C·O·E CENTERS OF EXCELLENCE FOR LABOR MARKET RESEARCH

Computer Software Development

Labor Market Analysis for San Diego College of Continuing Education

September 2021

Summary

NEW PROGRAM RECOMMENDATION?	EVIDENCE OF A SUPPLY GAP?	AT OR ABOVE THE LIVING WAGE?	EXPECTED EDUCATION FOR MAJORITY OF OCCUPATIONS ANALYZED
Proceed with New Program	☑	☑	☑ Bachelor's Degree+ ☐ Associate Degree ☐ Some College or Certificate ☐ HS Diploma or Equivalent ☐ Less than a HS Diploma ☐ Apprenticeship
SUPPORT FOR PROGRAM MODIFICATION?	NUMBER OF INSTITUTIONS THAT PROVIDE TRAINING	NUMBER OF ANNUAL JOB OPENINGS	
☑	LOW	HIGH	

This report provides labor market information for occupations selected by San Diego College of Continuing Education for its *Computer Software Development* program. These occupations include "Computer Network Support Specialists," "Computer Programmers," "Software Developers and Software Quality Assurance Analysts and Testers," and "Web Developers and Digital Interface Designers." According to available labor market information, *Computer Software Development Occupations* in San Diego County have a labor market demand of 2,272 annual job openings (while average demand for a single occupation in San Diego County is 242 annual job openings). On average, one institution supplies 30 for-credit awards and no institution supplies noncredit awards in San Diego County for these occupations. In short, the region supplies 30 for-credit and noncredit awards for 2,272 annual job openings, suggesting that there is a supply gap in the labor market. Entry-level and median wages for these occupations are above the living wage. This brief recommends proceeding with a new program or program modification because 1) there is a supply gap; and 2) entry-level and median wages are above the living wage. The college should note that **the typical entry-level education for these occupations is a bachelor's degree**.

Introduction

This report provides labor market information in San Diego County for occupations related to the six-digit Taxonomy of Programs (TOP)[1] code, Computer Software Development (TOP 0707.00). The purpose of this brief is to assist noncredit program providers in the region, such as San Diego College of Continuing Education (SDCCE), with program development and review. SDCCE identified the following occupational codes from the Standard Occupational Classification (SOC)[2] system for *Computer Software Development*, which will be the focus of this report:

- **Computer Network Support Specialists** (SOC 15-1231): Analyze, test, troubleshoot, and evaluate existing network systems, such as local area networks (LAN), wide area networks (WAN), cloud networks, servers, and other data communications networks. Perform network maintenance to ensure networks operate correctly with minimal interruption.
- **Computer Programmers** (SOC 15-1251): Create, modify, and test the code and scripts that allow computer applications to run. Work from specifications drawn up by software and web developers or other individuals. May develop and write computer programs to store, locate, and retrieve specific documents, data, and information.
- **Software Developers and Software Quality Assurance Analysts and Testers** (SOC 15-1256): Research, design, and develop computer and network software or specialized utility programs. Analyze user needs and develop software solutions, applying principles and techniques of computer science, engineering, and mathematical analysis. Update software or enhance existing software capabilities. May work with computer hardware engineers to integrate hardware and software systems, and develop specifications and performance requirements. May maintain databases within an application area, working individually or coordinating database development as part of a team. Develop and execute software tests to identify software problems and their causes. Test system modifications to prepare for implementation. Document software and application defects using a bug tracking system and report defects to software or web developers. Create and maintain databases of known defects. May participate in software design reviews to provide input on functional requirements, operational characteristics, product designs, and schedules.

[1] Taxonomy of Programs (TOP) is a system of codes used by the California Community Colleges for the purpose of collecting, calculating, or disseminating data about similar training programs.
[2] The Standard Occupational Classification (SOC) system is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating or disseminating data. bls.gov/soc.

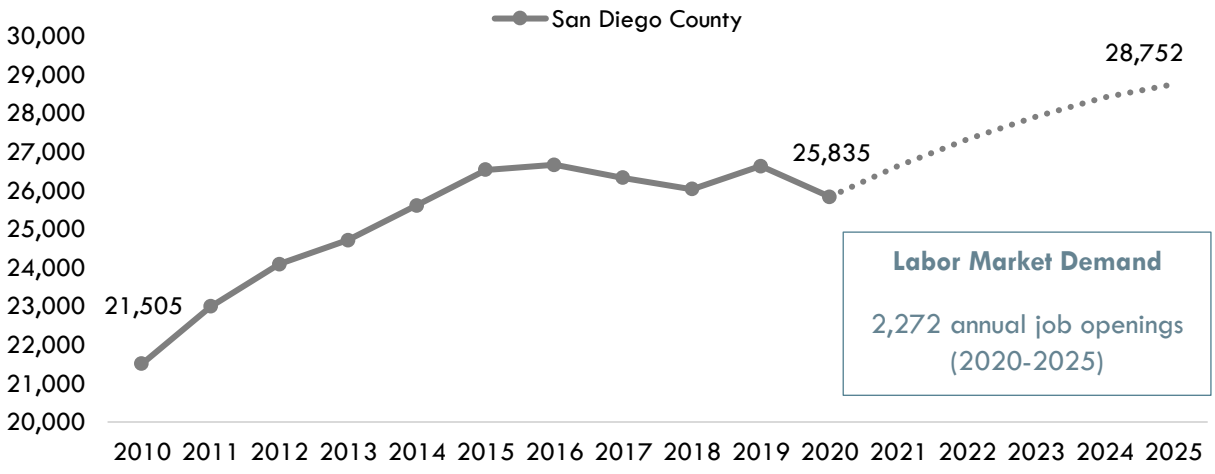
- **Web Developers and Digital Interface Designers** (SOC 15-1257): Develop and implement websites, web applications, application databases, and interactive web interfaces. Evaluate code to ensure that it is properly structured, meets industry standards, and is compatible with browsers and devices. Optimize website performance, scalability, and server-side code and processes. May develop website infrastructure and integrate websites with other computer applications. Design digital user interfaces or websites. Develop and test layouts, interfaces, functionality, and navigation menus to ensure compatibility and usability across browsers or devices. May use web framework applications as well as client-side code and processes. May evaluate web design following web and accessibility standards, and may analyze web use metrics and optimize websites for marketability and search engine ranking. May design and test interfaces that facilitate the human-computer interaction and maximize the usability of digital devices, websites, and software with a focus on aesthetics and design. May create graphics used in websites and manage website content and links.

For the purpose of this report, these occupations are referred to as *Computer Software Development Occupations*.

Projected Occupational Demand

Between 2020 and 2025, *Computer Software Development Occupations* are projected to increase by 2,917 net jobs or 11 percent (Exhibit 1a). Employers in San Diego County will need to hire 2,272 workers annually to fill new jobs and backfill jobs due to attrition caused by turnover and retirement, for example.

Exhibit 1a: Number of Jobs for *Computer Software Development Occupations* (2010-2025)[3]



[3] EMSI 2021.2; QCEW, Non-QCEW, Self-Employed.

Exhibit 1b disaggregates the projected number of jobs change by occupation. "Software Developers and Software Quality Assurance Analysts and Testers" are projected to have the most labor market demand between 2020 and 2025, with 1,831 annual job openings.

Exhibit 1b: Number of Jobs for *Computer Software Development Occupations* in San Diego County (2020-2025)[4]

Occupational Title	2020 Jobs	2025 Jobs	2020 - 2025 Net Jobs Change	2020-2025 % Net Jobs Change	Annual Job Openings (Demand)
Software Developers and Software Quality Assurance Analysts and Testers	19,936	22,622	2,686	13%	1,831
Web Developers and Digital Interface Designers	2,261	2,398	137	6%	181
Computer Programmers	2,300	2,278	-22	-1%	143
Computer Network Support Specialists	1,338	1,454	116	9%	117
Total	25,835	28,752	2,917	11%	2,272

Earnings

Exhibit 2a disaggregates hourly earnings by occupation. The entry-level hourly earnings for C*omputer Software Development Occupations* range from $22.39 to $44.63.

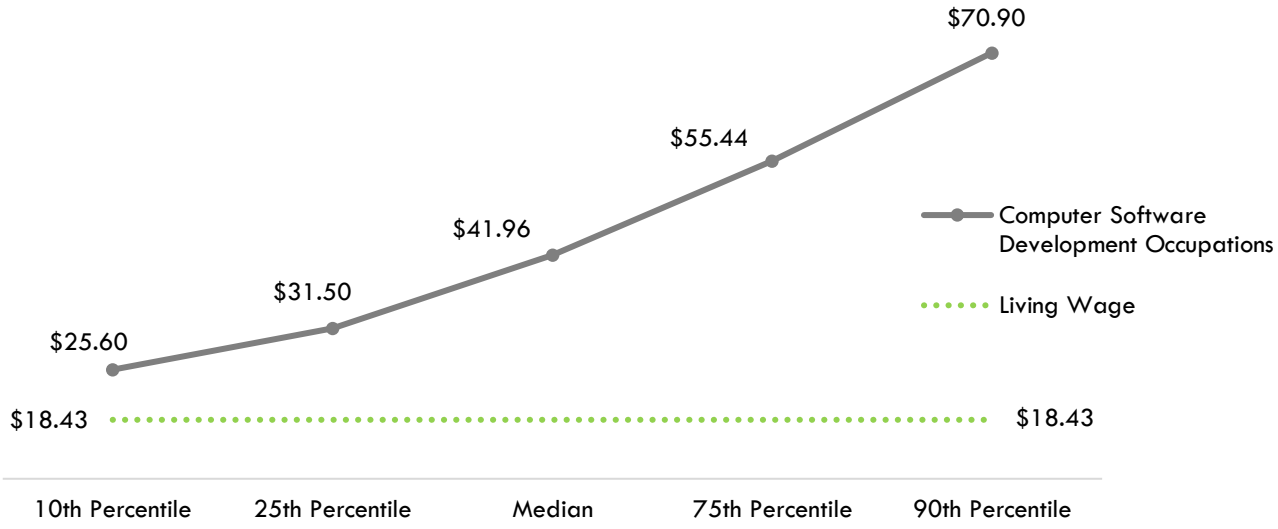
Exhibit 2a: Hourly Earnings for *Computer Software Development Occupations* in San Diego County[5]

Occupational Title	Entry-Level Hourly Earnings (25th Percentile)	Median Hourly Earnings	Experienced Hourly Earnings (75th Percentile)
Software Developers and Software Quality Assurance Analysts and Testers	$44.63	$56.99	$70.49
Computer Programmers	$35.05	$45.21	$60.65
Computer Network Support Specialists	$23.95	$31.84	$44.66
Web Developers and Digital Interface Designers	$22.39	$33.79	$45.99

[4] EMSI 2021.2; QCEW, Non-QCEW, Self-Employed.
[5] EMSI 2021.2; QCEW, Non-QCEW, Self-Employed.

On average, the entry-level hourly earnings for *Computer Software Development Occupations* are $31.50; this is more than the living wage for a single adult in San Diego County, which is $18.43 per hour (Exhibit 2b).[6]

Exhibit 2b: Average Hourly Earnings[7] for *Computer Software Development Occupations* in San Diego County[8]



Educational Supply

Educational supply for an occupation can be estimated by analyzing the number of awards in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes.[9] According to TOP and CIP[10] data, one community college supplies the region with for-credit awards for Computer Software Development (TOP 0707.00): Palomar College (Exhibit 3a).

[6] "Family Needs Calculator (formerly the California Family Needs Calculator)," Insight: Center for Community Economic Development, last updated 2021. insightcced.org/family-needs-calculator/.
[7] 10th and 25th percentiles could be considered entry-level wages, and 75th and 90th percentiles could be considered experienced wages for individuals who may have been in the occupation longer, received more training than others, etc.
[8] EMSI 2021.2; QCEW, Non-QCEW, Self-Employed.
[9] TOP data comes from the California Community Colleges Chancellor's Office MIS Data Mart (datamart.cccco.edu) and CIP data comes from the Integrated Postsecondary Education Data System (nces.ed.gov/ipeds/use-the-data).
[10] There are two CIP codes related to Computer Software Development (TOP 0707.00): Computer Programming/Programmer, General (CIP 11.0201) and Computer Software Technology/Technician (CIP 15.1204).

Exhibit 3a: Number of For-Credit Awards (Certificates and Degrees) Conferred by Postsecondary Institutions (Program Years 2017-18 through 2019-20)

College	Award Type	PY 17-18	PY 18-19	PY 19-20	3-Yr Total Average
Palomar	Associate Degree	13	20	0	11
	Certificate 30 to < 60 units	21	20	17	19
	Total	**34**	**40**	**17**	**30**

Note: The numbers may not add up exactly due to rounding.

By for-credit award type, the college supplied the most awards for certificates 30 to < 60 units based on the three-year average (program years 2017-18 through 2019-20) (Exhibit 3b).

Exhibit 3b: Total Number of For-credit Awards by Type for Computer Software Development (TOP 0707.00) in San Diego County (3-Yr Average)

In terms of noncredit awards, San Diego College of Continuing Education does not provide any noncredit awards for Computer Software Development (TOP 0707.00), with a three-year average of zero noncredit awards (program years 2017-18 through 2019-20) (Exhibit 4).

Exhibit 4: Number of Noncredit Awards Conferred by SDCCE (Program Years 2017-18 through 2019-20)

Program Title	Award Type	PY 17-18	PY 18-19	PY 19-20	3-Yr Total Average
Python Program	Noncredit	0	0	0	0
Data Management with Python	Noncredit	0	0	0	0
	Total	**0**	**0**	**0**	**0**

Demand vs. Supply

Comparing labor demand (annual openings) with labor supply[11] suggests that there is a supply gap in San Diego County, with 2,272 annual openings and 30 for-credit and noncredit awards supplied by the region (Exhibit 5).

Exhibit 5: Labor Demand (Annual Openings) Compared with Labor Supply (Average Annual Awards)

TOP6 Program	**Demand** (Annual Openings)	**Supply** (Total Annual Average Supply)		**Supply Gap or Oversupply**
		Noncredit	For-Credit	
Computer Software Development (TOP 0707.00)	2,272	0	30	**2,242**

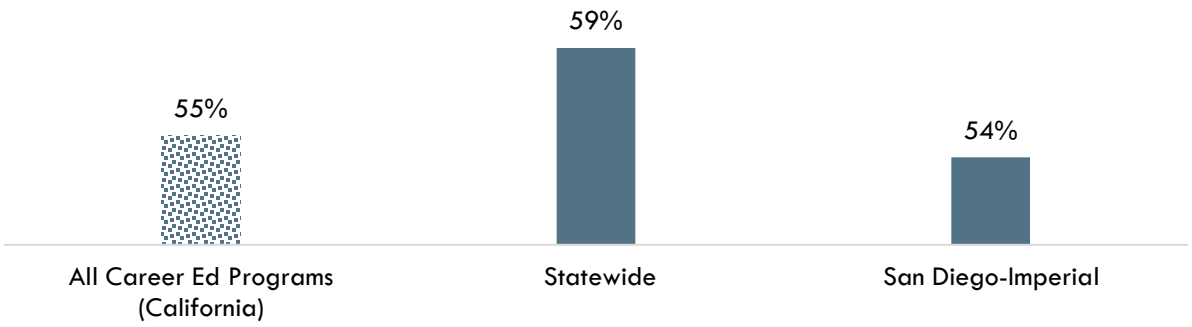
Please note: This is a basic analysis of supply and demand of labor. The data does not include workers currently in the labor force who could fill these positions or workers who are not captured by publicly available data. This data should be used to discuss the potential gaps or oversupply of workers; however, it should not be the only basis for determining whether or not a program should be developed.

[11] Labor supply can be found from two different sources: EMSI or the California Community Colleges Chancellor's Office MIS Data Mart. EMSI uses CIP codes while MIS uses TOP codes. Different coding systems result in differences in the supply numbers.

Student Outcomes and Regional Comparisons

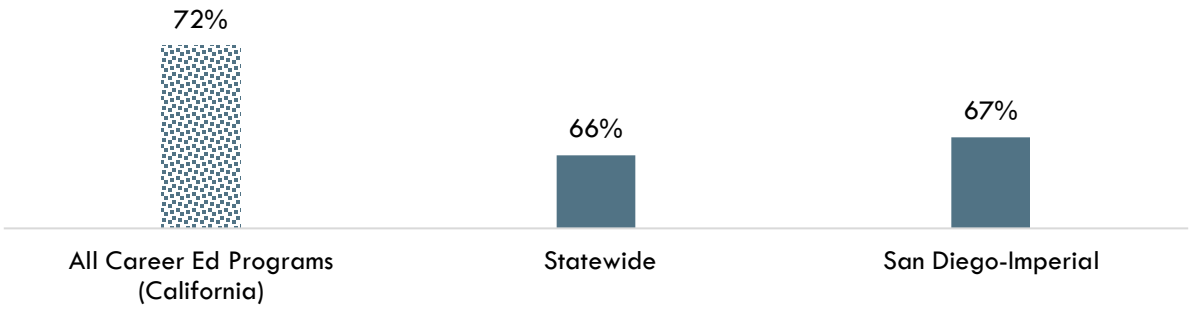
According to the California Community Colleges LaunchBoard, 54 percent of students in the San Diego-Imperial region earned a living wage after completing a Computer Software Development (0707.00) program, compared to 59 percent statewide and 55 percent of students in Career Education programs in general across the state (Exhibit 6a).[12]

Exhibit 6a: Percentage of Students Who Earned a Living Wage by Program (Computer Software Development, PY 2017-18)[13]



According to the California Community Colleges LaunchBoard, 67 percent of students in the San Diego-Imperial region obtained a job closely related to their field of study after completing a Computer Software Development (0707.00) program, compared to 66 percent statewide and 72 percent of students in Career Education programs in general across the state (Exhibit 6b).[14]

Exhibit 6b: Percentage of Students in a Job Closely Related to Field of Study by Program (Computer Software Development, PY 2016-17)[15]

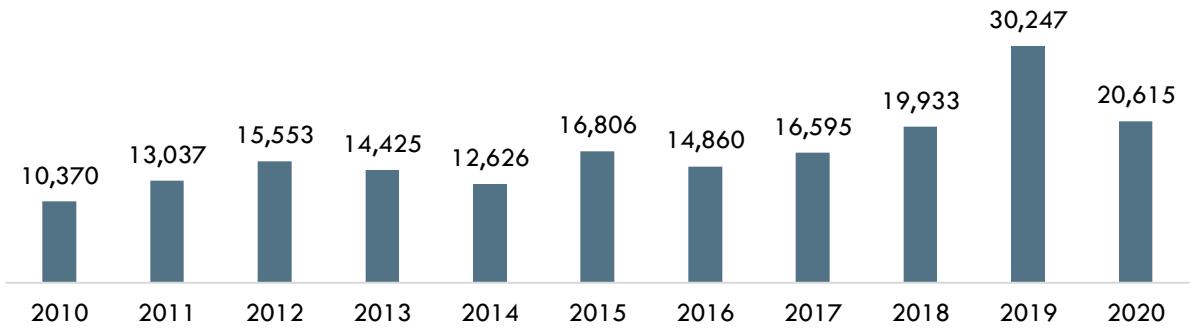


[12] "California Community Colleges Strong Workforce Program," California Community Colleges, calpassplus.org/LaunchBoard/SWP.aspx.
[13] Among completers and skills builders who exited, the proportion of students who attained a living wage.
[14] "California Community Colleges Strong Workforce Program," California Community Colleges, calpassplus.org/LaunchBoard/SWP.aspx.
[15] Most recent year with available data is Program Year 2016-17. Percentage of Students in a Job Closely Related to Field of Study: Among students who responded to the CTEOS, the percentage reporting employment in the same or similar field as their program of study.

Online Job Postings

This report analyzes not only historical and projected (traditional LMI) data, but also recent data from online job postings (real-time LMI). Online job postings may provide additional insight about recent changes in the labor market that are not captured by historical data. Between 2010 and 2020, there was an average of 16,824 online job postings per year for *Computer Software Development Occupations* in San Diego County (Exhibit 7). Please note that online job postings do **not** equal labor market demand; demand is represented by annual job openings (see Exhibit 1b). Employers may post a position multiple times for various reasons, such as increasing the pool of applicants, for example.

Exhibit 7: Number of Online Job Postings for *Computer Software Development Occupations* in San Diego County (2010-2020)[16]



Top Employers

Between January 1, 2018 and December 31, 2020, the top five employers in San Diego County for *Computer Software Development Occupations* were Qualcomm, Northrop Grumman, Intuit, General Atomics, and Teradata Operations based on online job postings (Exhibit 8).

Exhibit 8: Top Employers for *Computer Software Development Occupations* in San Diego County[17]

Top Employers	
• Qualcomm	• ServiceNow
• Northrop Grumman	• University of California San Diego
• Intuit	• Booz Allen Hamilton Inc.
• General Atomics	• Viasat
• Teradata Operations, Inc.	• CACI

[16] Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2010-2020.
[17] Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2018-2020.

Education, Skills, and Certifications

Computer Software Development Occupations have a national educational attainment ranging from an associate degree to a bachelor's degree (Exhibit 9a).

Exhibit 9a: National Educational Attainment for *Computer Software Development Occupations*[18]

Occupational Title	Typical Entry-Level Education
Software Developers and Software Quality Assurance Analysts and Testers	Bachelor's degree
Computer Programmers	Bachelor's degree
Computer Network Support Specialists	Associate degree
Web Developers and Digital Interface Designers	Associate degree

Based on online job postings between January 1, 2018 and December 31, 2020 in San Diego County, employers posted a bachelor's degree as the educational requirement for *Computer Software Development Occupations* (Exhibit 9b).[19]

Exhibit 9b: Educational Requirements for *Computer Software Development Occupations* in San Diego County[20]

*may not total 100 percent due to rounding

[18] EMSI 2021.2; QCEW, Non-QCEW, Self-Employed.
[19] Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2018-2020.
[20] "Educational Attainment for Workers 25 Years and Older by Detailed Occupation," Bureau of Labor Statistics, last modified April 9, 2021. bls.gov/emp/tables/educational-attainment.htm.

Exhibit 10 lists the top specialized, soft, and software skills that appeared in online job postings between January 1, 2018 and December 31, 2020.

Exhibit 10: Top Skills for *Computer Software Development Occupations* in San Diego County[21]

Specialized Skills	Soft Skills	Software Skills
• Software Engineering • Software Development • Object-Oriented Analysis and Design • Scrum • Debugging • Unit Testing • Agile Development • DevOps • Web Application Development • Software Architecture • Project Management • Web Development • Computer Engineering • Information Systems • Quality Assurance and Control	• Communication Skills • Teamwork / Collaboration • Problem Solving • Troubleshooting • Writing • Planning • Research • Creativity • Written Communication • Detail-Oriented • Organizational Skills • Verbal / Oral Communication • Mentoring • Self-Starter • Multi-Tasking	• Java • JavaScript • SQL • Python • Linux • C++ • Git • Microsoft C# • Scrum • .NET • Extensible Markup Language • AngularJS • jQuery • Oracle • MySQL

[21] Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2018-2020.

Exhibit 11 lists the top certifications that appeared in online job postings between January 1, 2018 and December 31, 2020.

Exhibit 11: Top Certifications for *Computer Software Development Occupations* in San Diego County[22]

Top Certifications in Online Job Postings
1. Security Clearance
2. CompTIA Security+
3. IT Infrastructure Library (ITIL) Certification
4. Certified Information Systems Security Professional (CISSP)
5. Cisco Certified Network Associate (CCNA)
6. Project Management Certification
7. SANS/GIAC Certification
8. Cisco Certified Network Professional (CCNP)
9. Certified Salesforce Platform Developer
10. CompTIA Linux+
11. Microsoft Certified Solutions Associate (MCSA)
12. Microsoft Certified Solutions Expert (MCSE)
13. Systems Security Certified Practitioner (SSCP)
14. Project Management Professional (PMP)
15. CompTIA Network+

[22] Burning Glass Technologies, "Labor Insight Real-Time Labor Market Information Tool." 2018-2020.

Prepared by:
Tina Ngo Bartel, Director (tngobartel@miracosta.edu)
John Edwards, Research Analyst (jedwards@miracosta.edu)
Priscilla Fernandez, Research Analyst (pfernandez@miracosta.edu)
San Diego-Imperial Center of Excellence for Labor Market Research

Important Disclaimers

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. This study examines the most recent data available at the time of the analysis; however, data sets are updated regularly and may not be consistent with previous reports. Efforts have been made to qualify and validate the accuracy of the data and the report findings; however, neither the Centers of Excellence for Labor Market Research (COE), COE host district, nor California Community Colleges Chancellor's Office are responsible for the applications or decisions made by individuals and/or organizations based on this study or its recommendations.

This workforce demand report uses state and federal job projection data that was developed before the economic impact of COVID-19. The COE is monitoring the situation and will provide more information as it becomes available. Please consult with local employers to understand their current employment needs.