Labor Market Analysis for Program Recommendation: 0707.10/Computer Programming (C++ *Programming Certificate of Achievement*) (Java *Programming Certificate of Achievement*) (Python *Programming Certificate of Achievement*)

Orange County Center of Excellence, October 2023

Summary

Program LMI Endorsement	Endorsed: All LMI Criteria Met	☒	Endorsed: Some LMI Criteria Met	☐	Not LMI Endorsed	☐

Program LMI Endorsement Criteria		
Supply Gap:	Yes ☑	No ☐
	Comments: There is projected to be **808 middle-skill annual job openings** throughout Los Angeles and Orange counties for these occupations, **which is more than the 99 awards conferred by educational institutions.**	
Living Wage: (Entry-Level, 25th)	Yes ☑	No ☐
	Comments: **Typical entry-level wages** for *web and digital interface designers* are $25.00, **which is above the OC living wage of $20.63.**	
Education:	Yes ☑	No ☐
	Comments: The typical entry-level education for *web and digital interface designers* is a **bachelor's degree. However, a significant percentage of workers in the field have completed some college or an associate degree as their highest level of education.**	

Emerging Occupation(s)	
Yes ☐	*No* ☑
Comments: N/A	

The Orange County Center of Excellence for Labor Market Research (OC COE) prepared this report to determine whether there is a supply gap in the Los Angeles/Orange County regional labor market related to four occupations that are most closely related to computer programming:

- Middle-Skill
  - Web and Digital Interface Designers (15-1255)
- Above Middle-Skill – denoted with an asterisk (*) throughout this report.
  - Computer Programmers (15-1251)*
  - Software Developers (15-1252)*
  - Software Quality Assurance Analysts and Testers (15-1253)*

Middle-skill occupations typically require a community college education while above middle-skill occupations typically require at least a bachelor's degree. Currently, these Standard Occupational Classification (SOC) codes are those that are most closely related to computer programming, which utilizes programming languages such as Java, Python, and C++ to create code and scripts that allow computer and software applications to run.

Based on the available data, there appears to be a supply gap for *web and digital interface designers* in the region, typical entry-level wages are above the living wage, and typical education requirements align with a community college education. **Therefore, due to all of the regional labor market criteria being met, the COE endorses this proposed program.**

Exhibit 1 lists the occupational demand, supply, typical entry-level education, and educational attainment for the occupations included in this report.

Exhibit 1: Labor Market Endorsement Summary

Occupation (SOC)	Demand (Annual Openings)	Supply (CC and Non-CC)	Entry-Level Hourly Earnings (25th Percentile)	Typical Entry-Level Education	Community College Educational Attainment
Web and Digital Interface Designers (15-1255)	LA: 604	LA: 62	$25.00	Bachelor's degree	25%
	OC: 204	OC: 37			
	TTL: 808	*TTL: 99*			
Middle-Skill Total	**808**	**99**	**N/A**	**N/A**	**N/A**
Computer Programmers (15-1251)	LA: 245	LA: *Accounted for Below*	OC: $33.54	Bachelor's degree	20%
	OC: 112	OC: *Accounted for Below*			
	TTL: 357	*TTL: Accounted for Below*			
Software Developers (15-1252)	LA: 3,480	LA: 3,170	OC: $50.42	Bachelor's degree	12%
	OC: 1,649	OC: 1,805			
	TTL: 5,128	*TTL: 4,325*			
Software Quality Assurance Analysts and Testers (15-1253)	LA: 401	LA: *Accounted for Above*	OC: $37.59	Bachelor's degree	12%
	OC: 200	OC: *Accounted for Above*			
	TTL: 601	*TTL: Accounted for Above*			
Above Middle-Skill Total	**6,086**	**4,975**	**N/A**	**N/A**	**N/A**
Total	**6,894**	**5,074**	**N/A**	**N/A**	**N/A**

Demand:

- The number of jobs related to *web and digital interface designers* is projected to increase 11% through 2027, equating to 808 annual job openings.
- Hourly entry-level wages for *web and digital interface designers* are $25.00 in Orange County, which is above the living wage.

- There were 40,623 online job postings related to these computer programming occupations over the past 12 months. Of those, 3% (1,197) were for *web and digital interface designers*. The highest number of postings for this occupation were content creators, concept artists, and gameplay engineers.
- The typical entry-level education for these computer programming occupations is a bachelor's degree.
- Approximately 25% of workers in the field have completed some college or an associate degree as their highest level of education.

Supply:

- There was an average of 1,569 awards conferred by 28 community colleges in Los Angeles and Orange Counties from 2019 to 2022. Of those, 6% (99) were for *web and digital interface designers*.
    - Though a majority of these community college programs are most closely related to the above middle-skill computer programming occupations in this report, it is important to note that they train for a variety of occupations, including middle-skill occupations. However, these above middle-skill computer programming-related occupations have high education requirements and employers typically require more than a community college education for these occupations. For these reasons, community college supply is overstated.
- Non-community college institutions conferred an average of 3,505 awards from 2019 to 2021.
- Orange County community college students that exited computer programming programs in the 2019-20 academic year had a median annual wage of $35,304 after exiting the program and 39% of students attained the living wage.
- Throughout Orange County, 52% of computer programming students that exited their program in 2018-19 reported that they are working in a job closely related to their field of study.

Demand

Occupational Projections:

Exhibit 2 shows the annual percent change in jobs for these computer programming occupations from 2017 through 2027. Though there was a 7% decline across all occupations from 2019 to 2020 due to the COVID-19 pandemic, employment in these computer programming occupations decreased only 1% in Orange County during the same period. These computer programming occupations are projected to grow at a slightly higher rate compared to all occupations through 2027.

Exhibit 2: Annual Percent Change in Jobs for Computer programming Occupations, 2017-2027

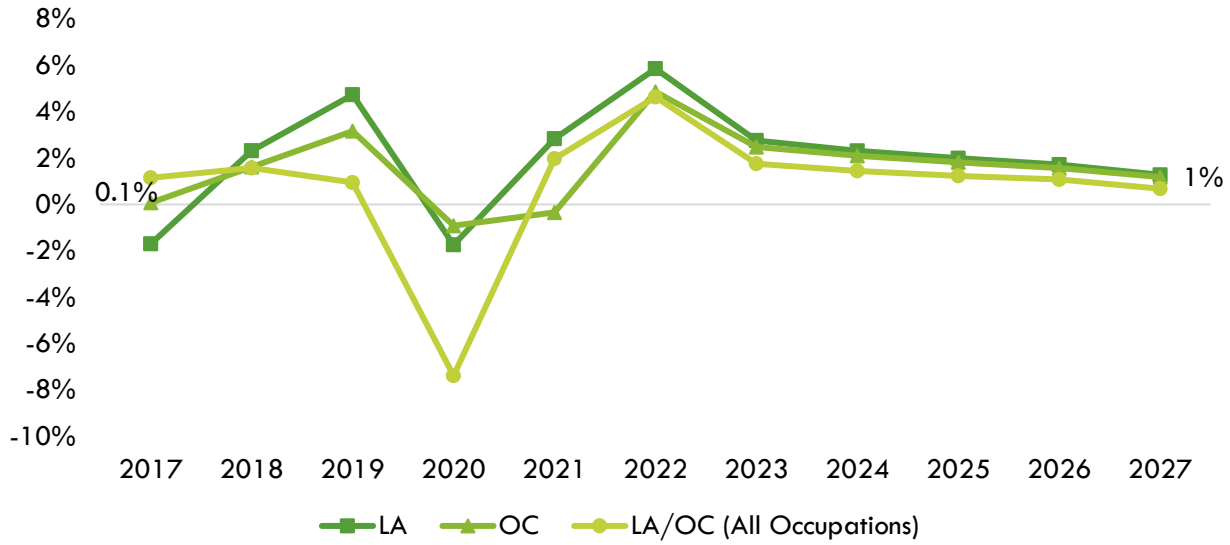


Exhibit 3 shows the five-year occupational demand projections for *web and digital interface designers*. In Los Angeles/Orange County, the number of jobs related to these occupations is projected to increase by 11% through 2027. There is projected to be 808 jobs available annually.

Exhibit 3: Occupational Demand in Los Angeles and Orange Counties[1]

Geography	2022 Jobs	2027 Jobs	2022-2027 Change	2022-2027 % Change	Annual Openings
Los Angeles	5,492	6,113	621	11%	604
Orange	1,940	2,118	178	9%	204
Total	**7,432**	**8,231**	**799**	**11%**	**808**

Exhibit 4 shows the five-year occupational demand projections for these computer programming occupations. In Los Angeles/Orange County, the number of jobs related to these occupations is projected to increase by 10% through 2027. There is projected to be 6,086 jobs available annually.

Exhibit 4: Occupational Demand in Los Angeles and Orange Counties[2]

Geography	2022 Jobs	2027 Jobs	2022-2027 Change	2022-2027 % Change	Annual Openings
Los Angeles	45,193	49,925	4,732	10%	4,126
Orange	22,007	24,093	2,086	9%	1,961
Total	**67,200**	**74,018**	**6,818**	**10%**	**6,086**

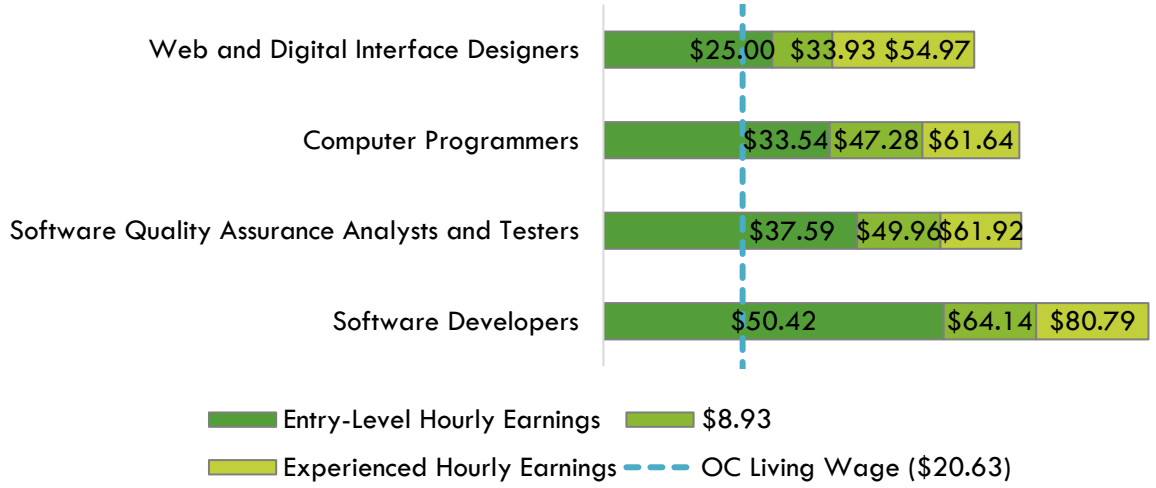
[1] Five-year change represents new job additions to the workforce. Annual openings include new jobs and replacement jobs that result from retirements and separations.
[2] Five-year change represents new job additions to the workforce. Annual openings include new jobs and replacement jobs that result from retirements and separations.

Wages:

The labor market analysis in this report considers the entry-level hourly wages for these computer programming occupations in Orange County as they relate to the county's living wage. Los Angeles County wages are included below in order to provide a complete analysis of the LA/OC region.

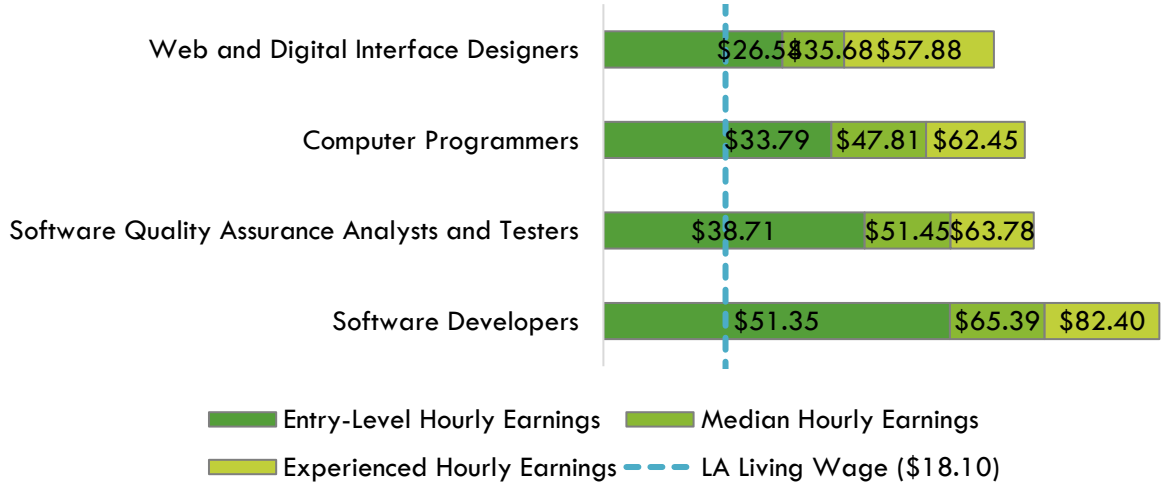
The typical entry-level hourly wages for *web and digital interface designers* are $25.00, which is above the living wage for one adult ($20.63 in Orange County). Orange County's average wages are below the average statewide wage of $65.02 for this occupation. Exhibit 5 shows the wage range for each of these computer programming occupations in Orange County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

Exhibit 5: Wages by Occupation in Orange County



The typical entry-level hourly wages for *web and digital interface designers* are $26.54, which is above the living wage for one adult ($18.10 in Los Angeles County). Los Angeles County's average wages are below the average statewide wage of $65.02 for this occupation. Exhibit 6 shows the wage range for each of these computer programming occupations in Los Angeles County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

Exhibit 6: Wages by Occupation in Los Angeles County



Job Postings:

Important Online Job Postings Data Note: *Online job postings data is sourced from Lightcast, a labor market analytics firm that scrapes, collects, and organizes data from online job boards such as LinkedIn, Indeed, Glassdoor, Monster, GovernmentJobs.com, and thousands more. Lightcast uses natural language processing (NLP) to determine the related company, industry, occupation, and other information for each job posting. However, NLP has limitations that include understanding contextual words of phrases; determining differences in words that can be used as nouns, verbs, and/or adjectives; and misspellings or grammatical errors.*[3] *For these reasons, job postings could be assigned to the wrong employer, industry, or occupation within Lightcast's database.*

Additionally, there are several limitations when analyzing job postings. A single job posting may not represent a single job opening, as employers may be creating a pool of candidates for future openings or hiring for multiple positions with a single posting. Additionally, not all jobs are posted online, and jobs may be filled through other methods such as internal promotion, word-of-mouth advertising, physical job boards, or a variety of other channels.

There were 40,623 online job postings related to these computer programming occupations listed in the past 12 months. Exhibit 7 shows the number of job postings by occupation. The vast majority (81%) of postings were for *software developers*.

Exhibit 7: Number of Job Postings by Occupation (n=40,623)

Occupation	Job Postings	Percentage of Job Postings
Software Developers	33,023	84%
Software Quality Assurance Analysts and Testers	3,931	10%
Computer Programmers	2,472	6%
Web and Digital Interface Designers	1,197	3%
Total Postings	**40,623**	**100%**

The top employers for *web and digital interface designers*, by number of job postings, are shown in Exhibit 8.

Exhibit 8: Top Middle-Skill Employers by Number of Job Postings (n=1,197)

Employer	Job Postings	Percentage of Job Postings
Canteen Vending	89	7%
Riot Games	69	6%
Electronic Arts	31	3%
Skydance Media Limited	26	3%
Activision Blizzard	23	2%
Tencent	21	2%
CyberCoders	20	2%
Netflix	17	2%
VirtualVocations	17	2%
Epson America	12	1%

The top employers in the region, by number of job postings, for the above middle-skill occupations are shown in Exhibit 9.

[3] K. R. Chowdhary, Fundamentals of Computer programming (Basingstoke: Springer Nature, 2020), https://link.springer.com/book/10.1007/978-81-322-3972-7.

Exhibit 9: Top Above Middle-Skill Employers by Number of Job Postings (n=39,426)

Employer	Job Postings	Percentage of Job Postings
Boeing	1,563	4%
Motion Recruitment	1,341	3%
Northrop Grumman	994	3%
CyberCoders	904	2%
VirtualVocations	761	2%
Disney	547	1%
SpaceX	500	1%
Amazon	433	1%
Actalent	425	1%
Anduril Industries	399	1%

The top specialized, soft, and computer skills listed by those most frequently mentioned in job postings (denoted in parentheses) for *web and digital interface designers* are shown in Exhibit 10.

Exhibit 10: Top Skills by Number of Job Postings (n=1,197)

Top Specialized Skills	Top Soft Skills	Top Computer Skills
Adobe Photoshop (212)	Communications (459)	Adobe Photoshop (212)
Content Creation (196)	Leadership (229)	TikTok (173)
Game Design (186)	Research (191)	Unreal Engine (143)
Marketing (184)	Management (183)	Autodesk Maya (135)
TikTok (172)	Editing (162)	C++ (Programming Language) (127)
Project Management (145)	Self-Motivation (160)	Unity Engine (105)
Workflow Management (145)	Planning (150)	Game Engine (97)
Social Media (141)	Problem Solving (143)	Instagram (93)
Unreal Engine (138)	Writing (142)	ZBrush (93)
Concept Arts (136)	Innovation (136)	AAA Video Games (89)

The top specialized, soft, and computer skills listed by those most frequently mentioned in job postings (denoted in parentheses) for the above middle-skill occupations are shown in Exhibit 11.

Exhibit 11: Top Skills by Number of Job Postings (n=39,426)

Top Specialized Skills	Top Soft Skills	Top Computer Skills
Computer Science (15,068)	Communications (13,712)	Python (Programming Language) (9,550)
Software Engineering (12,892)	Management (7,981)	Java (Programming Language) (8,387)
Software Development (10,872)	Problem Solving (6,858)	SQL (Programming Language) (8,051)
Python (Programming Language) (9,550)	Troubleshooting (Problem Solving) (6,662)	Amazon Web Services (7,446)

Top Specialized Skills	Top Soft Skills	Top Computer Skills
Agile Methodology (9,465)	Leadership (6,639)	JavaScript (Programming Language) (6,995)
Java (Programming Language) (8,387)	Operations (5,634)	C++ (Programming Language) (6,907)
SQL (Programming Language) (8,051)	Planning (5,191)	Application Programming Interface (API) (6,533)
Amazon Web Services (7,446)	Writing (4,972)	C# (Programming Language) (5,731)
JavaScript (Programming Language) (6,995)	Mathematics (4,622)	Linux (4,713)
C++ (Programming Language) (6,907)	Research (4,046)	Git (Version Control System) (4,509)

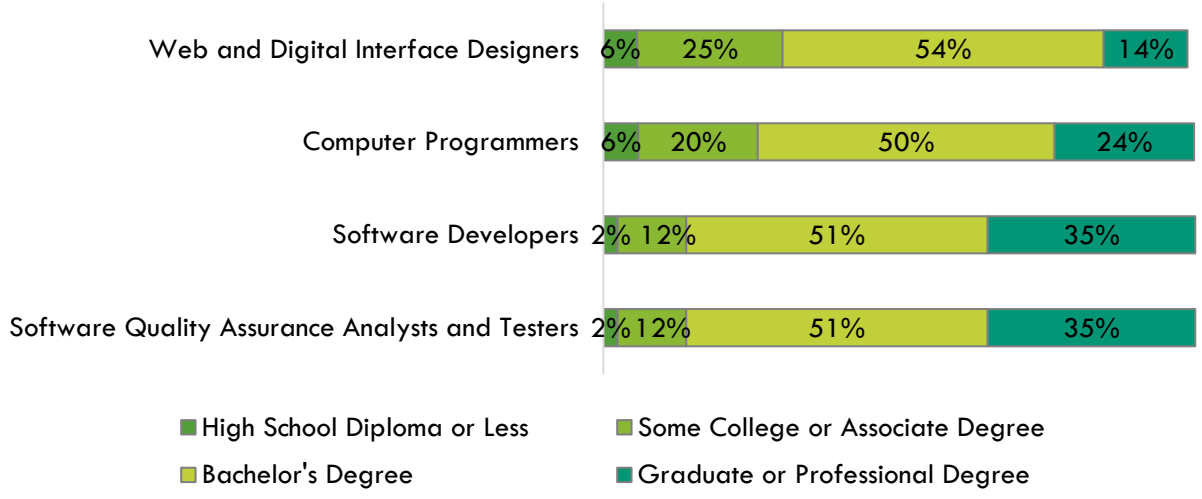
Educational Attainment:

The Bureau of Labor Statistics (BLS) lists a bachelor's degree as the typical entry-level education for these computer programming occupations. Additionally, the national-level educational attainment data indicates between 12% and 25% of workers in the field have completed some college or an associate degree as their highest level of education. Though the vast majority of workers in these occupations have completed a bachelor's, master's, or doctoral degree as their highest level of education, a significant percentage of *web and digital interface designers* have completed some college or an associate degree as their highest level of education. Exhibit 12 shows the educational attainment for each occupation, sorted by highest community college educational attainment to lowest.

Of the28% of the cumulative job postings for *web and digital interface designers* that included a requested education level in Los Angeles/Orange County, 85% (283) requested a bachelor's, master's, or doctoral degree and 15% (47) requested a high school diploma or associate degree.

Of the 63% of the cumulative job postings for these above middle-skill computer programming occupations in Los Angeles/Orange County, 91% (22,751) requested a bachelor's, master's, or doctoral degree and only 9% (2,136) requested a high school diploma, vocational training, or an associate degree.

Exhibit 12: National-level Educational Attainment for Occupations



Educational Supply

Community College Supply:

Exhibit 13 shows the three-year average number of awards conferred by community colleges in the related TOP codes: Digital Media (0614.00), Multimedia (0614.10), Electronic Game Design (0614.20), Information Technology, General (0701.00), Computer Information Systems (0702.00), Computer Software Development (0707.00), Computer Programming (0707.10), Database Design and Administration (0707.20), Computer Infrastructure and Support (0708.00), and Computer Networking (0708.10). The colleges with the most completions are Mt. San Antonio, Orange Coast, and Long Beach. Over the past 12 months, there were two other related program recommendation requests from regional community colleges.

Though these programs are most closely related to *web and digital interface designers* and the three above middle-skill computer programming occupations in this report, it is important to note that they train for a variety of occupations, including other middle-skill occupations such as *computer network support specialists, computer network architects,* and *computer user support specialists*. However, the above middle-skill computer programming-related occupations in this report have high education requirements and employers typically require more than a community college education for these occupations. For these reasons, community college supply is overstated.

Exhibit 13: Regional Community College Awards (Certificates and Degrees), 2019-2022

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
0614.00	Digital Media	Glendale	1	0	0	0
		LA Mission	4	5	5	5
		LA Trade	11	18	12	14
		Pasadena	0	3	15	6
		Rio Hondo	2	1	1	1
		Santa Monica	0	0	19	6
		LA Subtotal	**18**	**27**	**52**	**32**
		Coastline	0	3	3	2
		Cypress	0	2	7	3
		Golden West	10	7	0	6
		Irvine	1	6	3	3
		Saddleback	0	1	1	1
		Santa Ana	1	6	34	14
		OC Subtotal	**12**	**25**	**48**	**28**
Supply Subtotal/Average			**30**	**52**	**100**	**61**
0614.10	Multimedia	East LA	2	0	0	1
		Glendale	0	0	4	1
		LA Mission	18	23	28	23
		Pasadena	1	0	0	0
		Santa Monica	5	9	0	5

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		LA Subtotal	**26**	**32**	**32**	**30**
		Cypress	1	1	3	2
		Orange Coast	2	4	8	5
		Santiago Canyon	3	4	0	2
		OC Subtotal	**6**	**9**	**11**	**9**
		Supply Subtotal/Average	**32**	**41**	**43**	**39**
		Pasadena	1	1	5	3
0614.20	Electronic Game Design	**LA Subtotal**	**1**	**1**	**5**	**3**
		Golden West	2	0	0	0
		OC Subtotal	**2**	**0**	**0**	**0**
		Supply Subtotal/Average	**3**	**1**	**5**	**3**
		East LA	10	4	30	15
		Glendale	0	3	17	7
		LA Harbor	0	1	2	1
		LA Mission	3	1	4	3
		LA Southwest	0	2	12	5
0701.00	Information Technology, General	Long Beach	64	106	88	85
		Mt San Antonio	90	49	23	53
		Santa Monica	0	1	0	0
		West LA	5	0	6	4
		LA Subtotal	**172**	**167**	**182**	**173**
		Santa Ana	0	3	9	4
		OC Subtotal	**0**	**3**	**9**	**4**
		Supply Subtotal/Average	**172**	**170**	**191**	**177**
		Citrus	8	4	6	6
		Compton	0	0	12	4
		East LA	15	23	11	16
		El Camino	21	11	28	20
		Glendale	5	6	8	6
		LA City	1	4	3	3
0702.00	Computer Information Systems	LA Harbor	0	0	1	0
		LA Mission	1	1	1	1
		LA Southwest	0	0	21	7
		LA Trade	20	15	17	17
		Long Beach	0	3	0	1
		Mt San Antonio	79	6	68	51
		Rio Hondo	10	6	15	11

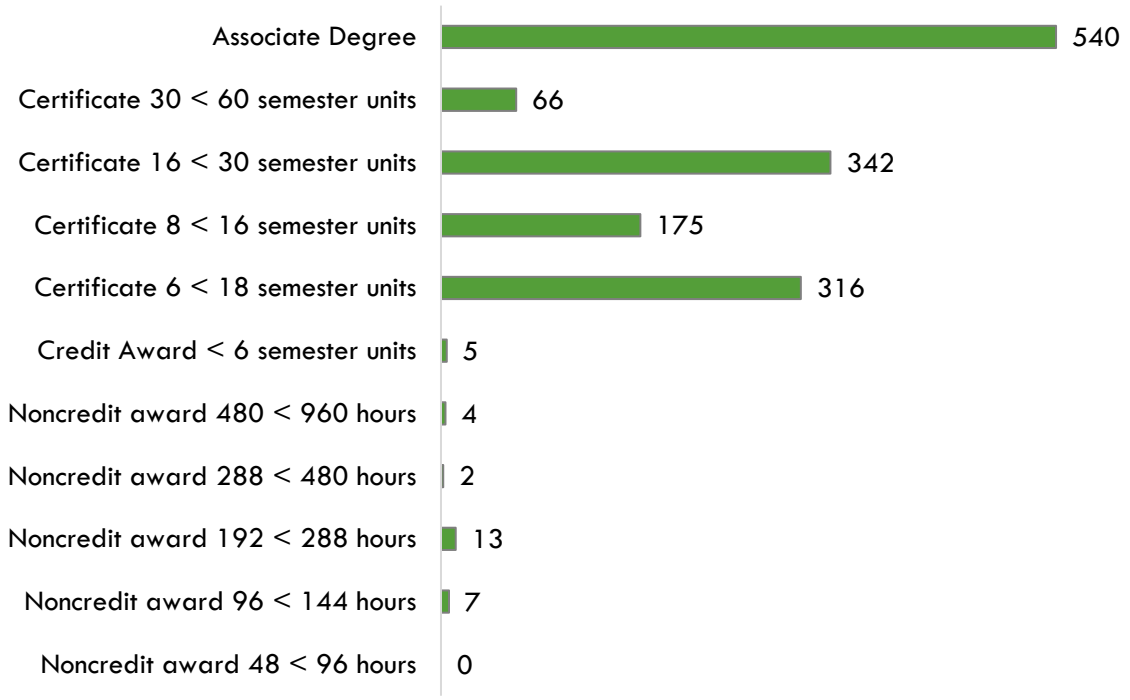
TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		West LA	10	9	14	11
		LA Subtotal	**170**	**88**	**205**	**154**
		Coastline	0	0	2	0
		Cypress	4	0	0	1
		Fullerton	11	31	49	30
		Irvine	2	0	0	1
		Orange Coast	2	0	1	1
		Saddleback	0	1	0	0
		Santa Ana	2	16	18	12
		Santiago Canyon	4	1	1	2
		OC Subtotal	**25**	**49**	**71**	**47**
		Supply Subtotal/Average	**195**	**137**	**276**	**201**
0707.00	Computer Software Development	LA City	0	0	1	0
		LA Harbor	0	0	2	1
		LA Mission	0	0	2	1
		LA Pierce	0	4	7	4
		Santa Monica	0	1	1	1
		West LA	0	0	6	2
		LA Subtotal	**0**	**5**	**19**	**9**
		Cypress	1	0	0	0
		Golden West	2	6	4	4
		Orange Coast	2	2	0	2
		Saddleback	3	10	15	10
		OC Subtotal	**8**	**18**	**19**	**16**
		Supply Subtotal/Average	**8**	**23**	**38**	**25**
0707.10	Computer Programming	Cerritos	2	3	7	4
		Citrus	1	3	9	4
		East LA	4	1	0	2
		Glendale	3	0	0	1
		LA City	6	8	10	8
		LA Harbor	0	2	4	2
		LA Mission	4	7	7	7
		LA Pierce	4	5	5	4
		LA Southwest	1	2	2	2
		LA Valley	6	13	8	9
		Long Beach	5	3	7	5
		Mt San Antonio	114	83	125	107

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		Pasadena	21	23	23	22
		Santa Monica	46	65	71	61
		LA Subtotal	**217**	**218**	**278**	**238**
		Coastline	0	0	1	0
		Cypress	20	6	5	11
		Fullerton	28	24	28	27
		Irvine	4	0	0	1
		Orange Coast	157	206	160	175
		Santa Ana	1	0	0	0
		Santiago Canyon	3	2	2	2
		OC Subtotal	**213**	**238**	**196**	**216**
Supply Subtotal/Average			**430**	**456**	**474**	**454**
0707.20	Database Design and Administration	Citrus	1	0	1	1
		Long Beach	1	13	11	8
		Mt San Antonio	12	8	16	12
		Pasadena	4	24	14	14
		Santa Monica	5	2	4	3
		LA Subtotal	**23**	**47**	**46**	**38**
		Santa Ana	8	2	2	4
		OC Subtotal	**8**	**2**	**2**	**4**
Supply Subtotal/Average			**31**	**49**	**48**	**42**
0707.30	Computer Systems Analysis	Cerritos	3	0	5	2
		East LA	1	0	0	0
		LA City	0	1	6	2
		LA Harbor	0	1	1	1
		LA Mission	1	1	1	1
		LA Pierce	0	6	5	4
		Mt San Antonio	0	0	9	3
		Rio Hondo	0	0	3	1
		LA Subtotal	**5**	**9**	**30**	**14**
		-	-	-	-	-
		OC Subtotal	**-**	**-**	**-**	**-**
Supply Subtotal/Average			**5**	**9**	**30**	**14**
0708.00	Computer Infrastructure and Support	Cerritos	4	4	9	5
		East LA	0	0	3	1
		El Camino	0	0	5	2
		Glendale	3	4	11	6

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		LA City	3	5	12	6
		LA Harbor	1	1	2	1
		LA Mission	12	17	32	20
		LA Valley	2	4	3	3
		Long Beach	8	8	2	6
		Mt San Antonio	24	24	36	28
		Pasadena	1	24	8	11
		Rio Hondo	10	11	19	13
		West LA	15	16	7	13
		LA Subtotal	**83**	**118**	**149**	**115**
		Coastline	46	73	91	70
		Cypress	3	1	1	1
		Orange Coast	7	5	7	6
		Saddleback	0	3	13	5
		Santa Ana	0	27	14	13
		OC Subtotal	**56**	**109**	**126**	**95**
		Supply Subtotal/Average	**139**	**227**	**275**	**210**
0708.10	Computer Networking	Cerritos	9	8	6	8
		Glendale	3	0	2	1
		LA City	0	4	8	4
		LA Pierce	20	12	19	16
		Long Beach	47	48	52	49
		Mt San Antonio	11	4	25	13
		Rio Hondo	7	2	5	5
		West LA	48	58	24	43
		LA Subtotal	**145**	**136**	**141**	**139**
		Coastline	59	92	49	67
		Cypress	95	61	71	76
		Fullerton	0	1	0	0
		Irvine	21	10	18	16
		Saddleback	21	19	15	19
		Santa Ana	12	23	45	27
		OC Subtotal	**208**	**206**	**198**	**205**
		Supply Subtotal/Average	**353**	**342**	**339**	**344**
		Supply Subtotal/Average	**1,398**	**1,507**	**1,819**	**1,569**

Exhibit 14 shows the annual average community college awards by type from 2019-20 through 2021-22. The plurality of the awards are for associate degrees, followed by certificates between 16 and less than 30 semester units.

Exhibit 14: Annual Average Community College Awards by Type, 2018-2021



Community College Student Outcomes:

Exhibit 15 shows the Strong Workforce Program (SWP) metrics for computer programming programs in Coast Community College District (CCCD), the Orange County Region, and California. Of the 2,905 computer programming students in the 2020-21 academic year, 57% (1,660) attended a CCCD college.

Additionally, CCCD students that exited computer programming programs in the 2019-20 academic year had slightly higher median annual earnings ($37,304) compared to all computer programming students in Orange County ($35,034). A similar percentage of CCCD computer programming students attained the living wage (41%) when compared to all computer programming students in Orange County (41%). However, both figures a significantly below the statewide percentage of students that attained the living wage (53%).

Exhibit 15: Computer Programming (0707.10) Strong Workforce Program Metrics, 2020-21[4]

SWP Metric	CCCD	OC Region	California
SWP Students	1,660	2,905	39,212
SWP Students Who Earned 9 or More Career Education Units in the District in a Single Year	16%	19%	24%
SWP Students Who Completed a Noncredit CTE or Workforce Preparation Course	100%	94%	76%

[4] All SWP metrics are for 2020-21 unless otherwise noted.

SWP Metric	CCCD	OC Region	California
SWP Students Who Earned a Degree or Certificate or Attained Apprenticeship Journey Status	98	128	745
SWP Students Who Transferred to a Four-Year Postsecondary Institution (2019-20)	201	306	4,166
SWP Students with a Job Closely Related to Their Field of Study (2018-19)	64%	52%	67%
Median Annual Earnings for SWP Exiting Students (2019-20)	$37,304	$35,034	$41,032
Median Change in Earnings for SWP Exiting Students (2019-20)	23%	22%	22%
SWP Exiting Students Who Attained the Living Wage (2019-20)	41%	39%	53%

Non-Community College Supply:

For a comprehensive regional supply analysis, it is also important to consider the supply from other institutions in the region that provide training programs for these computer programming occupations. Exhibit 16 shows the annual and three-year average number of awards conferred by these institutions in the related Classification of Instructional Programs (CIP) Codes: Computer and Information Sciences, General (11.0101), Information Technology (11.0103), Computer Programming/Programmer, General (11.0201), Computer Science (11.0701), and Computer/Computer Systems Technology/Technician (15.1202). Due to different data collection periods, the most recent two-year period of available data is from 2019 to 2021. Currently, only two years of data are currently available due to changes in the CIP Taxonomy. Between 2019 and 2021, four-year colleges in the region conferred an average of 3,505 awards annually in related training programs.

Exhibit 16: Regional Non-Community College Awards, 2017-2020

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
11.0101	Computer and Information Sciences, General	Azusa Pacific University	21	25	23
		Chapman University	18	23	20
		Los Angeles Pacific College	6	2	4
		Loyola Marymount University	27	45	36
		Mount Saint Mary's University	0	0	0
		Pacific States University	0	0	0
		Pitzer College	0	1	0
		The Master's University and Seminary	11	5	8
		University of California-Irvine	0	1	0
		University of La Verne	23	36	30
		University of Massachusetts Global	30	36	33
		University of the People	203	292	248

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
		Westcliff University	0	0	0
		Supply Subtotal/Average	**339**	**466**	**402**
11.0103	Information Technology	Bethesda University	0	0	0
		Brand College	13	17	15
		California Intercontinental University	2	0	1
		California State University-Dominguez Hills	4	10	7
		California State University-Los Angeles	166	116	141
		California State University-Northridge	29	51	40
		Platt College-Anaheim	15	17	16
		Platt College-Los Angeles	12	6	9
		University of La Verne	2	3	2
		Westcliff University	0	0	0
		Supply Subtotal/Average	**243**	**220**	**231**
11.0201	Computer Programming/ Programmer, General	ABCO Technology	46	34	40
		Platt College-Anaheim	4	0	2
		Supply Subtotal/Average	**243**	**220**	**231**
11.0701	Computer Science	Biola University	18	19	18
		California Institute of Technology	72	83	78
		California State Polytechnic University-Pomona	238	270	254
		California State University-Dominguez Hills	57	66	62
		California State University-Fullerton	264	308	286
		California State University-Long Beach	220	221	220
		California State University-Los Angeles	119	152	136
		California State University-Northridge	160	214	187
		Chapman University	30	45	38
		Claremont McKenna College	35	17	26
		Harvey Mudd College	47	48	48

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
		Occidental College	18	18	18
		Pitzer College	10	5	8
		Pomona College	34	33	34
		Scripps College	11	5	8
		Southern California Institute of Technology	10	7	8
		The Master's University and Seminary	0	0	0
		University of California-Irvine	805	822	814
		University of California-Los Angeles	287	342	314
		University of Southern California	247	293	270
		Supply Subtotal/Average	**2,682**	**2,968**	**2,827**
15.1202	Computer/ Computer Systems Technology/ Technician	Learnet Academy Inc	4	2	3
		University of La Verne	0	0	0
		Supply Subtotal/Average	**4**	**2**	**3**
		Supply Total/Average	**3,318**	**3,690**	**3,505**

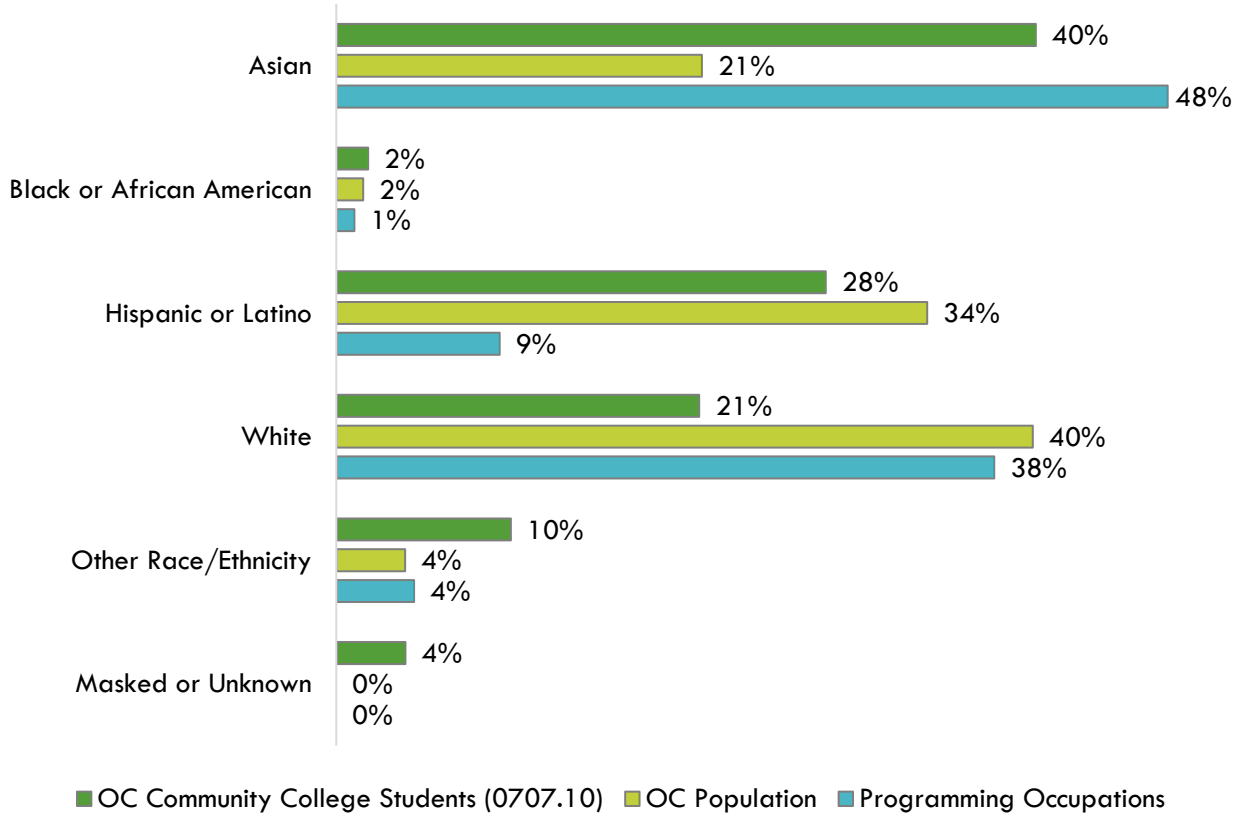
Regional Demographics

This section analyzes demographic data for Orange County community college students enrolled in computer programming programs compared to the OC population, as well occupational data, for the purpose of identifying potential diversity and equity issues that can be addressed by community college programs.

Ethnicity:

Exhibit 17 shows the ethnicity of the overall Orange County population, as well as the four computer programming occupations included in this report. Notably, 48% of workers employed in these computer programming occupations are Asian, which is slightly higher than community college computer programming students (40%) and significantly higher than the population (21%). Conversely, only 9% of workers in these occupations are Hispanic or Latino, which is significantly lower than the population (34%) and community college software application students (28%).

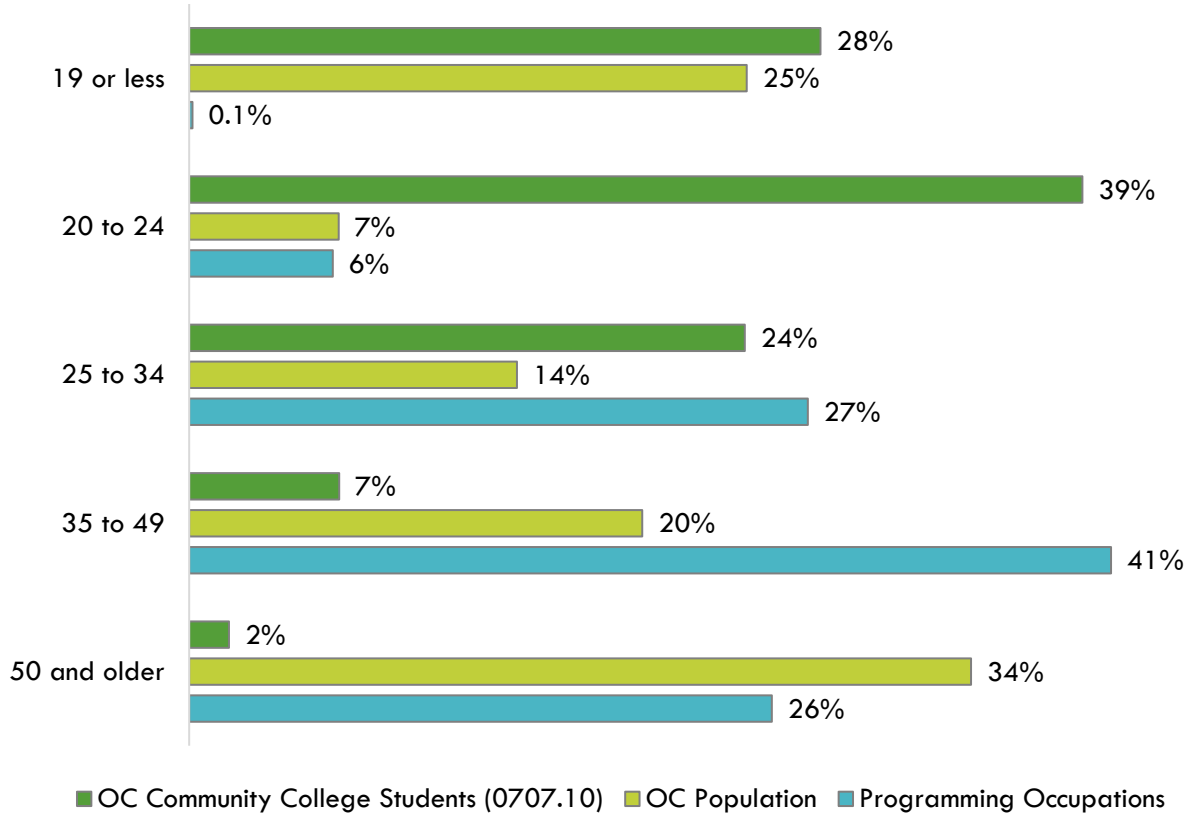
Exhibit 17: Program and County Demographics by Ethnicity



Age:

Exhibit 18 shows the age of the overall Orange County population, as well as the four computer programming occupations included in this report. The plurality (401) of workers in these computer programming occupations are 35 to 49, which is significantly higher than the population (20%) and nearly community college computer programming students (7%). Conversely, the vast majority (67%) of community college computer programming students are 24 or less.

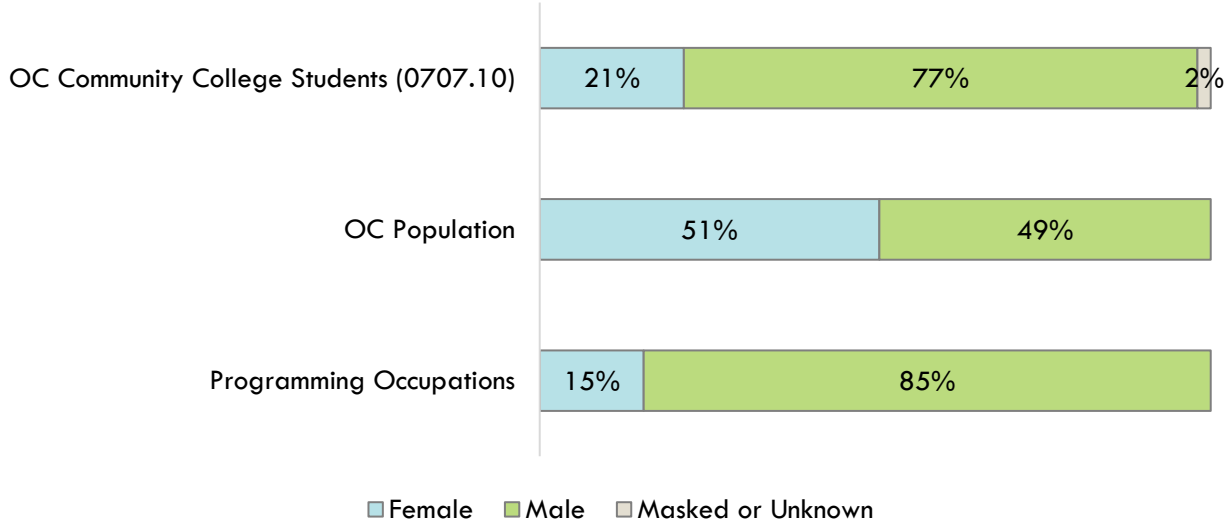
Exhibit 18: Program and County Demographics by Age



Sex:

Exhibit 19 shows the sex of the overall Orange County population as well as these computer programming occupations. Though the population is split nearly evenly between women and men, 85% of workers in these computer programming occupations and 77% of community college computer programming students are men.

Exhibit 19: Program and County Demographics by Sex



Appendix A: Methodology

The OC COE prepared this report by analyzing data from occupations and education programs. Occupational data is derived from Lightcast, a labor market analytics firm that consolidates data from the California Employment Development Department (EDD), U.S. Bureau of Labor Statistics (BLS) and other government agencies. Program supply data is drawn from two systems: Taxonomy of Programs (TOP) and Classification of Instructional Programs (CIP).

Using a TOP-SOC crosswalk, the OC COE identified middle-skill jobs for which programs within these TOP codes train. Middle-skill jobs include:

- All occupations that require an educational requirement of some college, associate degree or apprenticeship;
- All occupations that require a bachelor's degree, but also have more than one-third of their existing labor force with an educational attainment of some college or associate degree; or
- All occupations that require a high school diploma or equivalent or no formal education, but also require short- to long-term on-the-job training where multiple community colleges have existing programs.

The OC COE determined labor market supply for an occupation or SOC code by analyzing the number of program completers or awards in a related TOP or CIP code. The COE developed a "supply table" with this information, which is the source of the program supply data for this report. TOP code data comes from the California Community Colleges Chancellor's Office MIS Data Mart (datamart.cccco.edu) and CIP code data comes from the Integrated Postsecondary Education Data System (nces.ed.gov/ipeds/use-the-data), also known as IPEDS. TOP is a system of numerical codes used at the state level to collect and report information on California community college programs and courses throughout the state that have similar outcomes. CIP codes are a taxonomy of academic disciplines at institutions of higher education in the United States and Canada. Institutions outside of the California Community College system do not use TOP codes in their reporting systems.

Data included in this analysis represent the labor market demand for relevant positions most closely related to the proposed program as expressed by the requesting college in consultation with the OC COE. Traditional labor market information was used to show current and projected employment based on data trends, as well as annual average awards granted by regional community colleges. Real-time labor market information captures job post advertisements for occupations relevant to the field of study which can signal demand and show what employers are looking for in potential employees, but is not a perfect measure of the quantity of open positions.

All representations have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. The most recent data available at the time of the analysis was examined; 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 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.

Appendix B: Data Sources

Data Type	Source
Occupational Projections, Wages, and Job Postings	Traditional labor market information data is sourced from Lightcast, a labor market analytics firm. Lightcast occupational employment data are based on final Lightcast industry data and final Lightcast staffing patterns. Wage estimates are based on Occupational Employment Statistics and the American Community Survey. For more information, see https://lightcast.io/
Living Wage	The living wage is derived from the Insight Center's California Family Needs Calculator, which measures the income necessary for an individual of family to afford basic expenses. The data assesses the cost of housing, food, child care, health care, transportation, and taxes. For more information, see: https://insightcced.org/family-needs-calculator/ The living wage for one adult in Orange County is $20.63 per hour ($42,910.40 annually). This figure is used by the CCCCO to calculate the percentage of students that attained the regional living wage.
Typical Education and Training Requirements, and Educational Attainment	The Bureau of Labor Statistics (BLS) provides information about education and training requirements for hundreds of occupations. BLS uses a system to assign categories for entry-level education, work experience in a related occupation, and typical on-the-job training to each occupation for which BLS publishes projections data. For more information, see https://www.bls.gov/emp/documentation/education/tech.htm
Emerging Occupation Descriptions, Additional Education Requirements, and Employer Preferences	The O*NET database includes information on skills, abilities, knowledges, work activities, and interests associated with occupations. For more information, see https://www.onetonline.org/help/online/
Educational Supply	The CCCCO Data Mart provides information about students, courses, student services, outcomes and faculty and staff. For more information, see: https://datamart.cccco.edu The National Center for Education Statistics (NCES) Integrated Postsecondary Integrated Data System (IPEDS) collects data on the number of postsecondary awards earned (completions). For more information, see https://nces.ed.gov/ipeds/use-the-data/survey-components/7/completions
Student Metrics and Demographics	LaunchBoard, a statewide data system supported by the California Community Colleges Chancellor's Office and hosted by Cal-PASS Plus, provides data on progress, success, employment, and earnings outcomes for California community college students. For more information, see: https://www.calpassplus.org/LaunchBoard/Home.aspx

Data Type	Source
Population and Occupation Demographics	The Census Bureau's American Community Survey (ACS) is the premier source for detailed population and housing information. For more information, see: https://www.census.gov/programs-surveys/acs Data is sourced from IPUMS USA, a database providing access to ACS and other Census Bureau data products. For more information, see: https://usa.ipums.org/usa/about.shtml

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