Labor Market Analysis for Program Recommendation: 0708.10/Computer Networking *(Cybersecurity Essentials)*

Orange County Center of Excellence, March 2024

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

Summary

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

Program LMI Endorsement Criteria		
	Yes ☑	No ☐
Supply Gap:	*Comments:* There is projected to be **1,229 annual job openings** throughout Los Angeles and Orange counties for these computer network occupations, which **is less than the 6,965 awards conferred by educational institutions**. However, these educational programs also prepare students for 21 other related occupations, **which account for 19,086 additional annual job openings. *Because these programs train for a variety of occupations with high demand, there is an undersupply of labor for these computer network occupations.***	
	Yes ☑	No ☐
Living Wage: (Entry-Level, 25th)	*Comments:* **All annual job openings** for these computer network occupations **have entry-level hourly wages above the OC living wage of $20.63.**	
	Yes ☑	No ☐
Education:	*Comments:* Though one of these computer network occupations typically requires an associate degree and two typically require a bachelor's degree, **more than one-third 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 three middle-skill occupations:

- *Computer Network Support Specialists* (15-1231)
- *Computer Network Architects* (15-1241)
- *Network and Computer Systems Administrators* (15-1244)

Based on the available data there appears be a supply gap for these computer network occupations. In addition, typical education requirements for these occupations align with a community college education and all annual job openings have entry-level wages above the living wage. **Therefore, due all 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
Computer Network Support Specialists (15-1231)	LA: 248	LA: 3,395	OC: $26.75	Associate degree	40%
	OC: 102	OC: 1,656			
	TTL: 350	*TTL: 5,052*			
Computer Network Architects (15-1241)	LA: 188	LA: 262	OC: $40.74	Bachelor's degree	37%
	OC: 86	OC: 79			
	TTL: 274	*TTL: 340*			
Network and Computer Systems Administrators (15-1244)	LA: 428	LA: 1,152	OC: $35.54	Bachelor's degree	39%
	OC: 177	OC: 422			
	TTL: 605	*TTL: 1,574*			
Total	**1,229**	**6,965**	**N/A**	**N/A**	**N/A**

Demand:

- The number of jobs related to these computer network occupations are projected to increase 1% through 2027, equating to 1,229 annual job openings.
- Hourly entry-level wages for these computer network occupations in Orange County range from $27.06 to $41.49, all of which are above the living wage.
- There were 5,932 online job postings for these computer network occupations over the past 12 months. The highest number of postings were for network engineers, systems administrators, and Linux system administrators.
- The typical entry-level education for these computer network occupations ranges from an associate degree to a bachelor's degree.
- Between 37% and 40% of workers in the field have completed some college or an associate degree as their highest level of educational attainment.

Supply:

- There was an average of 1,564 awards conferred by all 28 community colleges in Los Angeles and Orange Counties from 2019 to 2022.
- Non-community college institutions conferred an average of 5,401 awards from 2019 to 2021.
- Orange County community college students that exited computer networking programs in the 2020-21 academic year had a median annual wage of $55,242 ($26.56 per hour) after exiting the program and 66% attained the regional living wage.
- Throughout Orange County, 73% of computer networking students that exited their program in 2019-20 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 network occupations from 2017 through 2027. There was a 6% decline in employment for these computer network occupations in Orange County from 2019 to 2020 due to the COVID-19 pandemic, which is similar to the 7% decline across all occupations in Los Angeles and Orange counties during the same period. Employment in these computer network occupations continued to decrease each year through 2022 in Orange County. These computer network occupations are projected to grow at a lower rate relative to all occupations through 2027.

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

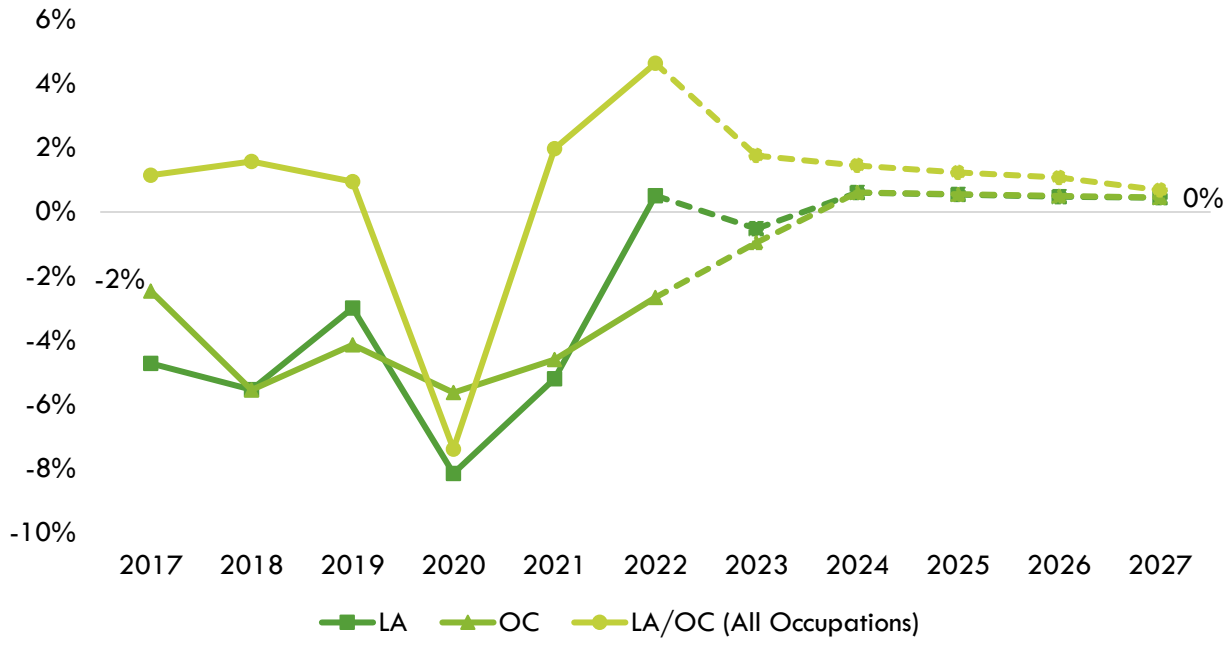


Exhibit 3 shows the five-year occupational demand projections for these computer network occupations. In Los Angeles/Orange County, the number of jobs related to these occupations is projected to increase by 1% through 2027. There is projected to be 1,229 jobs available annually.

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	14,021	14,238	217	2%	864
Orange	5,957	6,026	69	1%	365
Total	**19,978**	**20,264**	**286**	**1%**	**1,229**

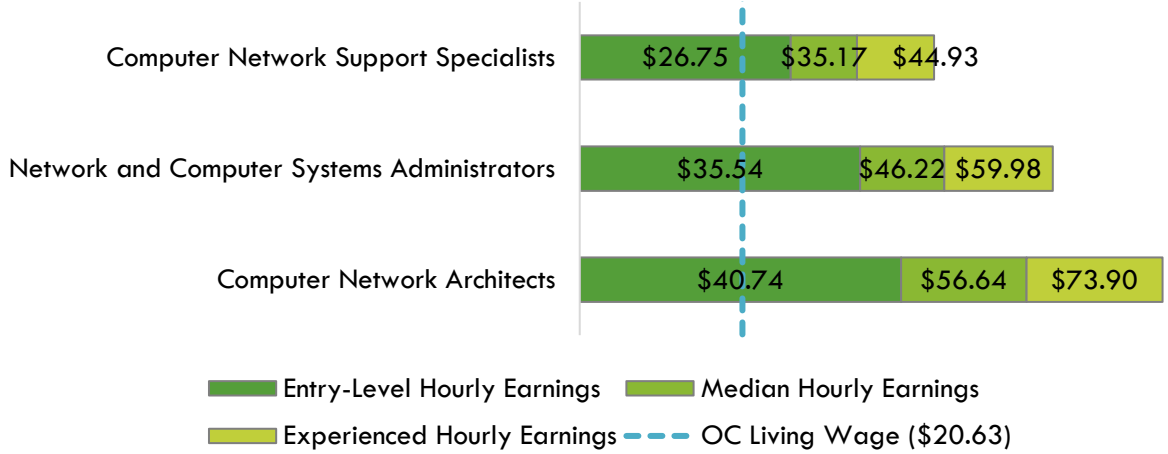
[1] Five-year change represents new job additions to the workforce. Annual openings include new jobs and replacement jobs that result from retirements and separations.

Wages:

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

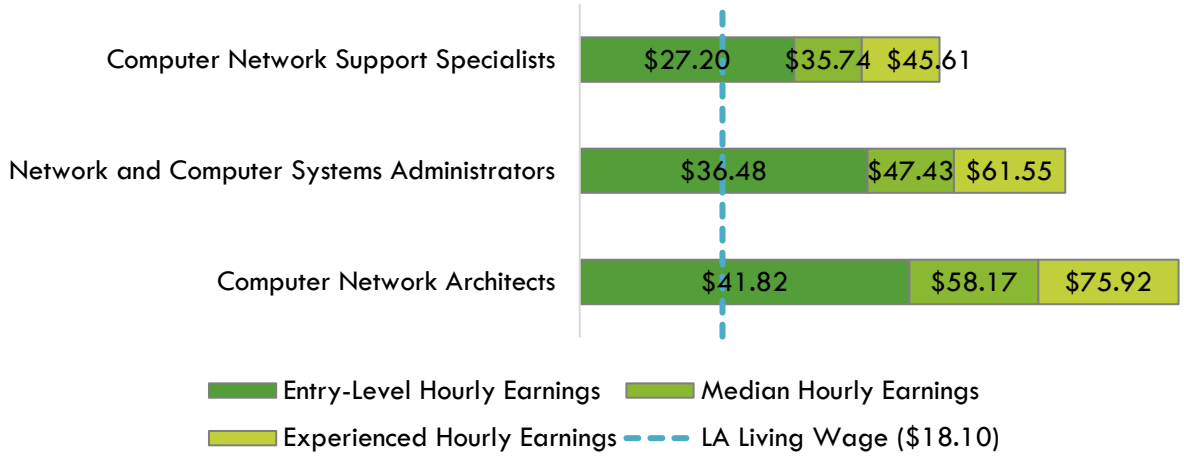
All annual openings for these computer network occupations have entry-level wages above the living wage for one adult ($20.63 in Orange County). Typical entry-level hourly wages range between $26.75 and $40.74. Orange County's average wages are $48.84, which is below the average statewide wage of $55.17 for these occupations. Exhibit 4 shows the wage range for each of these computer network occupations in Orange County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

Exhibit 4: Wages by Occupation in Orange County



All annual openings for these real estate occupations have entry-level wages above the living wage for one adult ($18.10 in Los Angeles County). Typical entry-level hourly wages are in a range between $27.20 and $41.82. Los Angeles County's average wages of $49.73 are below the average statewide wage of $45.06 for these occupations. Exhibit 5 shows the wage range for each of these computer network occupations in Los Angeles County and how they compare to the regional living wage, sorted from lowest to highest entry-level wage.

Exhibit 5: 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.*[2] *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 5,932 online job postings related to these computer network occupations listed in the past 12 months. Exhibit 6 shows the number of job postings by occupation. Nearly 50% of job postings were for network and computer systems administrators and approximately 41% were for computer network architects.

Exhibit 6: Number of Job Postings by Occupation (n=5,932)

Occupation	Job Postings	Percentage of Job Postings
Network and Computer Systems Administrators	2,947	49.7%
Computer Network Architects	2,415	40.7%
Computer Network Support Specialists	570	9.6%
Total Postings	**5,932**	**100.0%**

The top employers in the region, by number of job postings, are shown in Exhibit 7.

Exhibit 7: Top Employers by Number of Job Postings (n=5,932)

Employer	Job Postings	Percentage of Job Postings
Boeing	259	4%
Northrop Grumman	191	3%
Bowman Williams	102	2%
Randstad	97	2%
Robert Half	94	2%
University of California	73	1%
Kforce	55	1%
The Judge Group	55	1%
Leidos	54	1%
Raytheon Technologies	47	1%

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

The top specialized, soft, and computer skills listed by those most frequently mentioned in job postings (denoted in parentheses) are shown in Exhibit 8.

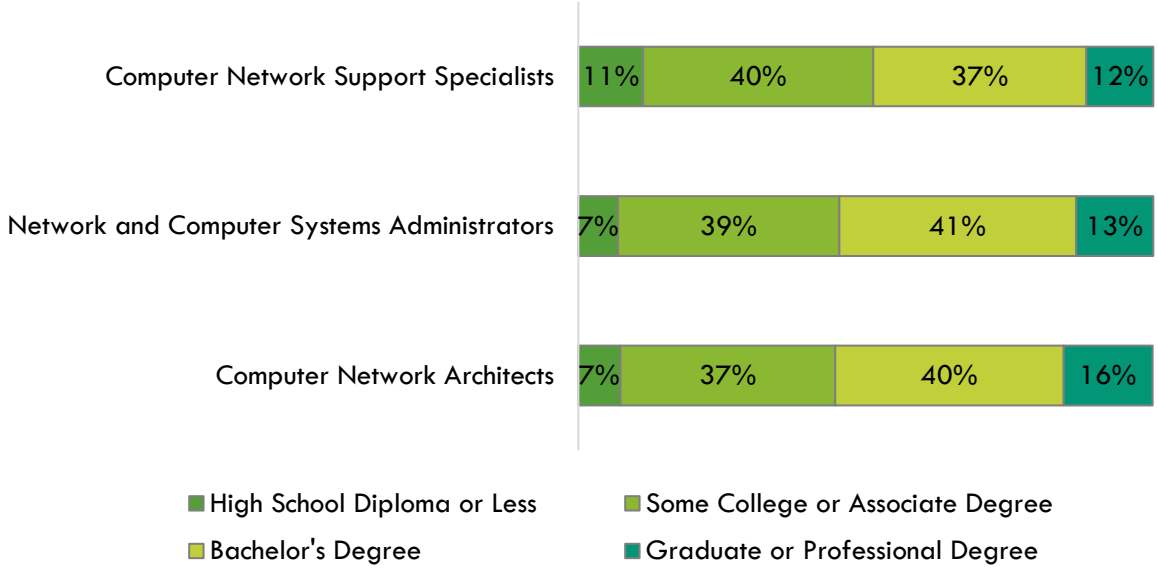
Exhibit 8: Top Skills by Number of Job Postings (n=5,932)

Top Specialized Skills	Top Soft Skills	Top Computer Skills
Computer Science (1,299)	Communication (2,381)	Firewall (961)
Network Engineering (1,000)	Troubleshooting (Problem Solving) (2,241)	Operating Systems (940)
Firewall (961)	Management (1,771)	Linux (809)
Operating Systems (940)	Operations (1,618)	Active Directory (701)
Network Switches (897)	Problem Solving (1,190)	Microsoft Azure (630)
Linux (809)	Customer Service (1,038)	Python (Programming Language) (535)
Wide Area Networks (794)	Information Technology (861)	Amazon Web Services (497)
Automation (761)	Leadership (854)	Windows Servers (495)
System Administration (730)	Planning (843)	Microsoft Office (426)
Project Management (726)	Writing (671)	Border Gateway Protocol (416)

Educational Attainment:

The Bureau of Labor Statistics (BLS) lists an associate degree as the typical entry-level education for *computer network support specialists* and a bachelor's degree for *computer network architects* and *network and computer systems administrators*. However, the national-level educational attainment data indicates between 37% and 40% of workers in the field have completed some college or an associate degree as their highest level of education. Exhibit 9 shows the educational attainment for each occupation, sorted by highest community college educational attainment to lowest.

Exhibit 9: National-level Educational Attainment for Occupations



Of the 65% of the cumulative job postings for these computer network occupations that listed a minimum education requirement in Los Angeles/Orange County, 28% (1,078) requested a high school diploma or an associate degree and 70% (2,708) requested a bachelor's degree.

Educational Supply

Community College Supply:

Exhibit 10 shows the three-year average number of awards conferred by community colleges in the related TOP codes:

- Information Technology, General (0701.00)
- Computer Information Systems (0702.00)
- Computer Software Development (0707.00)
- Computer Programming (0707.10)
- Computer Systems Analysis (0707.30)
- Computer Infrastructure and Support (0708.00)
- Computer Networking (0708.10)
- Computer Support (0708.20)
- World Wide Web Administration (0709.00).

The colleges with the most completions in the region are Mt. San Antonio, Long Beach, and Orange Coast. Over the past 12 months, there were sixteen other related program recommendation requests from regional community colleges.

Exhibit 10: 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
0701.00	Information Technology, General	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
		Long Beach	64	106	88	86
		Mt San Antonio	90	49	23	54
		Santa Monica	0	1	0	0
		West LA	5	0	6	4
		LA Subtotal	**172**	**167**	**182**	**174**
		Santa Ana	0	3	9	4
		OC Subtotal	**0**	**3**	**9**	**4**
Supply Subtotal/Average			**172**	**170**	**191**	**178**
0702.00	Computer Information Systems	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
		LA Harbor	0	0	1	0

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		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	10
		West LA	10	9	14	11
		LA Subtotal	**170**	**88**	**205**	**154**
		Coastline	0	0	2	1
		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**	**48**
		Supply Subtotal/Average	**195**	**137**	**276**	**203**
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**	**8**
		Cypress	1	0	0	0
		Golden West	2	6	4	4
		Orange Coast	2	2	0	1
		Saddleback	3	10	15	9
		OC Subtotal	**8**	**18**	**19**	**15**
		Supply Subtotal/Average	**8**	**23**	**38**	**23**
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

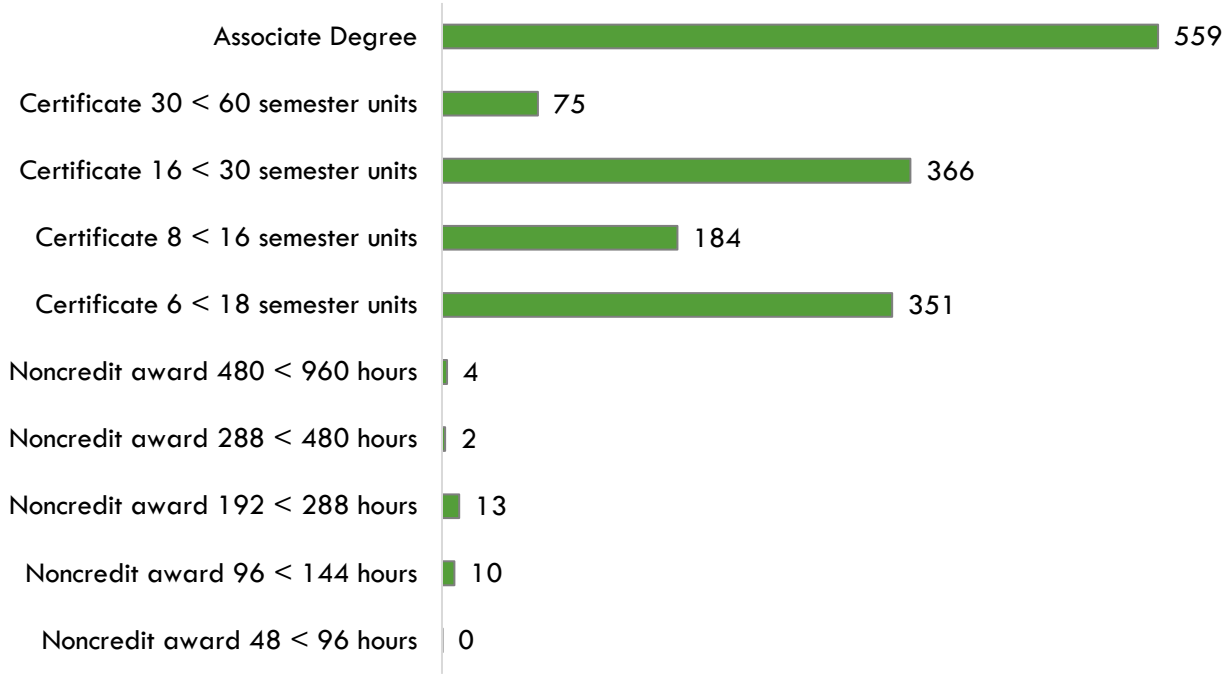
TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		LA Mission	4	7	7	6
		LA Pierce	4	5	5	5
		LA Southwest	1	2	2	2
		LA Valley	6	13	8	9
		Long Beach	5	3	7	5
		Mt San Antonio	114	83	125	107
		Pasadena	21	23	23	22
		Santa Monica	46	65	71	61
		LA Subtotal	**217**	**218**	**278**	**238**
		Coastline	0	0	1	0
		Cypress	20	6	5	10
		Fullerton	28	24	28	27
		Irvine	4	0	0	1
		Orange Coast	157	206	160	174
		Santa Ana	1	0	0	0
		Santiago Canyon	3	2	2	2
		OC Subtotal	**213**	**238**	**196**	**216**
		Supply Subtotal/Average	**430**	**456**	**474**	**453**
0707.30	Computer Systems Analysis	Cerritos	3	0	5	3
		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**	**15**
		-	-	-	-	-
		OC Subtotal	**-**	**-**	**-**	**-**
		Supply Subtotal/Average	**5**	**9**	**30**	**15**
0708.00	Computer Infrastructure and Support	Cerritos	4	4	9	6
		East LA	0	0	3	1
		El Camino	0	0	5	2
		Glendale	3	4	11	6
		LA City	3	5	12	7
		LA Harbor	1	1	2	1
		LA Mission	12	17	32	20

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		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**	**117**
		Coastline	46	73	91	70
		Cypress	3	1	1	2
		Orange Coast	7	5	7	6
		Saddleback	0	3	13	5
		Santa Ana	0	27	14	14
		OC Subtotal	**56**	**109**	**126**	**97**
		Supply Subtotal/Average	**139**	**227**	**275**	**214**
0708.10	Computer Networking	Cerritos	9	8	6	8
		Glendale	3	0	2	2
		LA City	0	4	8	4
		LA Pierce	20	12	19	17
		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**	**141**
		Coastline	59	92	49	67
		Cypress	95	61	71	76
		Fullerton	0	1	0	0
		Irvine	21	10	18	16
		Saddleback	21	19	15	18
		Santa Ana	12	23	45	27
		OC Subtotal	**208**	**206**	**198**	**204**
		Supply Subtotal/Average	**353**	**342**	**339**	**345**
0708.20	Computer Support	Citrus	1	1	4	2
		Glendale	7	2	7	5
		LA Pierce	8	6	6	7
		LA Valley	0	1	0	0
		Long Beach	14	40	33	29
		Pasadena	30	34	12	25

TOP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2021-2022 Awards	3-Year Award Average
		LA Subtotal	**60**	**84**	**62**	**69**
		Cypress	5	3	13	7
		OC Subtotal	**5**	**3**	**13**	**7**
		Supply Subtotal/Average	**65**	**87**	**75**	**76**
0709.00	World Wide Web Administration	Cerritos	0	0	3	1
		Glendale	7	10	7	8
		LA Pierce	0	2	0	1
		Long Beach	24	34	44	34
		Santa Monica	0	16	0	5
		West LA	9	6	7	7
		LA Subtotal	**40**	**68**	**61**	**56**
		Fullerton	0	1	0	0
		Saddleback	2	2	3	2
		OC Subtotal	**2**	**3**	**3**	**3**
		Supply Subtotal/Average	**42**	**71**	**64**	**59**
		Supply Total/Average	**1,409**	**1,522**	**1,762**	**1,564**

Exhibit 11 shows the annual average community college awards by type from 2019-20 to 2021-22. The plurality of the awards are for associate degrees, followed by certificates between 16 and less than 30 semester units and certificates between 6 and less than 18 semester units.

Exhibit 11: Annual Average Community College Awards by Type, 2019-2022



Community College Student Outcomes:

Exhibit 12 shows the Strong Workforce Program (SWP) metrics for computer networking programs in North Orange County Community College District (NOCCCD), the Orange County Region, and California. Of the 592 Orange County computer networking students in the 2020-21 academic year, 42% (248) attended an NOCCCD college.

NOCCCD students that exited computer networking programs in the 2020-21 academic year had lower median annual earnings ($48,556 or $23.34 per hour) compared to all computer networking students in Orange County ($55,242 or $26.56 per hour). In addition, a lower percentage of NOCCCD computer networking students attained the living wage (56%) when compared to all computer networking students in Orange County (66%).

Exhibit 12: Computer Networking (0708.10) Strong Workforce Program Metrics, 2020-21[3]

SWP Metric	NOCCCD	OC Region	California
SWP Students	248	592	8,179
SWP Students Who Earned 9 or More Career Education Units in the District in a Single Year	39%	36%	44%
SWP Students Who Completed a Noncredit CTE or Workforce Preparation Course	Insufficient Data	Insufficient Data	69%
SWP Students Who Earned a Degree or Certificate or Attained Apprenticeship Journey Status	29	61	684
SWP Students Who Transferred to a Four-Year Postsecondary Institution (2019-20)	Insufficient Data	Insufficient Data	Insufficient Data
SWP Students with a Job Closely Related to Their Field of Study (2019-20)	60%	73%	65%
Median Annual Earnings for SWP Exiting Students	$48,556 ($23.34)	$55,242 ($26.56)	$55,850 ($26.85)
Median Change in Earnings for SWP Exiting Students	11%	17%	19%
SWP Exiting Students Who Attained the Living Wage	56%	66%	69%

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

Non-Community College Supply:

To comprehensively analyze the regional supply, it is crucial to include data from other institutions offering computer networking programs. Exhibit 13 displays the annual and two-year average awards granted by these institutions under 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)
- Computer Systems Networking and Telecommunications (11.0901)
- Network and System Administration/Administrator (11.1001)
- Computer and Information Systems Security/Auditing/Information Assurance (11.1003)
- Computer Support Specialist (11.1006)

No metrics were available for the following CIP Codes: Computer Systems Analysis (11.0501) and Cloud Computing (11.0902). The available data covers 2019 to 2021. During this period, non-community college institutions in the region conferred an average of 5,401 awards annually in related programs.

Exhibit 13: Regional Non-Community College Awards, 2019-2021

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	21
		Los Angeles Pacific College	6	2	4
		Loyola Marymount University	27	47	37
		Mount Saint Mary's University	0	0	0
		Pacific States University	2	2	2
		Pitzer College	0	1	1
		The Master's University and Seminary	11	5	8
		University of California-Irvine	4	1	3
		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	4	2
		Supply Subtotal/Average	**345**	**474**	**410**
11.0103	Information Technology	Bethesda University	0	0	0
		Brand College	13	17	15
		California Intercontinental University	2	0	1
		California State Polytechnic University-Pomona	0	16	8
		California State University-Dominguez Hills	4	10	7
		California State University-Fullerton	58	62	60
		California State University-Los Angeles	214	146	180
		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	3
		Westcliff University	0	3	2
		Supply Subtotal/Average	**349**	**331**	**340**
11.0201	Computer Programming / Programmer, General	ABCO Technology	46	34	40
		Platt College-Anaheim	4	0	2
		Supply Subtotal/Average	**50**	**34**	**42**
11.0701	Computer Science	Biola University	18	19	19
		California Institute of Technology	73	84	79
		California State Polytechnic University-Pomona	266	297	282

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
		California State University-Dominguez Hills	77	90	84
		California State University-Fullerton	365	397	381
		California State University-Long Beach	316	304	310
		California State University-Los Angeles	177	182	180
		California State University-Northridge	172	228	200
		Chapman University	30	45	38
		Claremont McKenna College	35	17	26
		Harvey Mudd College	47	48	48
		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	9
		The Master's University and Seminary	0	0	0
		University of California-Irvine	897	1,007	952
		University of California-Los Angeles	437	504	471
		University of Southern California	1,273	1,386	1,330
		Supply Subtotal/Average	**4,266**	**4,676**	**4,471**
11.0901	Computer Systems	Brand College	2	0	1
		PCI College	0	0	0

CIP Code	Program	College	2019-2020 Awards	2020-2021 Awards	2-Year Award Average
	Networking and Telecommunications	University of California-Irvine	26	20	23
		University of Southern California	1	3	2
		Supply Subtotal/Average	**29**	**23**	**26**
11.1001	Network and System Administration / Administrator	ABCO Technology	25	40	33
		Brand College	9	16	13
		California Intercontinental University	1	1	1
		Supply Subtotal/Average	**35**	**57**	**46**
11.1003	Computer and Information Systems Security / Auditing/ Information Assurance	Azusa Pacific University	0	0	0
		California State University-Dominguez Hills	19	8	14
		Learnet Academy Inc	5	4	5
		Loyola Marymount University	0	0	0
		University of La Verne	0	0	0
		University of Southern California	25	29	27
		Supply Subtotal/Average	**49**	**41**	**45**
11.1006	Computer Support Specialist	Southern California Institute of Technology	26	17	22
		Supply Subtotal/Average	**26**	**17**	**22**
		Supply Total/Average	**5,149**	**5,653**	**5,401**

Regional Demographics

This section examines demographic data for Orange County community college students in computer networking programs compared to the OC population, along with occupational data, to identify potential diversity and equity issues addressable by community college programs.

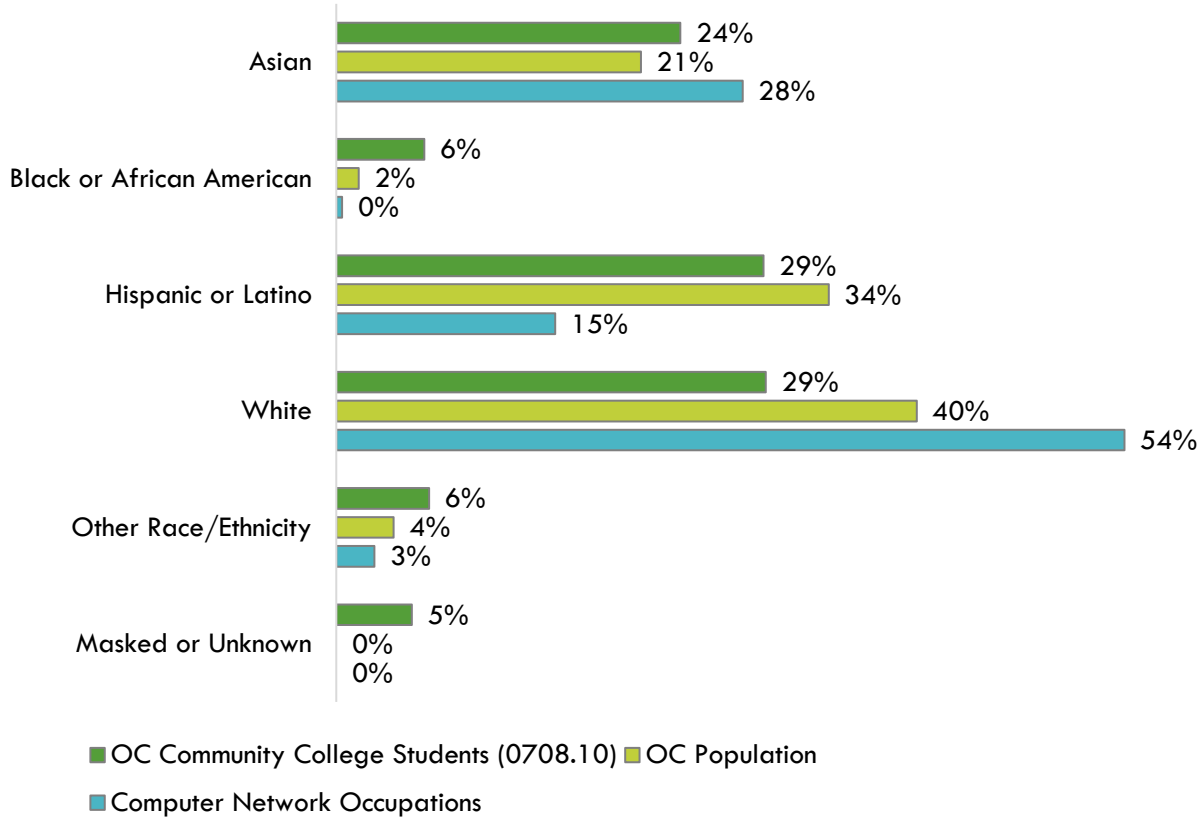
Ethnicity:

Exhibit 14 compares the ethnicity of Orange County community college students enrolled in computer networking programs, the overall Orange County population, and occupation-specific data for the three computer network occupations included in this report.

The majority (54%) of workers in these occupations are white, which is higher than their representation in the county's population (40%) and almost double their share of community college computer networking students (29%). Conversely, while Hispanic or Latino students (29%) and the county population (34%) relatively align, their share of workers in the field is only 15%. In addition, while Black or African American individuals represent 2% of the county population and 6% of community college computer networking student, they account for only 0.4% of all workers in the field.

Examining disaggregated data for each occupation (not shown), white individuals represent more than half of all workers in each of the three occupations: *computer network support specialists* (51%), *computer network architects* (53%), and *network and computer systems administrators* (58%). The occupation with the highest percentage of Hispanic or Latino workers is *network and computer systems administrators* (19%), which has the second highest entry-level wages of all three computer networking occupations. C*omputer network architects* has the highest percentage of Asian workers (33%). This occupation also has the highest entry-level wages of all three computer network occupations.

Exhibit 14: Program and County Demographics by Ethnicity



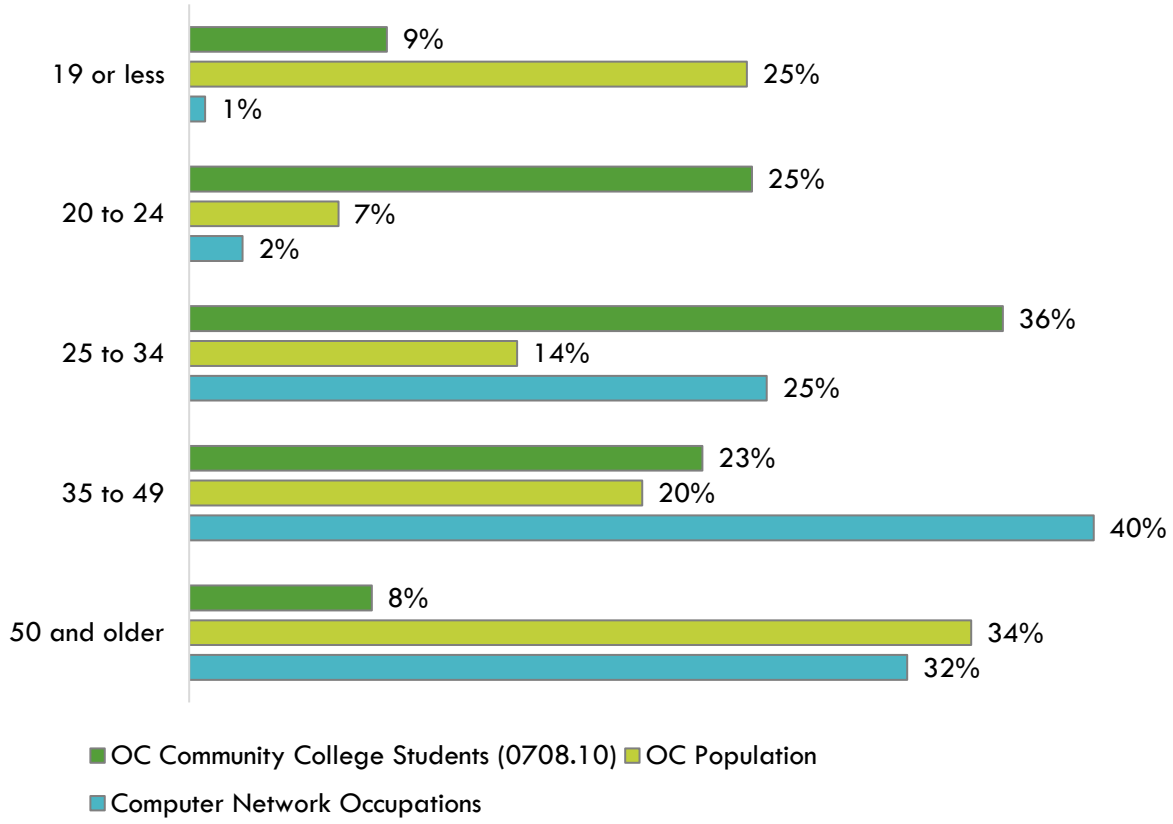
Age:

Exhibit 15 compares the age of Orange County community college students enrolled in computer networking programs, the overall Orange County population, and occupation-specific data for the three computer network occupations included in this report.

Individuals 35 to 49 account for 40% of workers in these computer network occupations, double their share of the population (20%) and higher than their representation among community college computer network students (23%). Conversely, the majority of community college computer network students (61%) are 20 to 34, yet this age group only represent 21% of the population and 27% of workers in the field.

Examining disaggregated data for each occupation (not shown), the occupation with the highest percentage of workers aged 35 to 34 is *computer network support specialists* (33%), followed closely by *network and computer systems administrators* (32%). *Computer network support specialists* has the lowest entry-level wages and education requirements of the three computer network occupations, whereas *network and computer systems administrators* has the second highest entry-level wages and requires a bachelor's degree as the typical entry-level education requirement. *Computer network architects* has the highest of workers aged 35 to 49. This occupation also has the highest entry-level wages of all three computer network occupations.

Exhibit 15: Program and County Demographics by Age

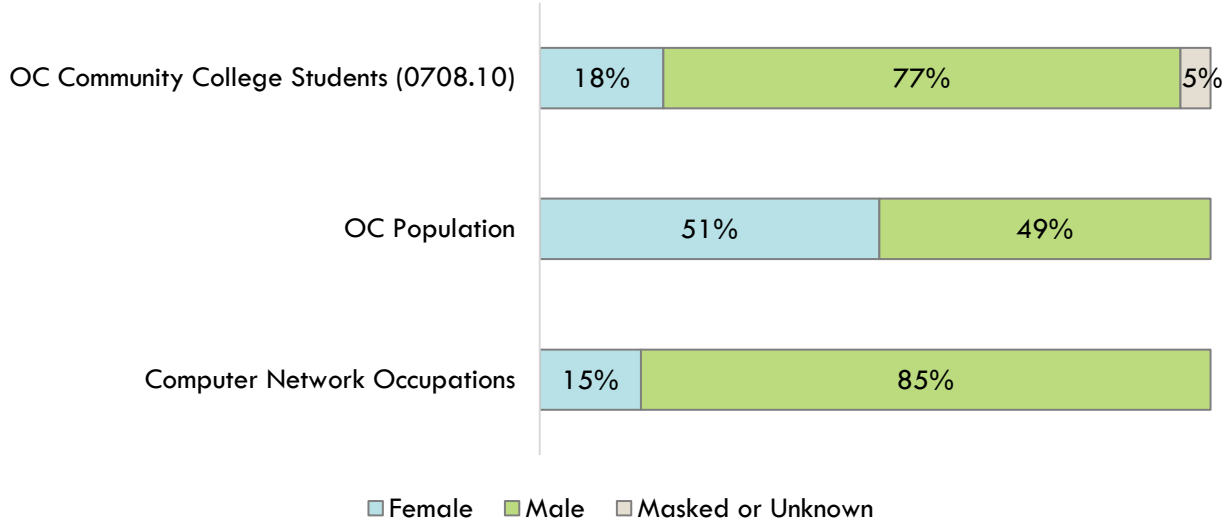


Sex:

Exhibit 16 compares the sex of Orange County community college students enrolled in computer networking programs, the overall Orange County population, and occupation-specific data for these computer network occupations.

Though the population is largely split evenly between men and women, only 18% of community college computer networking students and 15% of workers in these three occupations are women. When examining disaggregated data for each occupation (not shown), men represent a vast majority of workers across all occupations: *computer network support specialists* (84%), *computer network architects* (88%), and *network and computer systems administrators* (82%). The occupation with the highest percentage of women is *network and computer systems administrators* (18%). This occupation has the second highest entry-level wages and requires a bachelor's degree as the typical entry-level education requirement.

Exhibit 16: 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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FOR LABOR MARKET RESEARCH

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