

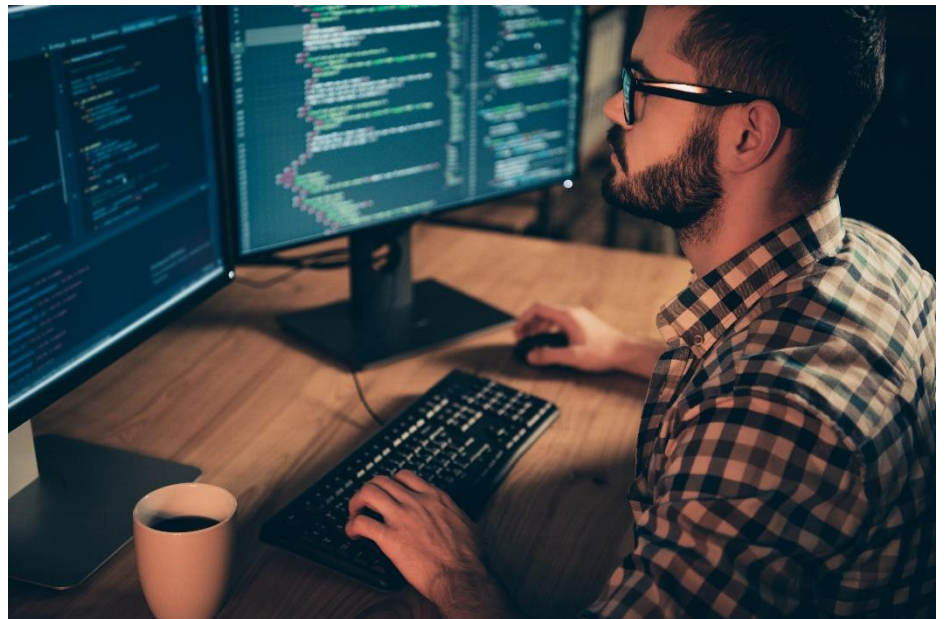
August 2020

Labor Market Analysis

Linux Operating System Certificate



California
Community
Colleges



Prepared by the Central Valley/Mother Lode Center of Excellence

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COVID-19 Statement: This report includes employment projection data by EMSI. EMSI’s projections are modeled on recorded (historical) employment figures and incorporate several underlying assumptions, including the assumption that the economy during the projection period will be at approximately full employment or potential output. To the extent that a recession or labor shock, such as the economic effects of COVID-19, can cause long-term structural change, they may impact the projections. At this time, it is not possible to quantify the impact of COVID-19 on projections of industry and occupational employment. Other measures such as unemployment rates and monthly industry employment estimates will reflect the most recent information on employment and jobs in the state and, in combination with input from local employers, may help validate current and future employment needs as depicted here.

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Summary

Please note the COVID-19 statement on page 2 when considering this report's findings.

This study conducted by the Central Valley/Mother Lode Center of Excellence examines labor market demand, wages, skills, and postsecondary supply for a Linux operating system certificate. Three occupations related to Linux operating system certificate were identified for Cerro Coso:

- 15-1232, Computer User Support Specialists
- 15-1244, Network and Computer Systems Administrators
- 15-1299, Computer Occupations, All Other

Key findings:

- **Occupational demand** — More than 5,000 workers were employed in jobs related to Linux operating system certificate in 2019 in the South Central Valley/Southern Mother Lode (SCV/SML) subregion. The largest occupation is computer user support specialists with 2,160 workers in 2019, a projected growth rate of 9% over the next five years, and 227 annual openings.
- **Wages** — Network and computer systems administrators earn the highest entry-level wages, \$33.06/hour in the subregion and \$32.05/hour in the region.
- **Employers** — Employers with the most job postings in the subregion are Anthem Blue Cross, Lockheed Martin Corporation, and CrowdStrike.
- **Occupational titles** — The most common occupational title in job postings in the subregion is software developers, applications. The most common job title is software development engineer.
- **Skills and certifications** — The top baseline skill is communication, the top specialized skill is SQL, and the top software skill is SQL. The most in-demand certification is a security clearance.
- **Education** — A bachelor's degree is typically required for two of the three occupations—network and computer systems administrators, and computer occupations, all other. Some college, no degree is typically required for computer user support specialists.
- **Supply** — Analysis of postsecondary completions in the region shows that on average 147 awards were conferred in the Central Valley/Mother Lode region each year.

Based on a comparison of occupational demand and supply, there is an undersupply of 357 trained workers in the subregion and 590 workers in the region. The Center of Excellence recommends that Cerro Coso work with the ICT/DM Regional Director, the college's advisory board, and local industry in the expansion of programs to address the shortage of workers with a Linux operating system certificate in the region.

Introduction

The Central Valley/Mother Lode Center of Excellence was asked by Cerro Coso to provide labor market information for a Linux operating system certificate. Review of the Taxonomy of Programs (TOP) and Classification of Instructional Programs (CIP) found the following programs are appropriate for this analysis:

- TOP 070100 - Information Technology, General
- TOP 070200 - Computer Information Systems
- CIP 11.0101 - Computer and Information Sciences, General
- CIP 11.0103 - Information Technology

The geographical focus for this report is the South Central Valley/Southern Mother Lode (SCV/SML) subregion, but regional demand and supply data has been included for broader applicability and use. The average living wage for a single adult in the South Central Valley/Southern Mother Lode (SCV/SML) subregion is \$10.30/hour.¹ Analysis of the program and occupational data related to Linux operating system certificate resulted in the identification of applicable occupations. The Standard Occupational Classification (SOC) System codes and titles used in this report are:

15-1232, Computer User Support Specialists

- 15-1244, Network and Computer Systems Administrators
- 15-1299, Computer Occupations, All Other

The occupational titles, job descriptions, sample job titles, and knowledge and skills from the Bureau of Labor Statistics and O*NET OnLine are shown below. O*NET data was not available for Computer Occupations, All Other.

Network and Computer Systems Administrators

Job Description: Install, configure, and support an organization's local area network (LAN), wide area network (WAN), and Internet systems or a segment of a network system. Monitor network to ensure network availability to all system users and may perform necessary maintenance to support network availability. May monitor and test Web site performance to ensure Web sites operate correctly and without interruption. May assist in network modeling, analysis, planning, and coordination between network and data communications hardware and software. May supervise computer user support specialists and computer network support specialists. May administer network security measures.

Knowledge: Computers and Electronics, English Language, Customer and Personal Service, Engineering and Technology, Mathematics

Skills: Critical Thinking, Judgment and Decision Making, Reading Comprehension, Systems Analysis, Active Listening

Computer User Support Specialists

Job Description: Provide technical assistance to computer users. Answer questions or resolve computer problems for clients in person, or via telephone or electronically. May provide assistance concerning the use of computer hardware and software, including printing, installation, word processing, electronic mail, and operating systems.

Knowledge: Computers and Electronics, Customer and Personal Service, English Language, Telecommunications, Engineering and Technology

Skills: Active Listening, Reading Comprehension, Speaking, Complex Problem Solving, Critical Thinking

¹ The term "living wage" in Center of Excellence reports is calculated by averaging the self-sufficiency wages from the Insight Center's California Family Needs Calculator for each county in the subregion: <https://insightccd.org/tools-metrics/self-sufficiency-standard-tool-for-california/>.

Occupational Demand

The South Central Valley/Southern Mother Lode subregion employed 5,096 workers in Linux operating system certificate occupations in 2019 (Exhibit 1). The largest occupation is computer user support specialists with 2,160 workers in 2019. This occupation is projected to grow by 9% over the next five years and has the greatest number of projected annual openings, 227.

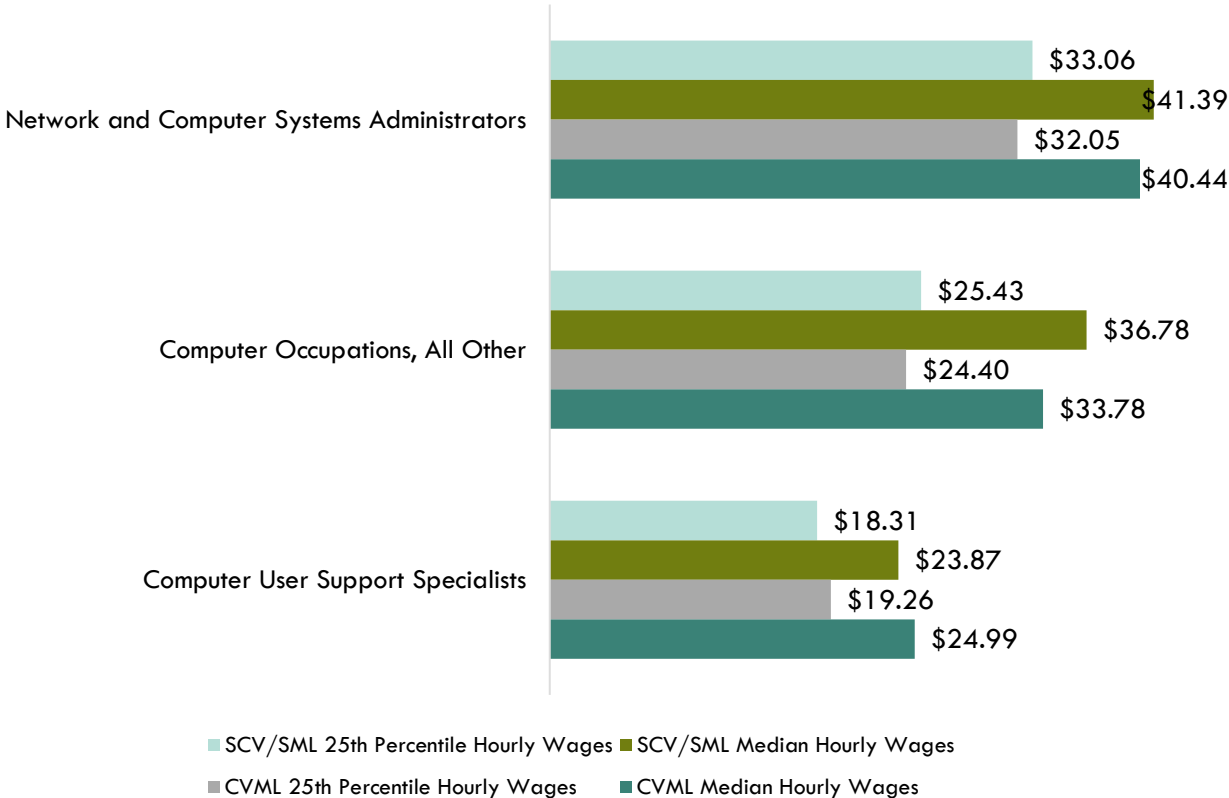
Exhibit 1. Linux certificate employment and occupational projections in the SCV/SML subregion

Occupation	2019 Jobs	2024 Jobs	5-Year Change	5-Year % Change	Annual Openings
Computer User Support Specialists	2,160	2,364	204	9%	227
Computer Occupations, All Other	2,068	2,141	73	4%	182
Network and Computer Systems Administrators	868	925	57	7%	74
Total	5,096	5,429	333	7%	483

Wages

Exhibit 2 compares the entry-level and experienced wages of the Linux operating system certificate occupations. Network and computer systems administrators earn the highest entry-level wages, \$33.06/hour in the subregion and \$32.05/hour in the region.

Exhibit 2. Entry-level and experienced wage comparison in the SCV/SML subregion and region



Job Postings

There were 3,575 job postings for the three occupations in the SCV/SML subregion from February to July 2020. The employers with the most job postings are listed in Exhibit 3.

Exhibit 3. Top employers for Linux operating system certificate by number of job postings

Employer	Job Postings	% Job Postings
Anthem Blue Cross	171	7%
Lockheed Martin Corporation	70	3%
Crowdstrike	63	2%
Northrop Grumman	52	2%
Dcs Corporation	33	1%
Amentum	30	1%
The Boeing Company	24	1%
Saailex Solutions Incorporated	23	1%
Dignity Health	22	1%
Internal Revenue Service	22	1%

Exhibit 4 shows how job postings for the targeted occupations in the SCV/SML subregion are distributed across 10 O*NET OnLine occupations. The occupational title software developers, applications, is listed in 760 job postings. Note how a higher proportion of job postings are for software developers, applications, and computer user support specialists. Common job titles in postings include software development engineer, 176 job postings, information technology specialist, 108 job postings, and systems administrator, 97 job postings.

Exhibit 4. Top occupational titles in job postings for Linux operating system certificate

Occupational Title	Job Postings	% of Job Postings
Software Developers, Applications	760	21%
Computer User Support Specialists	628	18%
Network and Computer Systems Administrators	271	8%
Information Technology Project Managers	240	7%
Computer Systems Engineers/Architects	216	6%
Computer Systems Analysts	208	6%
Business Intelligence Analysts	168	5%
Information Security Analysts	157	4%
Database Administrators	144	4%
Software Developers, Applications	760	21%

Salaries

Exhibit 5 shows the “Market Salaries” for Linux operating system certificate occupations that are calculated by Burning Glass which uses a machine learning model built off of millions of job postings every year, and accounts for adjustments based on locations, industry, skills, experience, education requirements, among other variables.

Exhibit 5. Salaries for Linux operating system certificate

Market Salary Percentile	Salary Amount
10th Percentile	\$38,438
25th Percentile	\$51,500
50th Percentile	\$73,702
75th Percentile	\$94,679
90th Percentile	\$113,913

Education

Of the 3,575 job postings, 2,238 listed an education level preferred for the positions being filled. Of those, 77% requested a bachelor's degree, 24% requested high school or vocational training, and 22% requested a master's degree (Exhibit 6).

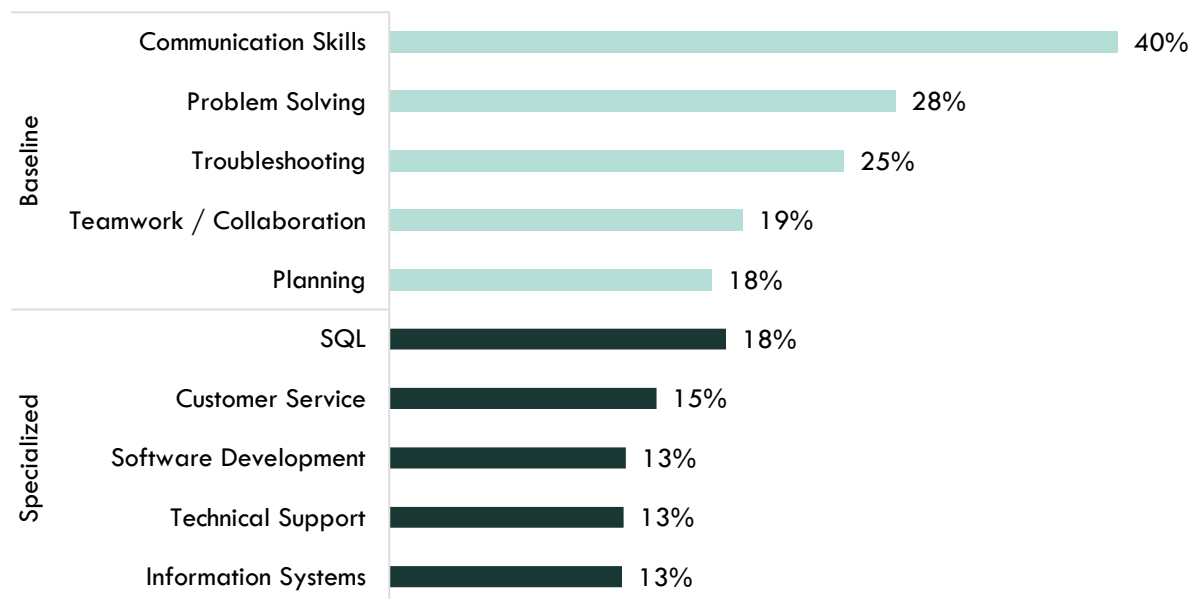
Exhibit 6. Education levels requested in job postings for Linux operating system certificate

Education level	Job Postings	% of Job Postings
Bachelor's degree	1,733	77%
High school or vocational training	532	24%
Master's degree	488	22%
Associate degree	226	10%
Doctoral degree	190	8%

Baseline and Specialized Skills

Exhibit 7 depicts the top baseline and specialized skills for the targeted occupations. The three most important baseline skills are communication, 40% of job postings, problem solving, 28%, and troubleshooting, 25%. The top three specialized skills are SQL, 18% of job postings, customer service, 15%, and software development, 13%.

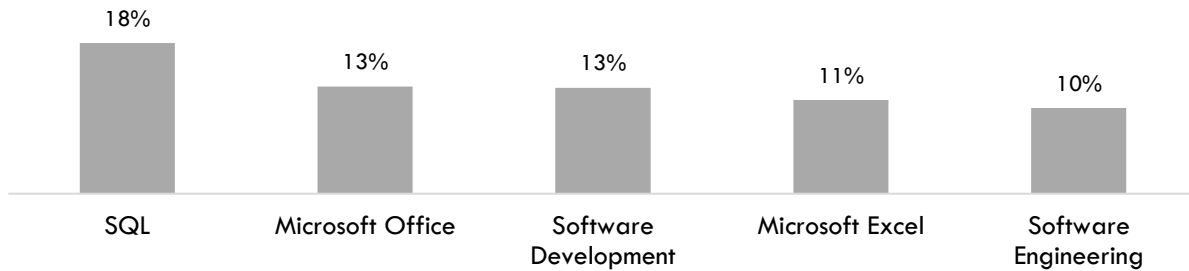
Exhibit 7. In-demand Linux operating system certificate baseline and specialized skills



Software Skills

Analysis also included the software skills most in demand by employers. SQL and Microsoft Office rank first and second (Exhibit 8).

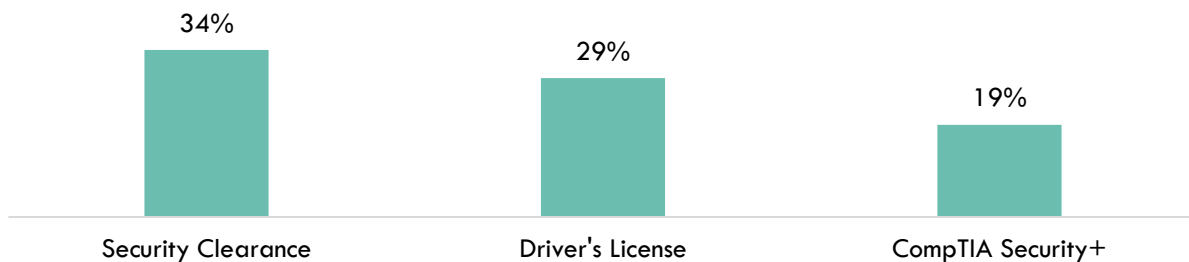
Exhibit 8. In-demand Linux operating system certificate software skills



Certifications

Of the 3,575 job postings, 1,147 contained certification data. Of those, 34% indicated a need for a security clearance. The next top certifications are driver’s license and CompTIA Security+ (Exhibit 9). (Due to the low number of job postings with certifications listed, the chart below may not be representative of the full sample.)

Exhibit 9. Top certifications requested in job postings related to Linux operating system certificate



Education, Work Experience & Training

A bachelor’s degree is typically required for two of the three occupations—network and computer systems administrators, and computer occupations, all other (Exhibit 10). Some college, no degree is typically required for computer user support specialists.

Exhibit 10. Education, work experience, training, and Current Population Survey results for Linux operating system certificate occupations²

Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
Computer User Support Specialists	Some college, no degree	None	None	41.2%
Network and Computer Systems Administrators	Bachelor's degree	None	None	36.5%
Computer Occupations, All Other	Bachelor's degree	None	Moderate-term	34.7%

² “Labor Force Statistics from the Current Population Survey,” Bureau of Labor Statistics, <https://www.bls.gov/cps/>.

Supply

Analysis of program data from the California Community Colleges Chancellor's Office Data Mart included the TOP and CIP codes: TOP 070100 - Information Technology, General; TOP 070200 - Computer Information Systems; CIP 11.0101 - Computer and Information Sciences, General; CIP 11.0103 - Information Technology. Analysis of the last three years of TOP code data shows that, on average, 147 awards were conferred in the Central Valley/Mother Lode region each year (Exhibit 11).

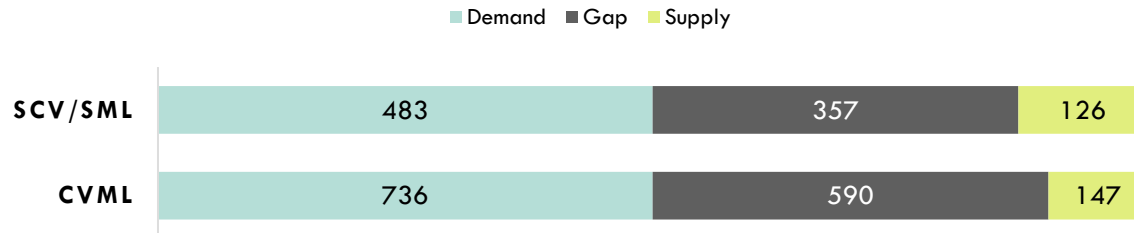
Exhibit 11. Postsecondary supply for Linux operating system certificate occupations in the region

TOP Title-Code	College	Associate Degree	Award 1<2 Academic Years	Cert. 12<18 Units	Cert. 18<30 Units	Cert. 30<60 Units	Cert. 6<18 Units	Subtotal
070100 - Information Technology, General	Modesto		1					1
	Porterville		1				3	3
	San Joaquin Delta					0		0
	Sequoias						0	0
070200 - Computer Information Systems	Bakersfield		2					2
	Cerro Coso		15			17	11	43
	Clovis					2		2
	Columbia		1					1
	Fresno City		6			0		6
	Merced		1					1
	Modesto		1					1
	Porterville		11				2	12
	Reedley College				14	8		22
	San Joaquin Delta		16					16
	Sequoias		6				3	8
Taft							2	2
11.0101 - Computer and Information Sciences, General	Milan Institute-Visalia			5				5
	Santa Barbara Business College-Bakersfield		11					11
11.0103 - Information Technology	San Joaquin Valley College-Visalia		2	7				10
TOTAL			73	13	14	27	15	147

Gap Analysis

There is an undersupply of 357 Linux operating system certificate workers in the SCV/SML subregion and 590 workers in the region (Exhibit 12).

Exhibit 12. Linux operating system certificate workforce annual demand and supply in the SCV/SML subregion and region



Student Outcomes

Exhibit 13 summarizes employment and wage outcomes from the California Community College Chancellor's Cal-PASS Plus LaunchBoard for the TOP codes related to a Linux operating system certificate. Across the region, 96 computer information systems students received a degree/certificate or attained apprenticeship journey status, and 28 transferred. By comparison, 753 information technology, general, students transferred. A median change in earnings was reported by 39% of information technology students, and by 12% of computer information systems students.

Exhibit 13. Regional metrics for the TOP code related to Linux operating system certificate

Metric	Information Technology, General-070100	Computer Information Systems-070200
Students Who Got a Degree or Certificate or Attained Apprenticeship Journey Status	*	96
Number of Students Who Transferred	753	28
Job Closely Related to Field of Study	65%	40%
Median Change in Earnings	39%	12%
Attained a Living Wage	57%	74%

* denotes data not available.

Conclusion

The entry-level wages of the three occupations exceed the SCV/SML subregion's average living wage. There were 3,575 job postings in the past six months for occupations related to Linux operating system certificate in the subregion. Analysis of skills and certification requirements in job postings indicates:

- The top baseline skill is communication, and the top specialized skill is SQL.
- The top software skill is SQL.
- The top certification is a security clearance.

There is an undersupply of trained workers, a shortage of 357 in the SCV/SML subregion and 590 in the region.

Recommendation

Based on these findings, it is recommended that Cerro Coso work with the ICT/DM Regional Director, the college's advisory board, and local industry in the expansion of programs to address the shortage of Linux operating system certificate in the region.

Appendix A: Methodology & Data Sources

Data Sources

Labor market and educational supply data compiled in this report derive from a variety of sources. Data were drawn from external sources, including the Economic Modeling Specialists, Inc., the California Community Colleges Chancellor's Office Management Information Systems Data Mart and the National Center for Educational Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS). Below is the summary of the data sources found in this study.

Data Type	Source
Labor Market Information/Population Estimates and Projections/Educational Attainment	Economic Modeling Specialists, Intl. (EMSI). EMSI occupational employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level EMSI earnings by industry: economicmodeling.com .
Typical Education Level and On-the-job Training	Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education and typical on-the-job training to each occupation for which BLS publishes projections data: https://www.bls.gov/emp/tables/educational-attainment.htm .
Labor Force, Employment and Unemployment Estimates	California Employment Development Department, Labor Market Information Division: labormarketinfo.edd.ca.gov .
Job Posting and Skills Data	Burning Glass: burning-glass.com/ .
Additional Education Requirements/ Employer Preferences	The O*NET Job Zone database includes over 900 occupations as well as information on skills, abilities, knowledge, work activities and interests associated with specific occupations: onetonline.org .

Key Terms and Concepts

Annual Job Openings: Annual openings are calculated by dividing the number of years in the projection period by total job openings.

Education Attainment Level: The highest education attainment level of workers age 25 years or older.

Employment Estimate: The total number of workers currently employed.

Employment Projections: Projections of employment are calculated by a proprietary Economic Modeling Specialists, Intl. (EMSI) formula that includes historical employment and economic indicators along with national, state, and local trends.

Living Wage: The cost of living in a specific community or region for one adult and no children. The cost increases with the addition of children.

Occupation: An occupation is a grouping of job titles that have a similar set of activities or tasks that employees perform.

Percent Change: Rate of growth or decline in the occupation for the projected period; this does not factor in replacement openings.

Replacements: Estimate of job openings resulting from workers retiring or otherwise permanently leaving an occupation. Workers entering an occupation often need training. These replacement needs, added to job openings due to growth, may be used to assess the minimum number of workers who will need to be trained for an occupation.

Total Job Openings (New + Replacements): Sum of projected growth (new jobs) and replacement needs. When an occupation is expected to lose jobs, or retain the current employment level, number of openings will equal replacements.

Typical Education Requirement: represents the typical education level most workers need to enter an occupation.

Typical On-The-Job Training: indicates the typical on-the-job training needed to attain competency in the skills needed in the occupation.