

LIFE SCIENCES & BIOTECHNOLOGY



Orange County Sector Analysis Project

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Prepared by:
Orange County Center of Excellence
for Labor Market Research

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Orange County Community Colleges

LIFE SCIENCES AND BIOTECHNOLOGY

Demand and Supply Analysis: Orange County

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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 college/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.

INTRODUCTION

This sector brief is a product of the Orange County Sector Analysis Project. It provides information about the Life Sciences and Biotechnology sector in Orange County, one of Orange County's two emerging sectors; it compares labor market demand with educational program supply for middle-skill jobs and provides qualitative information from experts in the field. Orange County community colleges could use the information in this report for strategic planning and discussions about program development, career pathways work, sector strategies, noncredit-to-credit pipelines, apprenticeship programs, and work-based learning opportunities.

All of the Orange County Sector Analysis Project briefs began with quantitative labor market demand and supply analysis; however, they also include qualitative information derived from the project's focus group discussions. Between July and August 2019, the Orange County Center of Excellence for Labor Market Research (COE) hosted a total of 12 sector-specific focus groups with regional stakeholders, including faculty and deans, as well as regional and state directors for employer engagement. One of these focus groups was specific to the Life Sciences and Biotechnology sector. The objectives of the focus groups were to identify labor market supply gaps (supply gaps) in middle-skill jobs; understand where programs exist or do not exist to fill in the supply gaps; and discuss how Orange County's community colleges could close the supply gaps. Focus group participants reviewed the demand and supply analysis prior to meeting and provided intelligence regarding how they are working to close supply gaps as well as the challenges they encounter in their programs; this valuable information could not be captured via traditional labor market research methods. The COE recorded then analyzed these discussions which resulted in the "Focus Group Insights" sections throughout this brief, supplementing traditional, quantitative labor market data with important, qualitative information.

Middle-Skill Jobs and Living Wage Introduction

In this brief, 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.

In this brief, top middle-skill jobs are defined as jobs that have both the most labor market demand (annual job openings) and entry-level wages at or above the California Family Needs Calculator¹ (commonly known as a "living wage"). The living wage is the hourly wage that a single adult needs to earn in order to meet basic needs in Orange County, and is currently \$17.39 per hour. The living wage is defined by the California Family Needs Calculator, which calculates the income necessary to cover costs including housing, food, transportation, health care, and other basic necessities.

Entry-level wage is defined as the 25th percentile hourly wage, which means that 25% of all workers in that occupation earn equal to or below this amount. Percentile wages represent the distribution of wages for each occupation. Generally, workers with minimal education and experience can expect to earn wages near the 10th percentile. With the additional education and training students receive in community college programs, they are more likely to earn wages at the 25th percentile, rather than the 10th percentile. Generally, with even more education and experience, students could expect to progress and earn the median wage, which is defined as the 50th percentile hourly wage.

Demand Introduction

For the purpose of this report, labor market demand is determined by the number of annual job openings employers expect to fill due to job growth and employee turnover between 2018 and 2023. Job growth is when an employer experiences increased demand for products and hires new employees to increase production, while employee turnover is when an employer hires replacement workers for employees who leave the workforce or change occupations.

Supply Introduction

Supply is determined by the average annual-number of related awards (e.g., certificates, degrees) generated between 2015 and 2017 by the region's community colleges and other educational institutions (e.g., private providers) for the purpose of this

¹ <https://insightccd.org/2018-family-needs-calculator/>

report. However, it should be noted that a student may earn more than one award; therefore, supply may be overestimated for certain occupations.

Whether or not there is a supply gap is determined by the difference between the demand and supply. The methodology regarding how these numbers are calculated is described in Appendix A.

FOCUS GROUP INSIGHTS

The Life Sciences and Biotechnology sector focus group included three faculty members and two administrators from three of the four community colleges that offered Life Sciences and Biotechnology programs in Orange County between 2015 and 2017. Both the statewide and regional director for employer engagement also attended the focus group. Life Sciences and Biotechnology is a relatively new sector for community colleges and is, by number of occupations, the smallest sector of all eight priority and emerging sectors.

The occupations in this brief do not match the occupations reported in 2017's statewide "Supply and Demand Analysis: Life Sciences & Biotech Middle Skills Workforce in California" report due to differing methodology.² This sector brief focuses on middle-skill occupations, while the statewide report included "pathway" occupations that would require at least a bachelor's degree or significant experience to gain employment. While several of the occupations analyzed in the statewide report may not meet the middle-skill definition used in this report, it is important to acknowledge them because prior work has been done to identify other occupations that are relevant to the Life Sciences and Biotechnology sector.

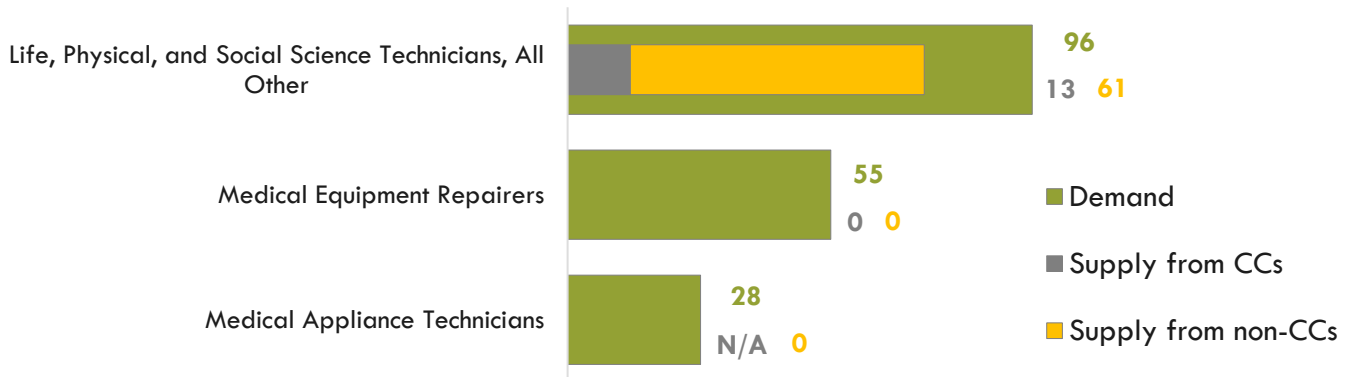
Focus group participants identified several data limitations, challenges in expanding programs, and other issues that were common across multiple sectors. The cross-sector, common themes are expanded on and explained in further detail in the standalone Orange County Sector Analysis Project Executive Summary report. Focus group participants also reported on limitations and challenges that were unique to the Life Sciences and Biotechnology sector. This sector-specific information is highlighted throughout this report in the Focus Group Insights and the Focus Group Insights – The Big Picture sections.

² coeccc.net/reports/Life_Sciences_Biotech_Middle_Skills_Workforce_1_1

LIFE SCIENCES AND BIOTECHNOLOGY TOP MIDDLE-SKILL JOBS

This section compares Orange County's labor market demand for the top middle-skill jobs in Life Sciences and Biotechnology with program supply from the region's community colleges and non-community college providers (Exhibit 1). As seen in Exhibit 2, the entry-level wages³ for these top middle-skill jobs are higher than the \$17.39 per hour living wage. Descriptions for each occupational title can be found in Appendix B. Detailed supply and demand data analyzed for each occupation, including supply numbers by institutions is included in Appendix C.

**Exhibit 1. Life Sciences and Biotechnology Top Middle-Skill Jobs in Orange County:
Labor Market Demand vs. Program Supply**



(Please note: N/A indicates that no community college program reported awards for this occupation or no community college program is available for this occupation.)

FOCUS GROUP INSIGHTS

Occupational Titles and Data Definitions

This sector brief uses occupational titles from the Standard Occupational Classification (SOC) system in the demand and supply exhibits, as identified and defined in Appendix B. While standardized occupational titles are useful for classifying, collecting, and disseminating data in general, they may not be the exact job titles used by employers. According to the focus group discussion, companies often have "job titles" that are different than SOC occupational titles. While job descriptions may be similar, actual job titles differ from organization to organization, and employers may not provide accurate information about SOC occupational titles, especially if they do not match their company's job titles. This inconsistency highlights a shortcoming of the SOC system and could provide a challenge when attempting to validate data with employers.

Local Low-Unit Certificates

The Life Sciences and Biotechnology sector focus group participants felt that supply data from traditional labor market information is limited; it does not capture locally issued low-unit certificates that are not reported to, or approved by, the California Community Colleges Chancellor's Office (CCCCO). According to focus group participants, Life Sciences and Biotechnology programs primarily attract industry professionals who are interested in upskilling or learning new skills for their current jobs. However, the supply data does not capture students that take a small number of courses to gain additional skills if colleges do not report data for low-unit certificate programs. This could result in an under-reporting of the supply number.

"There was nothing [courses in this sector] back in 2012 and we started to build from there. We're seeing an uptick in enrollment, but it takes a while for people to realize what you're offering."
—Santiago Canyon College Faculty Member

³ In this report, entry-level wage is defined as the 25th percentile hourly wage, which means that 25% of all workers in the field earn equal to or below this amount. Generally, workers with less experience earn lower wages.

Low Completion Numbers

According to the demand and supply exhibits in this brief, the community colleges in Orange County are undersupplying for both top middle-skill jobs and jobs that have entry-level wages below the California Family Needs Calculator (CFNC), but median wages above the CFNC within this sector, as shown in the next section of this brief. According to the CCCC's dashboard tool, LaunchBoard⁴, 379 (unduplicated) students took one or more courses in Life Sciences and Biotechnology programs in the 2016-17 program year in Orange County. However, in that same year, only 21 students earned a certificate or degree. Focus group participants provided the explanations below as to why supply numbers are so low:

- Students sometimes do not know that they have to complete and submit paperwork in order to earn their award. Multiple faculty members said they have set aside class time for students to complete the necessary paperwork, then either walk the students to the appropriate office to submit their paperwork or in some cases, even submit themselves.
- The majority of community college students take courses part-time; therefore, they may take longer to complete certificates than full-time students. The focus group participants felt that the longer a student stays in a program, the lower the chance the student will complete the program.

"A lot of students aren't aware that they have to file paperwork to get their award. I set aside class time for students to fill out the necessary paperwork then walk it over to the graduation office."

– Santa Ana College Faculty Member

Exhibit 2. Life Sciences and Biotechnology Top Middle-Skill Jobs in Orange County: Entry-Level and Median Wages

SOC Code	SOC (Occupational) Title	Demand (Annual Openings)	Entry-Level Wage (25 th Percentile)	Median Wage
19-4099	Life, Physical, and Social Science Technicians, All Other	96	\$17.45	\$23.32
49-9062	Medical Equipment Repairers	55	\$18.31	\$22.61
51-9082	Medical Appliance Technicians	28	\$18.56	\$24.52

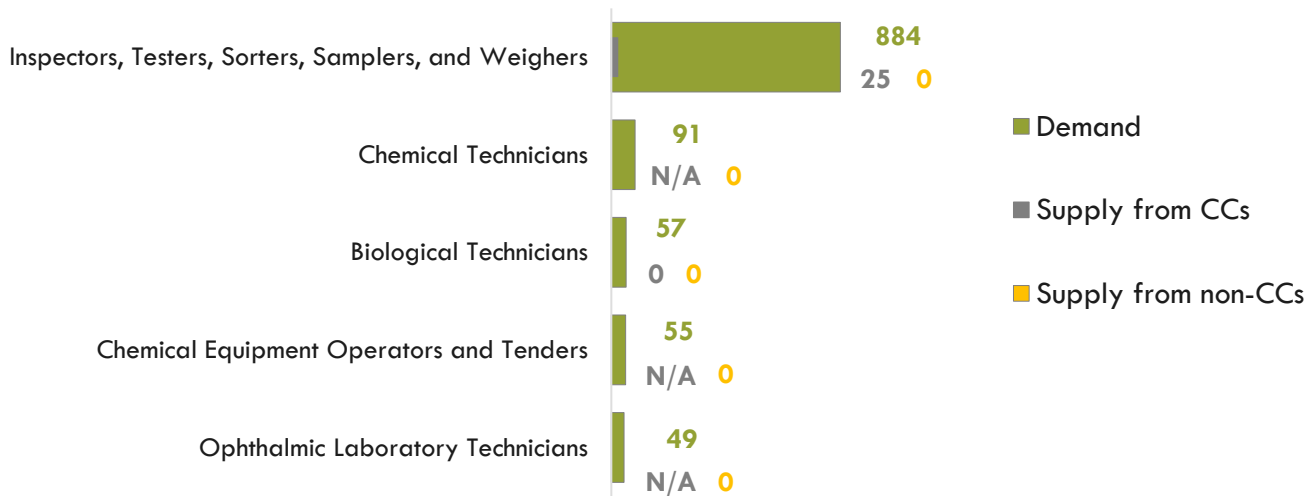
⁴ calpassplus.org/Launchboard/Community-College-Pipeline.aspx

LIFE SCIENCES AND BIOTECHNOLOGY MIDDLE-SKILL JOBS WITH ENTRY-LEVEL WAGES BELOW CALIFORNIA FAMILY NEEDS CALCULATOR

While it is important to understand which top middle-skill jobs have opportunities for increased program supply, it is also important to consider middle-skill occupations that have entry-level wages below the regional living wage but median wages near or above it. Since wages generally increase from entry-level to median earnings with additional experience and training, students could potentially earn self-sustaining wages with additional apprenticeship or work-based learning opportunities.

As seen in Exhibit 3, middle-skill Life Sciences and Biotechnology jobs with entry-level wages below the regional living wage have a significant number of annual job openings (labor market demand).

Exhibit 3. Life Sciences and Biotechnology Middle-Skill Jobs with Entry-Level Wages Below the California Family Needs Calculator in Orange County: Labor Market Demand vs. Program Supply



(Please note: N/A indicates that no community college program reported awards for this occupation or no community college program is available for this occupation.)

While these occupations have entry-level wages below the \$17.39 per hour California Family Needs Calculator, occupations such as Inspectors, Testers, Sorters, Samplers, and Weighers; Chemical Technicians; Biological Technicians; and Ophthalmic Laboratory Technicians have median wages higher than the regional living wage, as denoted by the gray shading in Exhibit 4.

Exhibit 4. Life Sciences and Biotechnology Middle-Skill Jobs with Entry-Level Earnings Below the California Family Needs Calculator in Orange County: Entry-Level and Median Wages

SOC Code	SOC (Occupational) Title	Demand (Annual Openings)	Entry-Level Wage (25 th Percentile)	Median Wage
51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	884	\$14.46	\$18.78
19-4031	Chemical Technicians	91	\$16.64	\$19.40
51-9011	Chemical Equipment Operators and Tenders	55	\$12.46	\$16.85
19-4021	Biological Technicians	57	\$16.88	\$19.57
51-9083	Ophthalmic Laboratory Technicians	49	\$14.87	\$17.44

FOCUS GROUP INSIGHTS – THE BIG PICTURE

Focus group participants addressed other issues and challenges that cannot be captured by traditional labor market information and provided insight on the tactics colleges and employers are currently using to address supply gaps in the Life Sciences and Biotechnology sector.

How Employers are Filling Supply Gaps

Focus group participants across all sectors reported that employers recruit heavily at four-year colleges for potential workers, even if a position does not require a bachelor's degree. In the Life Sciences and Biotechnology focus group, participants noted that there is anecdotal evidence that students taking community college courses tend to have stronger lab skills than their four-year college counterparts, who tend to have good theoretical knowledge, but limited lab skills. Faculty members shared that, in their experience, some technical skills are not taught at the four-year level. Participants shared that employers utilize staffing agencies in order to meet their workforce needs because they pre-screen candidates and provide a low-risk, fast-moving, pipeline of workers for companies.

Employer Engagement

Faculty from multiple colleges noted that they are working to connect students with employers that have a need for qualified workers. However, they shared that developing and maintaining continuous relationships with industry partners is time consuming and difficult. In their experience, oftentimes, companies are not interested in partnering with community colleges for new programs because of the long program approval periods and additional time it would take for students to complete the program.

Skills and Certifications

According to the focus group participants, many skills taught in community college Life Sciences and Biotechnology programs are transferable and are not exclusive to a single/particular job. For example, they shared that many skills taught in programs for quality assurance or quality control jobs can be used in other sectors (e.g., the food and beverage industry), and not only in the Life Sciences and Biotech sector.

Certifications are another way to demonstrate skill attainment according to focus group participants. Faculty members indicated that they are starting to train students for certifications such as Certified Quality Improvement Associate (CQIA) and are exploring other certifications such as Lean Six Sigma. However, faculty members noted that many students are either not able or willing to pay the high fee for the exams. Focus group participants reported that the American Society for Quality (ASQ), the certifying body for CQIA, does not accept vouchers, so colleges cannot help students pay for the exam.

Challenges in Expanding Programs

Focus group participants identified several challenges to expanding programs in the Life Sciences and Biotechnology sector. Many of these challenges, including the lack of dedicated lab space, difficulty hiring faculty and staff, and high costs for equipment, cut across all sectors. However, a unique challenge for the Life Sciences and Biotechnology sector is the difficulty in finding dual enrollment partners and integrating the K-12 system into a pathway. Focus group participants said that local high schools seem interested in a pathway for their students, but additional marketing and recruiting is needed to attract students, particularly because of the emerging nature of this sector.

“Dual enrollment is also a way to get the word out early and help students understand the sector earlier, but it will take time for programs to develop.”

— Fullerton College Faculty Member

KEY FINDINGS: LIFE SCIENCES AND BIOTECHNOLOGY

Based on the demand and supply data, as well as the focus group insights analyzed in this brief, the COE identified the following key research findings and recommendations:

Demand and Supply

1,315	99	1,216
annual job openings (labor market demand)	average annual program awards (labor market supply)	supply gap (number of awards needed to close the gap)

Focus Group Key Findings and Recommendations

Key Finding	Recommendation
<p>1. Employers in this sector heavily recruit from four-year colleges, even if a position does not require a bachelor's degree: Even though employers tend to have a preference to hire students from four-year colleges, there is anecdotal evidence that students taking community college course have stronger lab skills than their four-year college counterparts. Additionally, some technical lab skills are not typically taught at four-year colleges, where training tends to be more theoretical.</p>	<p>1. To break down the bachelor's degree requirement with employers, the Regional Director for Employer Engagement and internship coordinators at each college could work with employers to show how Orange County community colleges are preparing students to meet employers' demand for qualified workers.</p>
<p>2. Life Sciences and Biotechnology is a relatively new sector and attracting young students is difficult: Programs in this sector have historically attracted working professionals that are adding additional skills to advance in their current job. Because of the emerging nature of this sector, high school students are not always aware of Life Sciences and Biotechnology jobs and opportunities. Finding dual enrollment partners and integrating the K-12 system into a pathway has been difficult.</p>	<p>2. To raise awareness, attract younger students to community college programs, and increase enrollments in this sector, colleges could intentionally promote programs to targeted audiences such as K-12 students, career counselors, and K-12 partners. These efforts could help make high school students aware of Life Sciences and Biotechnology programs at the community colleges and create a potential pipeline of students to increase enrollment.</p>
<p>3. Knowledge, Skills, and Abilities (KSAs) for the sector have not been validated by employers: The OC Sector Analysis Project brief examines job gaps but does not explore the specific KSAs taught at the colleges and compare them to the labor market's demand for Life Sciences and Biotechnology KSAs.</p>	<p>3. To determine if the region's community colleges are training for the right KSAs, the Life Sciences and Biotechnology Regional Director for Employer Engagement should convene employers in a "regional advisory group" where employers can review program KSAs, provide feedback, and validate the KSAs' current relevance and demand in the labor market.</p>

APPENDIX A: METHODOLOGY AND LIFE SCIENCES AND BIOTECHNOLOGY DATA DEFINITIONS

The Centers of Excellence for Labor Market Research (COE) prepared this report by analyzing data from occupations and education programs. Occupational data is derived from Emsi, a software program 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).

The California Community Colleges (CCC) define “sectors” by TOP codes. To determine what occupations should be analyzed in this brief, the COE first reviewed the TOP codes associated with the sector and then matched them with the SOC codes. According to the CCC, the following six-digit TOP codes define the Life Sciences and Biotechnology sector:

TOP6 Program Name	TOP6 Code
Biomedical Instrumentation	0934.60
Biotechnology and Biomedical Technology	0430.00
Chemical Technology	0954.00
Electron Microscopy	0934.70
Laboratory Science Technology	0955.00

Using a TOP-SOC crosswalk, the COE then identified middle-skill jobs for which programs within these TOP codes train. The COE examined more than 850 occupational codes from the Standard Occupational Classification (SOC)⁵ system and identified approximately 300 occupational codes as middle-skill jobs.

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.

For this study, the COE analyzed occupations with a labor market demand of at least 28 annual job openings, which is less than the 50 annual openings threshold used in the seven other sectors. Life Sciences and Biotechnology is the smallest of all eight sectors and has a lower number of annual openings compared to those sectors. If the same 50 annual job openings threshold was used, there would have been only six occupations to analyze. (For comparison, the average and median demand for an occupation in Orange County is 307 and 63 annual job openings, respectively.)⁶ The number of annual job openings estimates employment change and turnover for an occupation each year between 2018 and 2023. Annual job openings include:

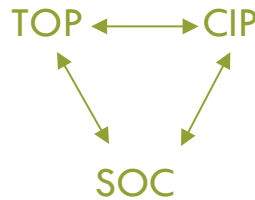
- Job Growth: An employer experiences increased demand for products and hires new employees to increase production. If job growth is zero or negative, then any and all openings are due to replacement needs.

⁵ SOC is a federal statistical standard used by EDD, BLS and other federal agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data.

⁶ Emsi. Data set 2019.2. QCEW Employees + Non-QCEW + Self-Employed. 2018-2023.

- **Replacement Needs:** An employer hires replacement workers for employees who leave the workforce or change occupations. Replacement rates are derived from national 10-year, occupation-specific percentages published by the U.S. BLS's Employment Projections program.

The COE then cross-referenced the SOC codes with CIP and TOP codes to compare labor market demand with program supply. The following diagram illustrates this process:



The 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 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), 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.

Because a TOP/CIP code may train for more than one occupation, simply aggregating all supply from all related codes may overestimate supply for an occupation. Therefore, the COE de-duplicated TOP codes that trained for more than one occupation to avoid counting the program supply more than once. Doing so provides a more accurate representation of the supply gaps in the region by occupation. This information can be seen in the demand and supply tables in Appendix C of this study.

Qualitative Methodology

An integral aspect of the Orange County Sector Analysis Project was the qualitative data collected during the project’s focus groups. In May 2019, the COE created an advisory group comprised of the Orange County Regional Consortium Director as well as five CTE deans and directors that represented the four community college districts in Orange County. The advisory group created a process and timeline for inviting faculty and administrators to participate in focus groups to better understand where programs exist or do not exist to fill supply gaps and discuss how Orange County’s community colleges could close the supply gaps for the county’s eight priority and emerging sectors.

To create the invite list of faculty and administrators, Regional Directors for Employer Engagement and career education deans at each college were asked to identify faculty and administrators that could represent their respective colleges in the sector-specific focus groups. Once this list was compiled, the career education deans invited faculty and administrators to express their interest in participating in a focus group via email. The email introduced the COE, provided an overview of the Orange County Sector Analysis Project, described the goals of the focus groups, and informed faculty that they would be compensated for their participation, and that lunch would be provided for all participants. All those that stated their interest were then connected with the COE who managed the focus groups scheduling and details.

In order to be as inclusive as possible, 12 focus groups were scheduled for the eight sectors – four sectors had one focus group each and four sectors had two focus groups each, during a three-week period from July to August 2019. All focus groups participants received a confirmation email before the event that included the focus group agenda, their sector-specific draft brief, and a pre-assignment with questions based off of the information contained in the draft sector briefs. Focus group participants were instructed to complete and bring the pre-assignment to the convening so

that they were prepared to discuss the data, the challenges they face in their programs, and strategies to close supply gaps. Each focus groups was recorded, with permission of the participants, by the COE solely for transcription purposes.

The COE conducted no more than two focus group sessions per day. During the focus groups the Orange County Sector Analysis Project was explained and then the information contained in the draft sector briefs was presented in detail. Participants were encouraged to ask questions and engage in dialogue throughout the entire focus group session. The COE took notes of each discussion as well as recorded the sessions, with permission of the participants and solely for transcription purposes.

Following the conclusion of the focus groups, the COE compiled the audio files, transcripts, notes, and pre-assignments to conduct a qualitative analysis of the themes for each focus group and to identify commonalities across multiple focus groups. The findings from this analysis have been highlighted throughout this report in the “Focus Group Insight” sections.

APPENDIX B: DEFINITIONS FOR LIFE SCIENCES AND BIOTECHNOLOGY MIDDLE-SKILL JOBS

The following definitions and sample job titles for each occupation are derived from O*NET, the nation's primary source of occupational information. The O*NET database contains hundreds of standardized and occupation-specific descriptors on nearly 1,000 occupations. O*NET is developed and sponsored by the U.S. Department of Labor⁷

Biological Technicians (19-4021): Assist biological and medical scientists in laboratories. Set up, operate, and maintain laboratory instruments and equipment, monitor experiments, make observations, and calculate and record results. May analyze organic substances, such as blood, food, and drugs. Sample job titles include:

- Biological Science Laboratory Technician
- Biological Science Technician
- Laboratory Technician

Chemical Equipment Operators and Tenders (51-9011): Operate or tend equipment to control chemical changes or reactions in the processing of industrial or consumer products. Equipment used includes devulcanizers, steam-jacketed kettles, and reactor vessels. Sample job titles include:

- Chemical Operator
- Production Operator
- Production Technician

Chemical Technicians (19-4031): Conduct chemical and physical laboratory tests to assist scientists in making qualitative and quantitative analyses of solids, liquids, and gaseous materials for research and development of new products or processes, quality control, maintenance of environmental standards, and other work involving experimental, theoretical, or practical application of chemistry and related sciences. Sample job titles include:

- Chemical Analyst
- Laboratory Analyst
- Formulation Technician

Inspectors, Testers, Sorters, Samplers, and Weighers (51-9061): Inspect, test, sort, sample, or weigh nonagricultural raw materials or processed, machined, fabricated, or assembled parts or products for defects, wear, and deviations from specifications. May use precision measuring instruments and complex test equipment. Sample job titles include:

- Inspector, Picker/Packer
- Quality Assurance Auditor
- Quality Assurance Inspector
- Quality Control Inspector
- Quality Control Technician
- Quality Inspector/Technician

Life, Physical, and Social Science Technicians, All Other (19-4099): All life, physical, and social science technicians not listed separately. For the purpose of this brief, the selected middle-skill job for the Life Sciences sector is:

- **Quality Control Analysts (19-4099.01):** Conduct tests to determine quality of raw materials, bulk intermediate and finished products. May conduct stability sample tests. Sample job titles include:
 - Analyst Microbiology Lab
 - Analytical Lab Analyst
 - Quality Control Technician
 - Quality Control Analyst
 - Quality Assurance Technician

Medical Appliance Technicians (51-9082): Construct, fit, maintain, or repair medical supportive devices, such as braces, orthotics and prosthetic devices, joints, arch supports, and other surgical and medical appliances. Sample job titles include:

- Hearing Aid Repair Technician
- Prosthetic Technician
- Certified Pedorthotist

⁷ <https://www.onetonline.org/>

Medical Equipment Repairers (49-9062): Test, adjust, or repair biomedical or electromedical equipment. Sample job titles include:

- Bio Medical Technician
- Biomedical Equipment Technician
- Biomedical Electronics Technician
- Biomedical Engineering Technician

Ophthalmic Laboratory Technicians (51-9083): Cut, grind, and polish eyeglasses, contact lenses, or other precision optical elements. Assemble and mount lenses into frames or process other optical elements. Includes precision lens polishers or grinders, centerer-edgers, and lens mounters. Sample job titles include:

- Edger Technician
- Finishing Lab Technician
- Optical Lab Technician

APPENDIX C: LIFE SCIENCES AND BIOTECHNOLOGY DEMAND AND SUPPLY DATA

The following tables compare labor market demand and program supply by occupation, and are the underlying information for the exhibits in this brief. Because a TOP/CIP code may train for more than one occupation, simply aggregating all supply from all related codes may overestimate supply for that occupation. Therefore, the COE de-duplicated TOP codes that train for more than one occupation to avoid counting program supply more than once. This de-duplication process is denoted by the “Already Accounted For” statements in the tables on the following pages.

Additionally, the COE reviewed program data from the LaunchBoard⁸ and the statewide COE Supply Table⁹ and identified conflicting information. For certain occupations, LaunchBoard indicates that a college has a program for that occupation, but the COE Supply Table does not show program data for that college, and vice versa. These discrepancies are marked with the following:

+ The COE Supply Table indicates that this college supplies awards for this TOP code, but this college is not listed in the LaunchBoard

* LaunchBoard indicates that this college/school supplies awards for this TOP code, but this college is not listed in COE Supply Table

The COE provided these markings for the community colleges in the region to review potential miscoded programs at their respective colleges.

The demand and supply tables in the following pages have three categories:

1. **Supply Gap** – If Average Annual Openings exceed Average Annual Awards by more than 25 percent, then the cell is shaded in green.
2. **Supply Met** – If Average Annual Openings is within 25 percent +/- of Average Annual Awards, then the cell is shaded in blue.
3. **Oversupply** – If Average Annual Awards exceed the Average Annual Openings by more than 25 percent, then the cell is shaded in red.

⁸ calpassplus.org/LaunchBoard/Home.aspx

⁹ coeccc.net/COE/media/SupplyandDemandPageDocuments/Supply-2014-17_Feb-2018.xlsm

DEMAND AND SUPPLY DATA FOR TOP LIFE SCIENCES AND BIOTECHNOLOGY MIDDLE-SKILL JOBS IN ORANGE COUNTY

+ The COE Supply Table indicates that this college/school supplies awards for this TOP code, but this college is not listed in the LaunchBoard

* LaunchBoard indicates that this college/school supplies awards for this TOP code, but this college is not listed in COE Supply Table

OCCUPATIONAL TITLE	AVERAGE ANNUAL OPENINGS (2018-23)	SUPPLY GAP/ SUPPLY MET/ OVERSUPPLY	AVERAGE ANNUAL AWARDS (2015-17)	TOP6 TITLE	TOP6 OR CIP	COLLEGE	COLLEGE SUPPLY (3-YR AVG)
Life, Physical, and Social Science Technicians, All Other	96	Supply Gap	74	Biotechnology and Biomedical Technology	0430.00	Fullerton	3
						Irvine	3
						Santa Ana	5
						Santiago Canyon	2
					CIP 15.0401	Southern California Institute of Technology	61
Medical Equipment Repairers	55	Supply Gap	0	Biotechnology and Biomedical Technology	0430.00	Already Accounted For	0
					CIP 15.0401	Already Accounted For	0
				Biomedical Instrumentation	0934.60	No Programs	0
Medical Appliance Technicians	28	Supply Gap	0	N/A	N/A	N/A	0

DEMAND AND SUPPLY DATA FOR LIFE SCIENCES AND BIOTECHNOLOGY MIDDLE-SKILL JOBS WITH ENTRY-LEVEL WAGES BELOW CALIFORNIA FAMILY NEEDS CALCULATOR IN ORANGE COUNTY

+The COE Supply Table indicates that this college/school supplies awards for this TOP code, but this college is not listed in the LaunchBoard

*LaunchBoard indicates that this college/school supplies awards for this TOP code, but this college is not listed in COE Supply Table

OCCUPATIONAL TITLE	AVERAGE ANNUAL OPENINGS (2018-23)	SUPPLY GAP/ SUPPLY MET/ OVERSUPPLY	AVERAGE ANNUAL AWARDS (2015-17)	TOP6 TITLE	TOP6 OR CIP	COLLEGE	COLLEGE SUPPLY (3-YR AVG)
Inspectors, Testers, Sorters, Samplers, and Weighers	884	Supply Gap	25	Biotechnology and Biomedical Technology	0430.00	Already Accounted For	0
					CIP 15.0401	Already Accounted For	0
				Laboratory Science Technology	0955.00	Fullerton+	1
				Manufacturing and Industrial Technology	0956.00	Fullerton	6
						Irvine	8
						Saddleback	6
						Santa Ana	3
						Orange Coast*	0
				Industrial Quality Control	0956.80	Santiago Canyon	1
Chemical Technicians	91	Supply Gap	0	Chemical Technology	0954.00	No Programs	0
				Laboratory Science Technology	0955.00	Already Accounted For	0
Chemical Equipment Operators and Tenders	55	Supply Gap	0	Chemical Technology	0954.00	No Programs	0
Biological Technicians	57	Supply Gap	0	Laboratory Science Technology	0955.00	Already Accounted For	0
				Biotechnology and Biomedical Technology	0430.00	Already Accounted For	0
Ophthalmic Laboratory Technicians	49	Supply Gap	0	Optics	0961.00	No Programs	0
				Optical Technology	1219.00	No Programs	0