foundation, June 2011. Based on data from Economic Modeling Specialists, Inc. (EMSI), EMSI Complete Employment, 1st Quarter 2011. For the full report see: <http://www.uschamber.com/sites/default/files/reports/Enterprising-States-final.pdf>.

This analysis takes a brief look at STEM employment in Oklahoma by using 2009 data from Occupational Employment Statistics (OES), a cooperative program between the Bureau of Labor Statistics (BLS) and the Oklahoma Employment Security Commission (OESC)¹. The data are available on the BLS website at: http://www.bls.gov/oes/oes_dl.htm. In this analysis, 97 occupations were selected as STEM occupations, which are distributed across the occupational groups including computer and mathematical sciences, architecture and engineering, and life and physical sciences. Some managerial and postsecondary teaching occupations, related to the skills and knowledge required by STEM occupations, were also included.

Figure 2

Employment by occupation for the largest STEM occupations, May 2009



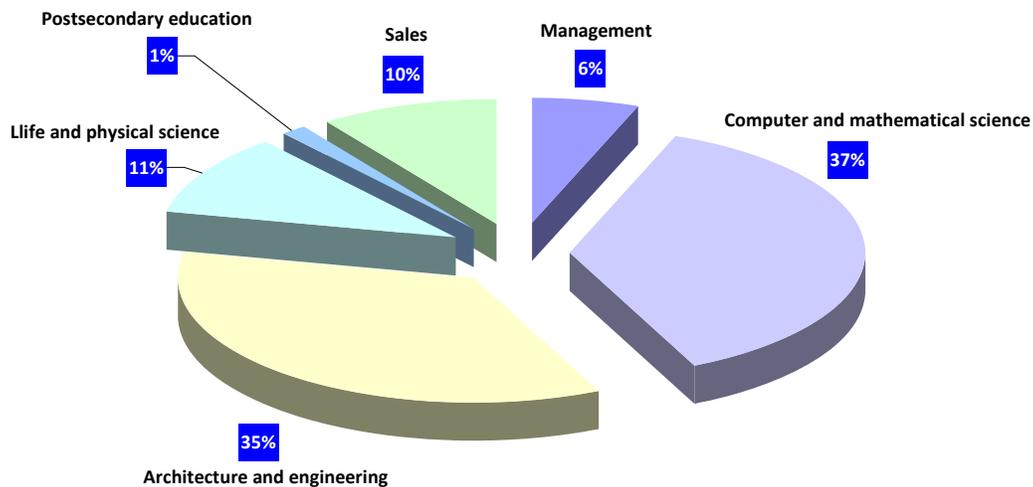
Source: Occupational Employment Statistics (OES), U.S. Bureau of Labor Statistics and Oklahoma Employment Security Commission, June 2010.

- The largest STEM occupation in Oklahoma in May 2009 was sales representatives, wholesale and manufacturing, technical and scientific products with 6,170 jobs.

- Computer support specialists ranked the second largest with employment of 6,000.
- The largest non-STEM occupation in Oklahoma in 2009 was retail salespersons with employment of 52,400.

Figure 3

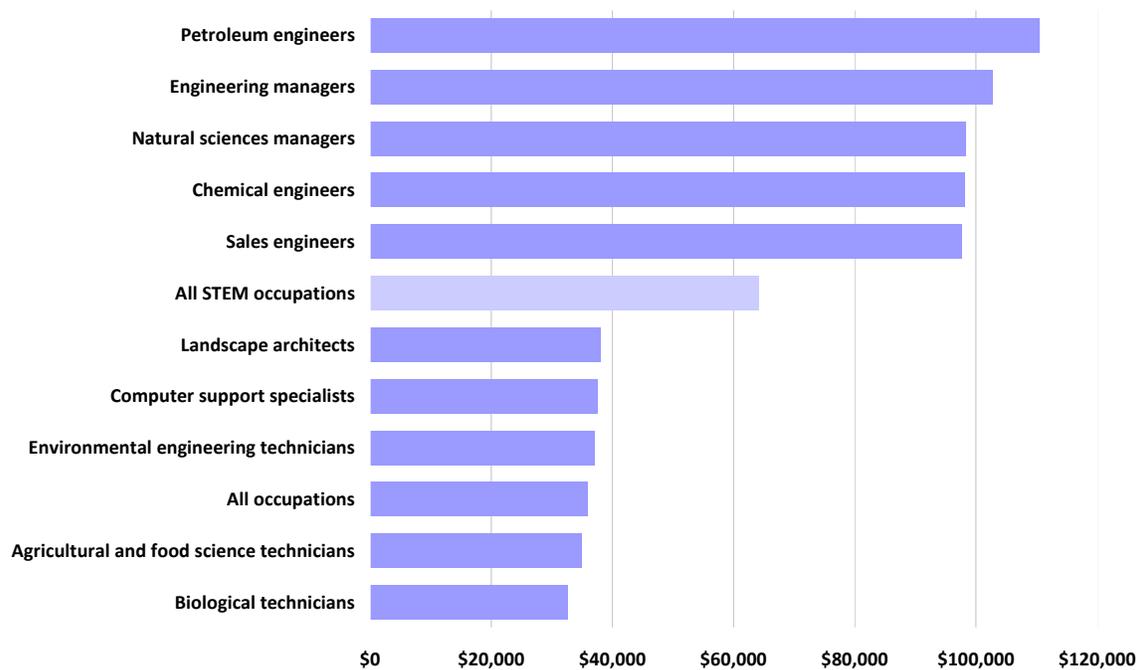
Employment share of STEM occupational groups, May 2009



Source: Occupational Employment Statistics (OES), U.S. Bureau of Labor Statistics and Oklahoma Employment Security Commission, June 2010.

- In May 2009, Oklahoma had a total of 65,450 STEM jobs that made up approximately 4.3 percent of Oklahoma employment.
- The computer and mathematical occupations group had the largest proportion of STEM occupations with 24,280 jobs, accounting for 37 percent of total STEM employment.
- The group of architecture and engineering occupations with 23,120 STEM jobs had the second largest proportion of STEM occupations, accounting for 35 percent of total STEM employment.

Figure 4
Highest- and lowest-paying STEM occupations, May 2009

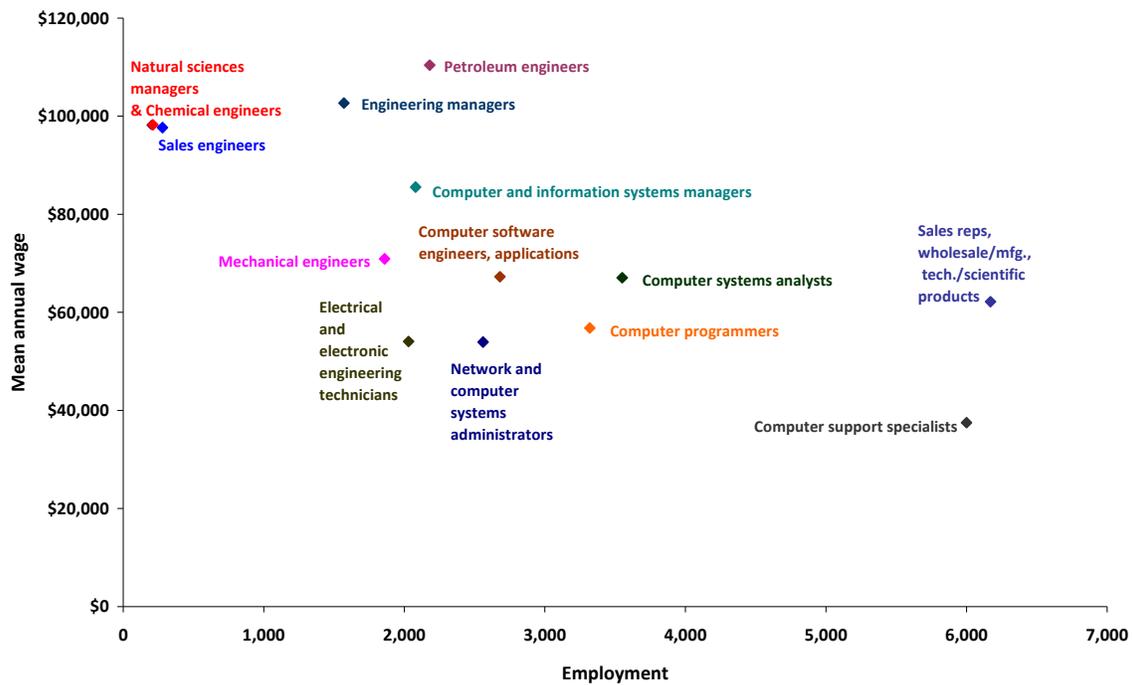


Source: Occupational Employment Statistics (OES), U.S. Bureau of Labor Statistics and Oklahoma Employment Security Commission, June 2010.

- Overall, on average, all STEM occupations had an annual wage of \$64,133 in May 2009. The annual wage for all occupations was \$35,830.
- Petroleum engineers was the highest-paid STEM occupation with \$110,390 for the average annual wage.
- Biological technicians was the lowest-paid STEM occupation with \$32,660 for the average annual wage.
- The five highest-paying STEM occupations had an average annual wage of \$105,734, including sales, chemical and petroleum engineers, natural sciences and engineering managers.
- The four lowest-paying STEM occupations had an average annual wage of \$37,042, including computer support specialists, environmental engineering technicians, agriculture and food science technicians, biological technicians.

Figure 5

Selected STEM occupations, employment and mean annual wage, Oklahoma, May 2009

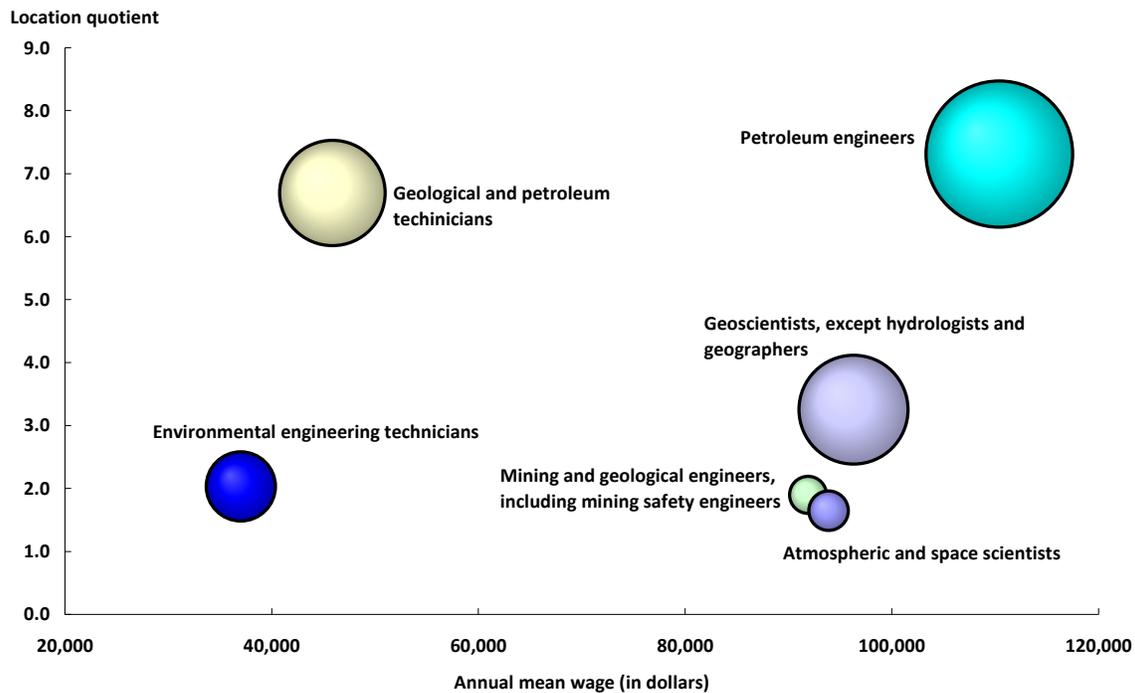


Source: Occupational Employment Statistics (OES), U.S. Bureau of Labor Statistics and Oklahoma Employment Security Commission, June 2010.

- Figure 5 shows the top ten STEM occupations with the largest employment & top five STEM occupations with the highest average annual wages.²
- Five STEM occupations: natural sciences managers, chemical engineers, petroleum engineers, sales engineers, and engineering managers had relatively smaller employment but higher average annual wages.
- Computer support specialists had relatively lower average annual wages, although it was the second-largest STEM occupation in terms of employment.
- Electrical and electronic engineering technicians had relatively smaller employment levels and lower average annual wages.

Figure 6

The highest location quotients for STEM occupations by employment level, May 2009



Note: Bubble size represents employment level

Source: Occupational Employment Statistics (OES), U.S. Bureau of Labor Statistics and Oklahoma Employment Security Commission, June 2010.

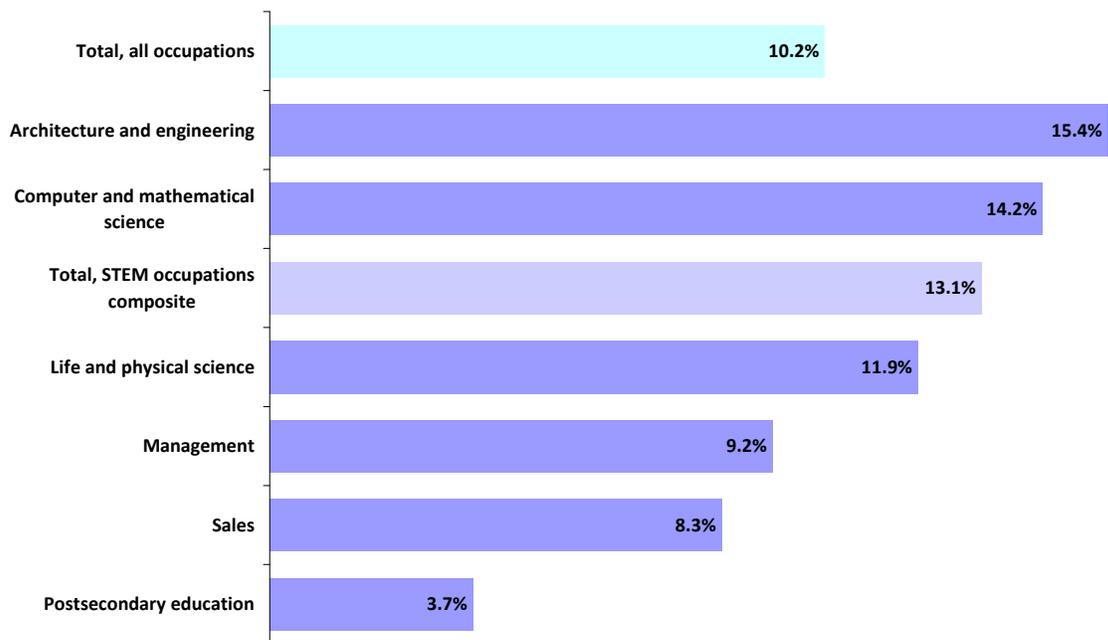
- The location quotients³ for STEM occupations are obtained by comparing STEM occupation employment concentration between Oklahoma and the U.S. average.
- A location quotient greater than 1.0 suggests this STEM occupation employment is more concentrated in Oklahoma compared to the national average.
- Figure 6 shows the top six STEM occupation location quotients. They ranked among the highest employment concentrations in Oklahoma in 2009, with 4 out of 6 being related to the energy sector (Mining, Quarrying, and Oil and Gas Extraction).
- In 2009, petroleum engineers accounted for 14 of every 10,000 jobs in Oklahoma, but in the U.S. as a whole there were fewer than 2 jobs per 10,000. Petroleum

engineers also had the highest employment level of 2,180 among the occupations shown.

- In 2009, geological and petroleum technicians accounted for approximately 7 of every 10,000 jobs in Oklahoma, but there were fewer than 2 jobs per 10,000 in the U.S. as a whole.
- Of the occupations shown, only petroleum engineers, geoscientists except hydrologists and geographers, mining and geological engineers, including mining safety engineers, atmospheric and space scientists had average annual wages above the STEM average wage of \$64,133 in May 2009.

Figure 7

Projected job growth by STEM occupational groups, 2008-2018



Note: Each STEM occupational group only includes STEM occupations.

Source: Employment Projections Program (EPP), U.S. Employment and Training Administration (ETA) and Oklahoma Employment Security Commission, June 2010.

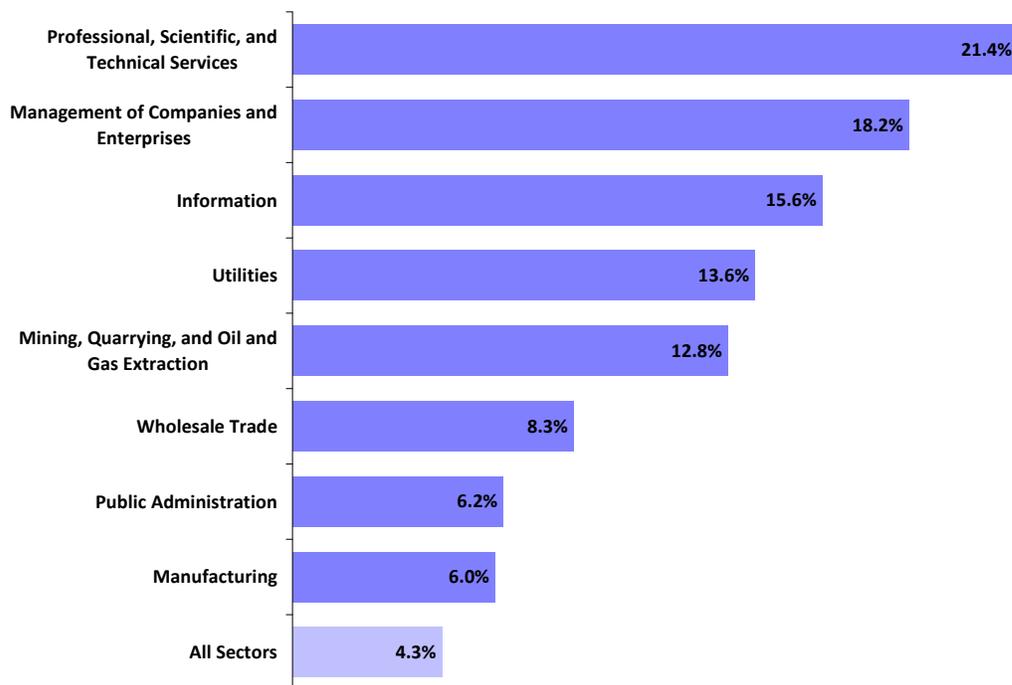
- The projected job growth rate from 2008 to 2018 for all STEM occupational groups is 13.1 percent, greater than the combined total of all occupations by

nearly 3 percentage points.

- The group of architecture and engineering occupations is projected to experience the greatest job growth of 15.4 percent.
- The group of postsecondary education occupations is projected to experience the smallest job growth of 3.7 percent.

Figure 8

Sectors with the highest employment share of STEM occupations, May 2009



Source: Occupational Employment Statistics (OES), U.S. Bureau of Labor Statistics and Oklahoma Employment Security Commission, June 2010.

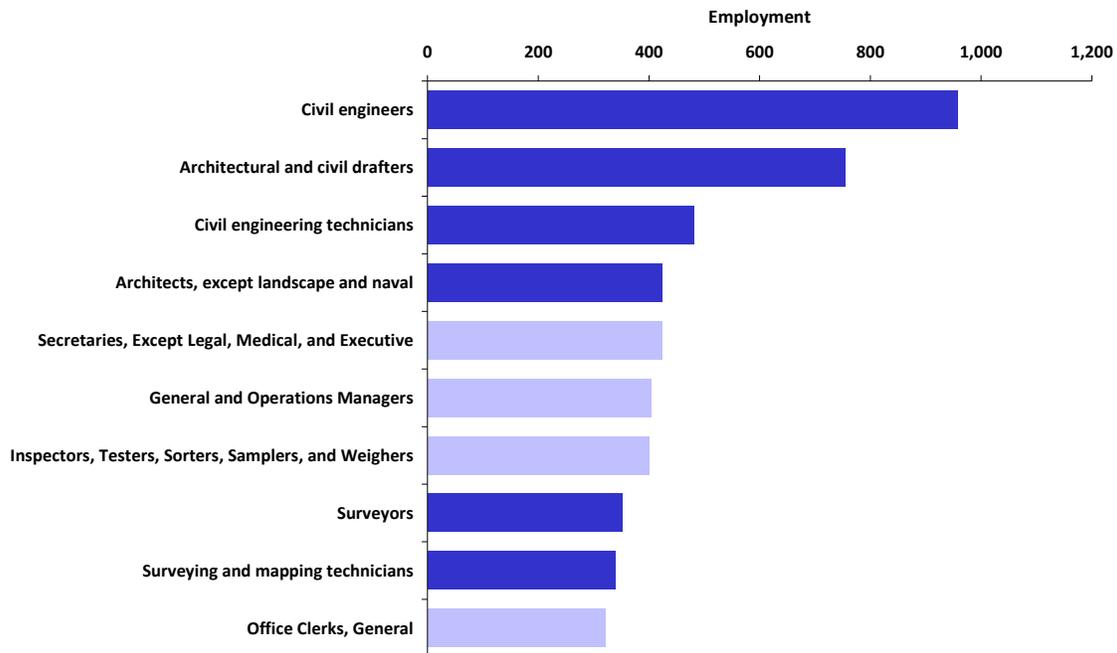
- The employment share of STEM occupations for all sectors⁴ was about 4.3 percent in 2009.
- The sector of professional, scientific, and technical services had the highest employment share of STEM occupations, or 21.4 percent in 2009.
- Management of companies and enterprises; information; utilities; and mining, quarrying, and oil and gas extraction were also among the top four sectors that

had a large portion of STEM occupation employment.

- The sector of accommodation and food services had the lowest employment share of STEM occupations or 0.02 percent in 2009.

Figure 9

The largest occupations in the architectural, engineering, and related services industry group, May 2009



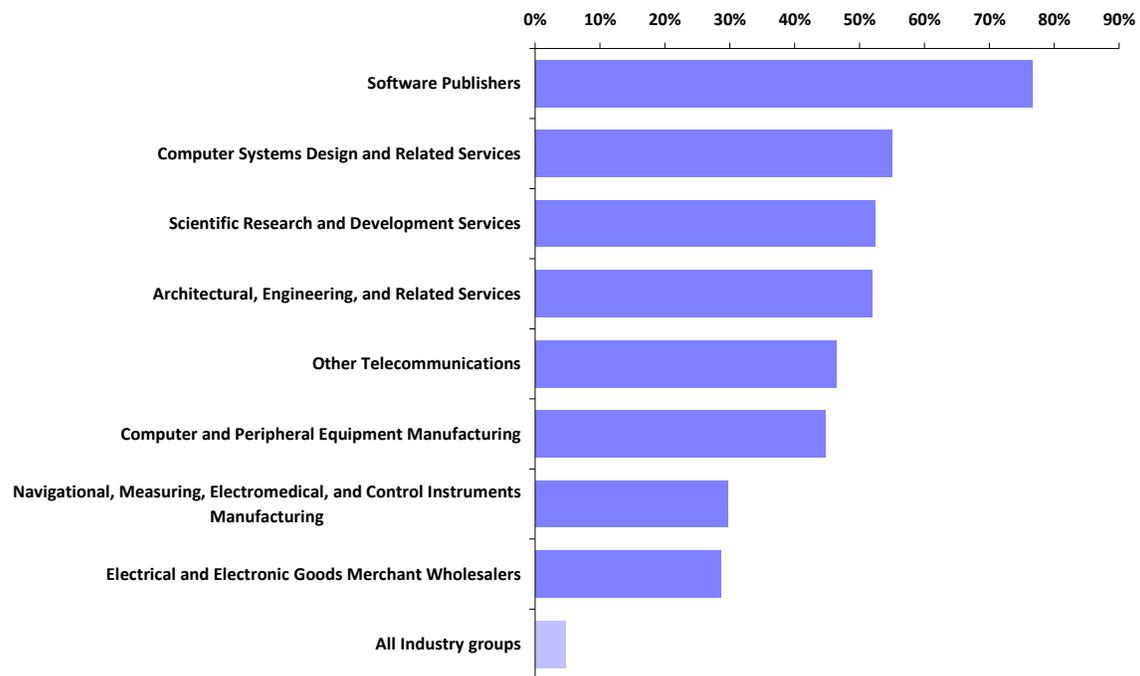
Note: Darker bars indicate STEM occupations.

Source: Occupational Employment Statistics (OES), U.S. Bureau of Labor Statistics and Oklahoma Employment Security Commission, June 2010.

- Within the professional, scientific, and technical services sector, the architectural, engineering, and related services industry group had the largest STEM employment of 6,313 in 2009.
- Civil engineers, architectural and civil drafters were two STEM occupations with the largest employment in architectural, engineering, and related services industry group.
- The six STEM occupations in Figure 9 made up 52 percent of STEM employment in the architectural, engineering, and related services industry group.

Figure 10

Industry groups with the highest share of STEM occupations, May 2009

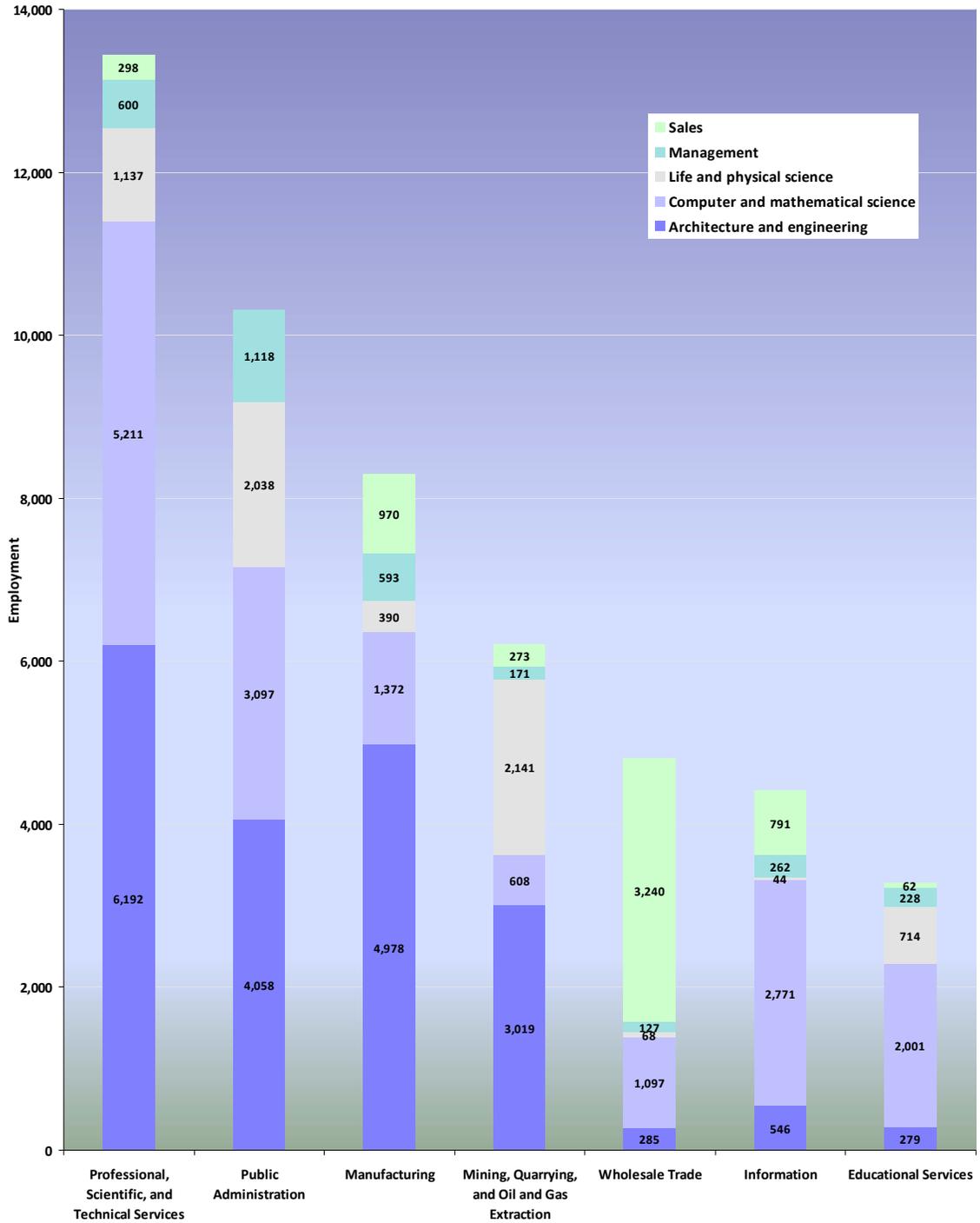


Source: Occupational Employment Statistics (OES), U.S. Bureau of Labor Statistics and Oklahoma Employment Security Commission, June 2010.

- The industry group of software publishers had the highest employment share of STEM occupations, or 77 percent in 2009.
- Computer systems design and related services was the second-largest industry group with the employment share of STEM occupations at 55 percent in 2009.
- For all industry groups, the employment share of STEM occupations was about 4.3 percent in 2009.

Figure 11

Sectors with the highest employment of STEM occupations, May 2009



Source: Occupational Employment Statistics (OES), U.S. Bureau of Labor Statistics and Oklahoma Employment Security Commission, June 2010.

- The professional, scientific, and technical services sector had the largest STEM employment of 13,439 in 2009.

- Architecture and engineering occupations had the most STEM jobs in the professional, scientific, and technical services sector with employment of 6,192.
- Public administration ranked the second largest sector with STEM employment of 10,313.

Summary

- STEM jobs in Oklahoma accounted for approximately 4.3 percent of total employment in May 2009.
- Overall, STEM occupations were high-paying occupations with an average annual wage of \$64,133, about \$28,000 higher than that of all occupations.
- Sales representatives, wholesale and manufacturing, technical and scientific products were the largest STEM occupations.
- Petroleum engineers were the highest-paying STEM occupations.
- The sector of professional, scientific, and technical services had the highest employment share of STEM occupations.
- The industry group of software publishers had the highest employment share of STEM occupations.

Appendix

1. The Occupational Employment Statistics (OES) program estimates employment and wage for over 800 occupations based on semiannual 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. The ten largest STEM occupations in Oklahoma, May 2009

Occupation	Employment
Sales representatives, wholesale and manufacturing, technical and scientific products	6,170
Computer support specialists	6,000
Computer systems analysts	3,550
Computer programmers	3,320
Computer software engineers, applications	2,680
Network and computer systems administrators	2,560
Petroleum engineers	2,180
Computer and information systems managers	2,080
Electrical and electronic engineering technicians	2,030
Mechanical engineers	1,860

The five highest-paying STEM occupations in Oklahoma, May 2009

Occupation	Mean annual wage
Petroleum engineers	\$110,390
Engineering managers	\$102,670
Natural sciences managers	\$98,250
Chemical engineers	\$98,210
Sales engineers	\$97,650

3. Location quotient: this method compares between a local economy and national average in order to identify concentration in Oklahoma. 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

	Employment in mechanical drafters	Total Employment
Oklahoma	1,170	1,525,330
U.S.	71,890	130,647,610

Table 2: Computation of the location quotient for Oklahoma for mechanical drafters

$$\text{LQ part 1} = \text{region occupation} / \text{region total} = 1,170 / 1,525,330 = 0.00076705$$

$$\text{LQ part 2} = \text{State occupation} / \text{state total} = 71,890 / 130,647,610 = 0.00055026$$

$$\text{LQ part 3} = \text{region ratio} / \text{state ratio} = 0.00076705 / 0.00055026 = 1.394$$

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.

4. 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. There are 20 sectors in 2007 NAICS.

Subsector: Three-digit codes designate *subsectors*, a more detailed level of aggregation. There are 99 subsectors in 2007 NAICS.

Industry group: Four-digit codes designate *industry groups*, which is even more detailed than subsectors. There are 313 industry groups in 2007 NAICS.