

March 2022

Labor Market Analysis

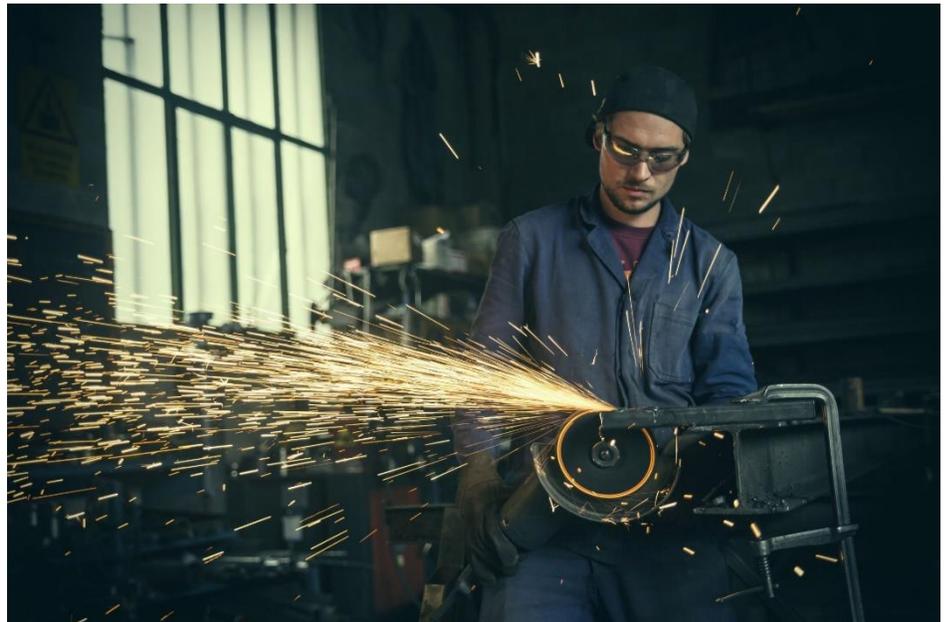
Machinist apprenticeship



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Prepared by the Central Valley/Mother Lode Center of Excellence

Table of Contents

- Summary 2
 - Key findings 2
- Introduction 3
- Occupational Demand 4
- Wages 4
- Job Postings 5
 - Salaries..... 5
 - Education..... 5
 - Baseline and Specialized Skills..... 6
 - Software Skills..... 6
 - Certifications..... 7
- Education, Work Experience & Training 8
- Supply 8
- Student Outcomes 9
- Conclusion 10
- Recommendation 10
- Appendix A: Methodology & Data Sources 11

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 machinist apprenticeship. Two occupations related to machinist apprenticeship were identified for Modesto College:

- 51-4041, Machinists
- 51-4111, Tool and Die Makers
- 51-9161, Computer Numerically Controlled Tool Operators
- 51-9162, Computer Numerically Controlled Tool Programmers

Key findings:

- **Occupational demand** — Nearly 1,070 workers were employed in jobs related to machinist apprenticeship in 2020 in the North Central Valley/Northern Mother Lode (NCV/NML) subregion. The largest occupation is machinists with 712 workers, a projected growth rate of 11% over the next five years, and 94 annual openings.
- **Wages** — Computer numerically controlled tool programmers earn the highest entry-level wage, \$22.80/hour in the subregion.
- **Employers** — Employers with the most job postings in the subregion are Fastenal Company, Advantage Metal Products, and Applied Aerospace Structures.
- **Occupational titles** — The most common occupational title in job postings in the subregion is machinists. The most common job title is machinist.
- **Skills and certifications** — The top baseline skill is physical abilities, the top specialized skill is machining, and the top software skill is Microsoft Office. The most in-demand certification is a driver's license.
- **Education** — A high school diploma or equivalent is typically required for machinists and computer numerically controlled tool operators. A postsecondary nondegree award is typically required for tool and die makers and computer numerically controlled tool programmers.
- **Supply** — Analysis of postsecondary completions shows that on average 63 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 139 trained workers in the subregion and 276 workers in the region. The Center of Excellence recommends that Modesto College work with the regional directors, the college's advisory board, and local industry in the expansion of programs to address the shortage of machinist apprenticeship workers in the region.

Introduction

The Central Valley/Mother Lode Center of Excellence was asked by Modesto College to provide labor market information for machinist apprenticeship. The geographical focus for this report is the North Central Valley/Northern Mother Lode (NCV/NML) 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 NCV/NML subregion is \$12.65/hour.¹ Analysis of the program and occupational data related to machinist apprenticeship resulted in the identification of applicable occupations. The Standard Occupational Classification (SOC) System codes and titles used in this report are:

- 51-4041, Machinists
- 51-4111, Tool and Die Makers
- 51-9161, Computer Numerically Controlled Tool Operators
- 51-9162, Computer Numerically Controlled Tool Programmers

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.

Machinists

Job Description: Set up and operate a variety of machine tools to produce precision parts and instruments out of metal. Includes precision instrument makers who fabricate, modify, or repair mechanical instruments. May also fabricate and modify parts to make or repair machine tools or maintain industrial machines, applying knowledge of mechanics, mathematics, metal properties, layout, and machining procedures.

Knowledge: Mathematics, Mechanical, Production and Processing, Design

Skills: Operation and Control, Critical Thinking, Monitoring, Operations Monitoring, Active Listening

Tool and Die Makers

Job Description: Analyze specifications, lay out metal stock, set up and operate machine tools, and fit and assemble parts to make and repair dies, cutting tools, jigs, fixtures, gauges, and machinists' hand tools.

Knowledge: Mechanical, Mathematics, Production and Processing, Design, English Language

Skills: Operation and Control, Operations Monitoring, Quality Control Analysis, Critical Thinking, Equipment Selection

Computer Numerically Controlled Tool Operators

Job Description: Operate computer-controlled tools, machines, or robots to machine or process parts, tools, or other work pieces made of metal, plastic, wood, stone, or other materials. May also set up and maintain equipment.

Knowledge: Mechanical, Mathematics, Design, Computer and Electronics, Engineering and Technology

Skills: Operations Monitoring, Monitoring, Quality Control Analysis, Critical Thinking, Operations and Control

Computer Numerically Controlled Tool Programmers

Job Description: Develop programs to control machining or processing of materials by automatic machine tools, equipment, or systems. May also set up, operate, or maintain equipment.

Knowledge: Computers and Electronics, Mechanical, Mathematics, Production and Processing, Design

Skills: Programming, Monitoring, Operations Monitoring, Active Learning, Complex Problem Solving

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 NCV/NML subregion employed 1,066 workers in machinist apprenticeship occupations in 2020 (Exhibit 1). The largest occupation is machinists with 712 workers in 2020. This occupation is projected to grow by 11% over the next five years and has the greatest number of projected annual openings, 94.

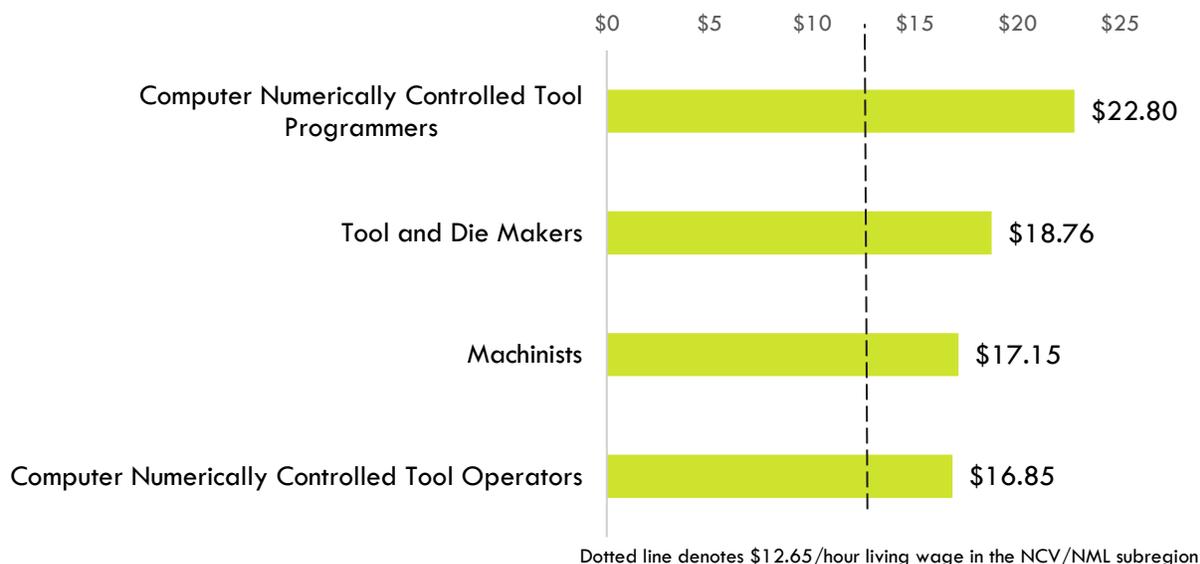
Exhibit 1. Machinist apprenticeship employment and occupational projections in the NCV/NML subregion

Occupation	2020 Jobs	2025 Jobs	5-Year Change	5-Year % Change	Annual Openings
Machinists	712	794	82	11%	94
Computer Numerically Controlled Tool Operators	233	253	20	8%	31
Tool and Die Makers	74	83	9	12%	10
Computer Numerically Controlled Tool Programmers	47	57	10	21%	7
TOTAL	1,066	1,187	121	11%	142

Wages

Exhibit 2 shows the entry-level hourly wages of the machinist apprenticeship occupations. Computer numerically controlled tool programmers earn the highest entry-level wage, \$22.80/hour in the subregion².

Exhibit 2. Machinist apprenticeship entry-level wages in the NCV/NML subregion



² Entry-level wages are derived from the 25th percentile

Job Postings

There were 47 job postings for the two occupations in the NCV/NML subregion from September 2021 to February 2022.³ The employers with the most job postings are listed in Exhibit 3.

Exhibit 3. Top employers of machinist apprenticeship by number of job postings

Employer	Job Postings	% Job Postings
Fastenal Company	4	15%
Advantage Metal Products	2	7%
Applied Aerospace Structures	2	7%
Pace Supply Corporation	2	7%
Thermalpress	2	7%
Wartsila	2	7%
Alc Group	1	4%
Burhoe Machine Works	1	4%
Cepheid	1	4%
Container Graphics Corporation	1	4%

Exhibit 4 shows how job postings for the targeted occupations in the NCV/NML subregion are distributed across two O*NET OnLine occupations. The occupational title machinists is listed in 45 job postings. Note how this occupational title dominates the job posting results. Common job titles in postings include Machinist in nine job postings, Cnc Machinist in five job postings, and Production Machinist 2nd in four job postings.

Exhibit 4. Top occupational titles in job postings for machinist apprenticeship

Occupational Title	Job Postings	% of Job Postings
Machinists	45	96%
Tool and Die Makers	2	4%

Salaries

Exhibit 5 shows the “Market Salaries” for machinist apprenticeship 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 machinist apprenticeship occupations

Market Salary Percentile	Salary Amount
10th Percentile	\$30,623
25th Percentile	\$31,717
50th Percentile	\$36,422
75th Percentile	\$44,100
90th Percentile	\$55,344

Education

³ Other than occupation titles and job titles, the categories below can be counted one or multiple times per job posting, and across several areas in a single posting. For example, a skill can be counted in two different skill types, and an employer can indicate more than one education level.

Of the 47 job postings, 25 listed an education level preferred for the positions being filled. Among those, 96% requested high school or vocational training, and 20% requested an associate degree (Exhibit 6). A job posting can indicate more than one education level. Hence, the percentages shown in the chart below may total more than 100%.

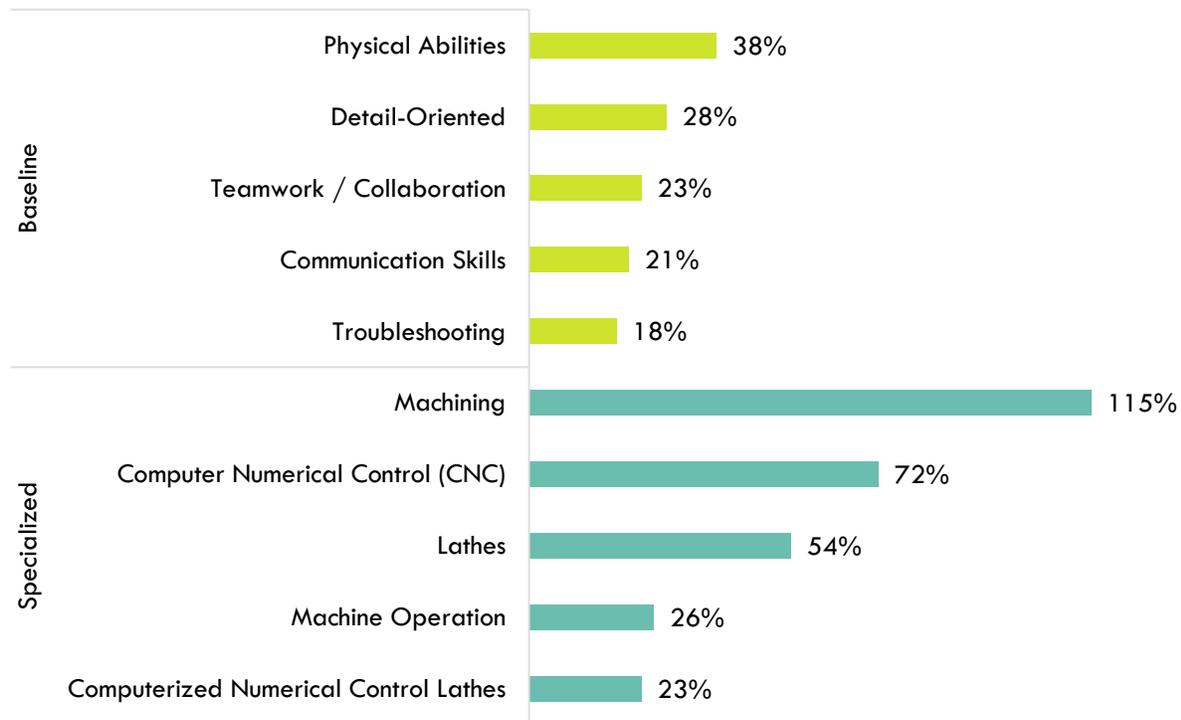
Exhibit 6. Education levels requested in job postings for machinist apprenticeship

Education Level	Job Postings	% of Job Postings
High school or vocational training	24	96%
Associate's degree	5	20%

Baseline and Specialized Skills

Exhibit 7 depicts the top baseline and specialized skills for the targeted occupations. The three most important baseline skills are physical abilities, 38% of job postings, detail-orientated, 28%, and teamwork / collaboration, 23%. The top three specialized skills are machining, 115% of job postings, computer numerical control (CNC), 72%, and lathes, 54%.

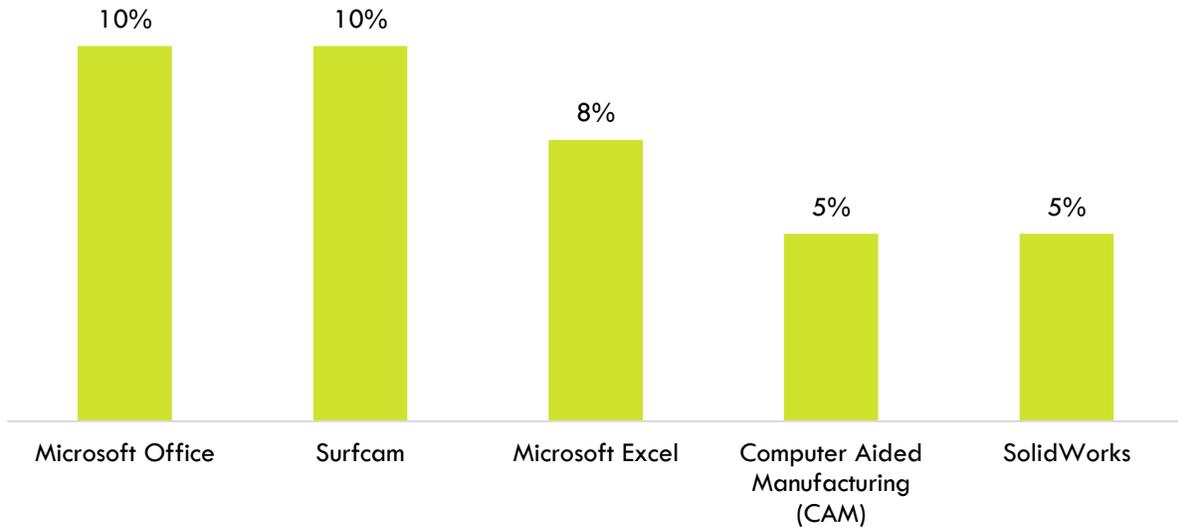
Exhibit 7. In-demand machinist apprenticeship baseline and specialized skills



Software Skills

Analysis also included the software skills most in demand by employers. Microsoft Office and Surfcam were the top two software skills identified in job postings (Exhibit 8).

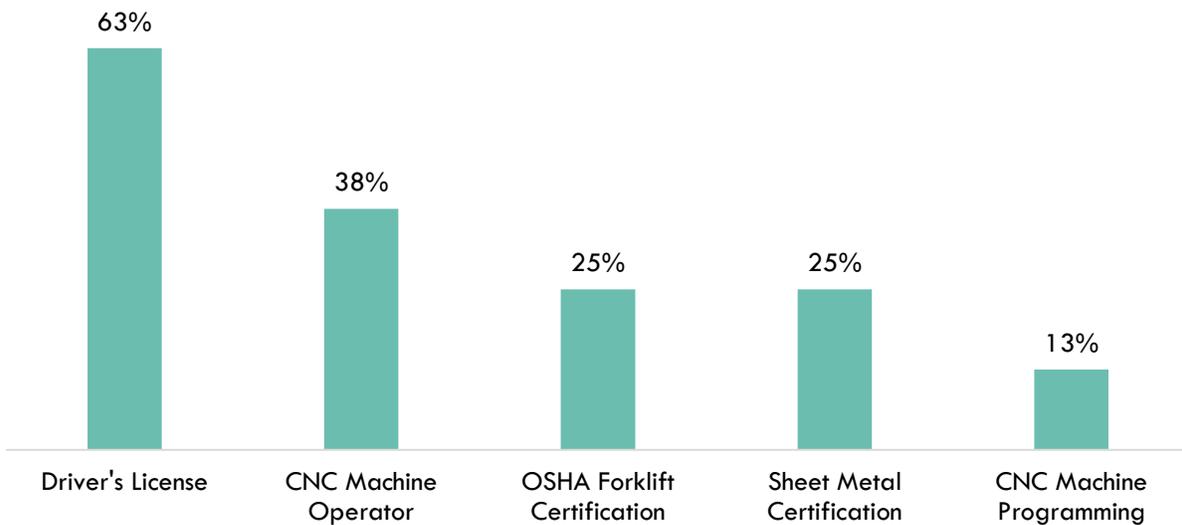
Exhibit 8. In-demand machinist apprenticeship software skills



Certifications

Of the 47 job postings, 8 contained certification data. Among those, 63% indicated a need for a driver's license. The next top certifications are a CNC machine operator and OSHA forklift certification (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 machinist apprenticeship certifications requested in job postings



Education, Work Experience & Training

A high school diploma or equivalent is typically required for machinists and computer numerically controlled tool operators. A postsecondary nondegree award is typically required for tool and die makers and computer numerically controlled tool programmers (Exhibit 10).

Exhibit 10. Education, work experience, training, and Current Population Survey results for machinist apprenticeship occupations⁴

Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training	CPS
Machinists	High school diploma or equivalent	None	Long-term	41.2%
Computer Numerically Controlled Tool Operators	High school diploma or equivalent	None	Moderate-term	42.5%
Tool and Die Makers	Postsecondary nondegree award	None	Long-term	48.4%
Computer Numerically Controlled Tool Programmers	Postsecondary nondegree award	None	Moderate-term	42.5%

Supply

Analysis of program data from the California Community Colleges Chancellor's Office Data Mart included the TOP code and title: 095630 - Machining and Machine Tools. Analysis of the last three years of data shows that, on average, 63 awards were conferred in the Central Valley/Mother Lode region each year (Exhibit 11).

Exhibit 11. Postsecondary supply for machinist apprenticeship occupations in the region

TOP/CIP Code- Title	College	Associate Degree	Certificate 12 < 18 Semester Units	Certificate 16 < 30 Semester Units	Certificate 18 < 30 Semester Units	Certificate 30 < 60 Semester Units	Certificate 6 < 18 Semester Units	Subtotal
095630 - Machining and Machine Tools	Bakersfield						31	31
	Modesto	1	2	0		1	1	5
	Reedley College	3		8	5	7		24
	San Joaquin Delta	1			2	0		3
TOTAL		6	2	9	7	8	32	63

⁴ "Labor Force Statistics from the Current Population Survey," Bureau of Labor Statistics, <https://www.bls.gov/cps/>.

There is an undersupply of 95 machinist apprenticeship workers in the NCV/NML subregion and 193 workers in the region (Exhibit 12).

Exhibit 12. Machinist apprenticeship workforce demand (annual job openings), postsecondary supply of students (awards), and additional students needed to fill gap in the NCV/NML 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 code related to machinist apprenticeship. Of note, 12 machining and machine tools students received a degree or certificate or attained apprenticeship journey status; 75% of students obtained a job closely related to their field of study; 36% had a median change in earnings; and 78% of students attained a living wage.

Exhibit 13. Subregional metrics for the TOP code related to machinist apprenticeship

Metric	Machining and Machine Tools 095630
Students Who Got a Degree or Certificate or Attained apprenticeship Journey Status	12
Number of Students Who Transferred	*
Job Closely Related to Field of Study	75%
Median Change in Earnings	36%
Attained a Living Wage	78%
* denotes data not available.	

Conclusion

The entry-level wages of the four occupations exceed the NCV/NML subregion's average living wage. There were 47 job postings in the past six months for occupations related to machinist apprenticeship in the subregion. Analysis of skills and certification requirements in job postings indicates:

- The top baseline skill is physical abilities, and the top specialized skill is machining.
- The top software skill is Microsoft Office.
- The top certification is a driver's license.

There is an undersupply of trained workers, a shortage of 139 in the NCV/NML subregion and 276 in the region.

Recommendation

Based on these findings, it is recommended that Modesto College work with the regional directors, the college's advisory board, and local industry in the expansion of programs to address the shortage of machinist apprenticeship workers 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.