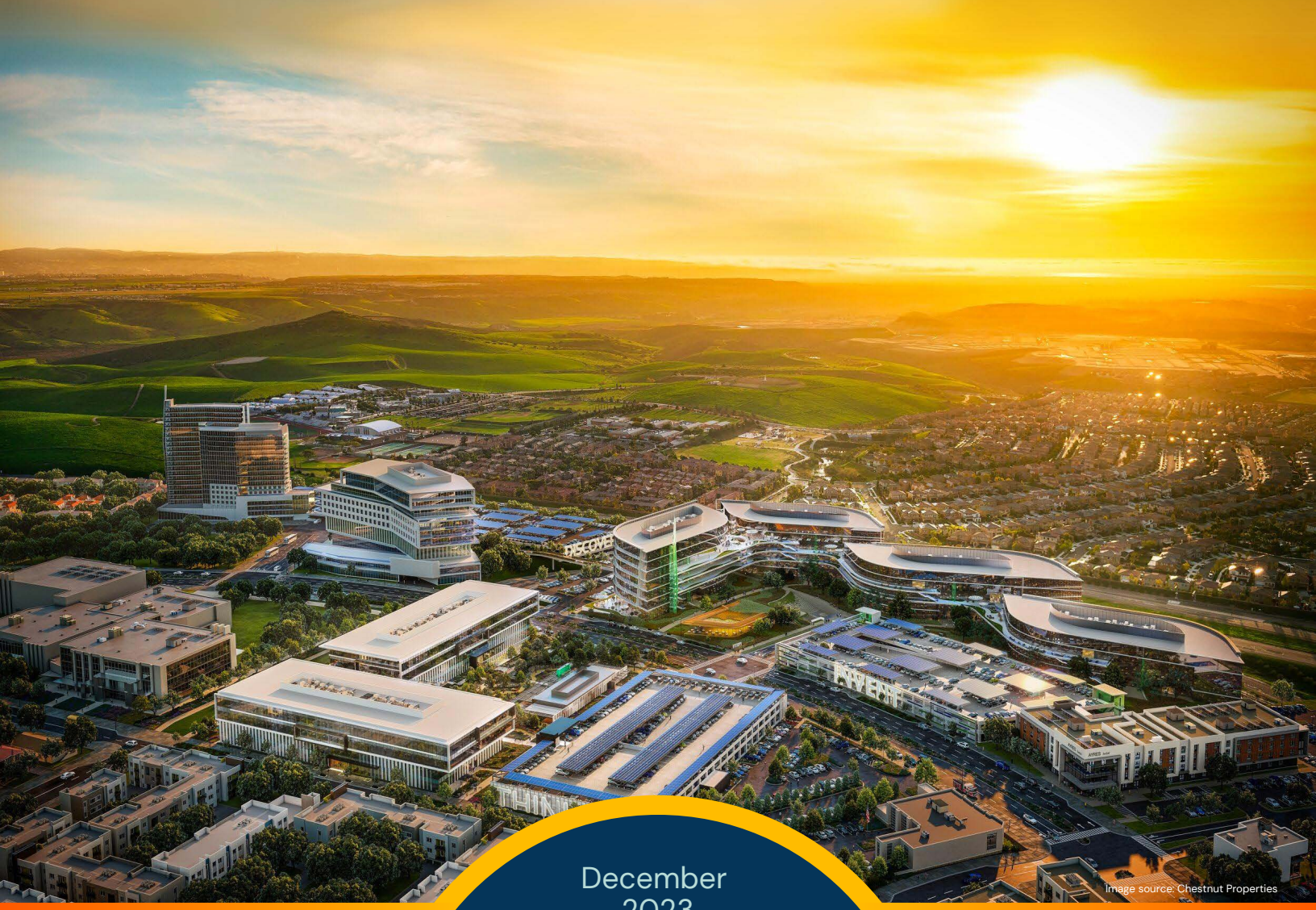



Image source: Chestnut Properties

December
2023

# Planning a Thriving Ecosystem of Higher Education in South County

*A Workforce & Education Needs Assessment*

Southwestern College | San Diego Regional Policy & Innovation Center | City of Chula Vista

# Table of Contents

# Table of Contents continued

# Executive Summary

## The Need

Chula Vista is the largest city in California without a university offering bachelor's degree programs. Local leaders have been trying to bring bachelor's degree programs to the 585,000 people living in South County since at least 1986. In 2023, the City of Chula Vista broke ground on a project that will change that. This research project identifies local workforce needs and demand for bachelor's degree programs. We draw on focus groups with business leaders across the region, a survey of employers in San Diego County, Orange County, and Baja California, Mexico, a representative-sample survey of 1,000 San Diego County residents, data from the US Census and Bureau of Labor Statistics, and data about programs from regional universities. Our analysis is designed to help the University Now Initiative (UNI) fill local gaps in higher education, differentiate themselves from other regional higher education offerings, and tailor their programs to residents' needs.

Chula Vista is the only city in California with a population over 200k that does not have a public university offering bachelor's degrees.

## Our Findings

South County residents want and need a bachelor's program. 40% of South County adults were interested in enrolling in a bachelor's degree program in the next two years, compared to just 27% in the rest of the county. Residents expressed the desire for programs in business, healthcare, technology, and the arts, and were as likely to be motivated by self-improvement as by income growth.

In focus groups, business leaders emphasized the skills they need from workers, including technical skills but also social awareness, communication, independence, creativity, critical thinking, and problem-solving. In the short-term, employers were focused on growing their businesses and improving processes. For the long-term, they were concerned about the impacts of AI and other emerging technologies, like virtual reality and robotics. To prepare them for the future of work, students need the skills to use these emerging technologies and work effectively and ethically in a workplace alongside automated agents.

To determine the most valuable academic programs to recruit to the region, we first identified 147 priority occupations—occupations that currently pay self-sufficient entry-level wages, don't require graduate degrees or more than four years of work experience, and are projected to hire at least 50 new workers each year. We adjusted hiring expectations based on eight trends, including AI and automation, climate change, nearshoring, and changes in California's regulatory environment. This process helped us focus on the jobs of the future.

## Our Recommendations

We recommend that the UNI committee consider prioritizing programs that: lead to high-quality, high-demand jobs that meet the economic needs of the future (see Appendix III: Future-Adjusted Priority Occupations); meet needs that are unmet by existing public universities in the region (see Table 2), and build on Southwestern College's strengths and existing programs where possible by building transfer pathways to the newly created university clear to students and easy to access.

# Background

## Chula Vista

Located in south San Diego County, Chula Vista is home to a thriving population of 276,000[1] residents who enjoy the city's unique blend of coastal landscapes, picturesque canyons, rolling hills, and majestic mountains. Chula Vista is San Diego County's second largest city, comprising approximately 8% of the county's population, and plays a vital role in the cross-border dynamics of the region.

Over 40,000 people live in Tijuana, Mexico, and commute daily to work or study in San Diego County.[2] Approximately 70,000 northbound vehicles and 20,000 northbound pedestrians cross the San Ysidro Land Port of Entry each day.[3] At the Otay Mesa Port of Entry, approximately 17,000 passenger vehicles and commercial trucks, and 7,000 pedestrians cross the border daily. With a new border crossing in east Otay Mesa slated to open in 2026,[4] and with the passage of AB-91 allowing some Mexican residents to pay in-state tuition at California community colleges,[5] the region will likely grow more interconnected.

Although it boasts a robust educational system and is renowned for its safety and high quality of life, Chula Vista is the largest city in California without a bachelor's granting institution. On June 16, 2023, Chula Vista Mayor John McCann, Assemblymember David Alvarez, and Southwestern College Board President Roberto Alcantar signed an agreement to signal their commitment to bringing at least one university to Chula Vista.[6]

The University Now Initiative (UNI) Committee was formed to bring together regional leaders in government, education, and economic and workforce development to guide the university planning efforts. This committee envisioned the creation of a vibrant binational ecosystem of innovation and higher education opportunities and collaboration to empower our region's distinctive potential. This study will support them in realizing that vision.

[1] United States Census Bureau. (n.d.). DP05: ACS Demographic and Housing Estimates. Retrieved from https://data.census.gov/table/ACSDP5Y2021.DP05?q=population&g=160XX00US0613392.

[2] Canedo Rivas, T., Floca, M., Gin, A., Medina Sanchez, R., Orraca Romano, P. P., & Shirk, D. A. (2022). *The CaliBaja Regional Economy: Production, Employment, Trade & Investment*. University of San Diego Knauss School of Business. Retrived from https://sdchamber.org/wp-content/uploads/2022/02/2022-TheCaliBajaRegionalEconomy-%C6%92.pdf

[3] *San Ysidro Land Port of Entry*. (2023). U.S. General Services Administration. Retrieved from https://www.gsa.gov/about-us/regions/region-9-pacific-rim/land-ports-of-entry/san-ysidro-land-port-of-entry

[4] Mendoza, A. (2023, July 6). Second Otay Mesa border crossing may open later than planned. *Los Angeles Times*. Retrieved from https://www.latimes.com/california/story/2023-07-06/second-otay-mesa-border-crossing-with-20-minute-average-wait-may-open-later-than-planned

[5] Sosa, A. (2023, Oct. 14). New law will allow some Mexican residents to pay in-state tuition at California community colleges. *Los Angeles Times*. Retrieved from https://www.latimes.com/california/story/2023-10-14/california-is-now-the-last-border-state-to-create-an-in-state-tuition-program-for-nearby-mexican-citizens

[6] City News Service. (2023, June 16). South Bay leaders to renew efforts to bring 4-year university to Chula Vista. *NBC San Diego*. Retrieved from https://www.nbcsandiego.com/news/local/south-bay-leaders-to-renew-efforts-to-bring-4-year-university-to-chula-vista/3247399/


Chula Vista

## Current Study

The current study was designed to be the first phase of the academic planning study for the approved university intended for Chula Vista. There were two primary goals for this study:

1

To conduct a workforce needs assessment identifying good jobs that will be obtainable for recent graduates with a bachelor's degree

2

To conduct an education needs assessment identifying high-demand academic programs that will prepare students for those priority jobs

We achieved these goals by using labor market information; data about existing education demand and offerings in regional colleges and universities; focus groups of business leaders in South County; a survey of business leaders in San Diego County, Orange County, and Baja California, Mexico; and a representative sample survey of San Diego County residents. For detailed information about the research methodology, see Appendix I: Research Methodology.

# Workforce Needs Assessment

To understand regional workforce needs, we studied the short-, mid-, and long-term workforce needs in the region. We learned about which programs and skills employers think are currently lacking in the region and, when looked at together with research questions addressing the long-term future, which evergreen skills educators can emphasize to ensure that graduates can succeed and bolster their programs' reputations.

## The Current Workforce: 2023

The current labor market and hiring needs and challenges of regional businesses are our best view into the short- and medium-term hiring needs of employers. Understanding these needs will support us in scaffolding a plan that addresses immediate local needs. First, we used labor market information to reveal the financial premium workers with associate and bachelor's degrees command in the local job market. Then, we used focus groups and a survey of local business leaders to identify their current hiring needs and challenges. We also surveyed San Diego County residents to understand the roles they play in the labor force and their experiences seeking jobs.

### Labor Market Information

In 2023, there were 2.24 million jobs in San Diego County.[7] These jobs had different entry-level requirements, such as level of education and work experience, and paid various wages. Approximately 21% of jobs had no formal educational requirement, 44% required between a high school diploma and a certification (but no college degree), 2% required an associate degree, 28% required a bachelor's degree, and 5% required a graduate degree. The median income for bachelor's degree earners in the county was $17.58 more than for those without a college degree.

[7] Data on number of jobs, entry-level requirements, and income sourced from Lightcast. (2022). Occupation table. Retrieved from https://analyst.lightcast.io/analyst/?t=4WmQn#h=ttdr2&page=occupation_table&vertical=edo&nation=us

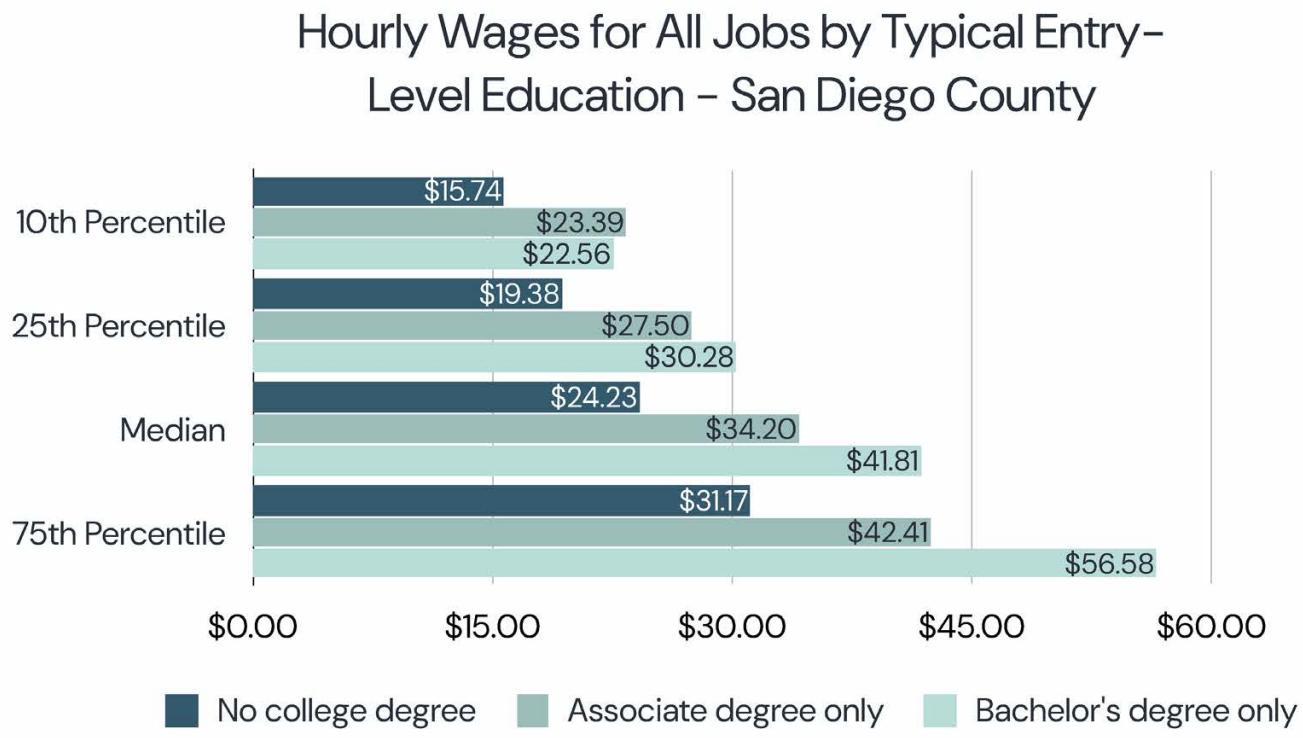



**Figure 1:** Hourly Wages by Typical Entry-Level Education

Of the 2.24 million jobs in the county, 244,574 were located in the South Bay region.[8] Around 20% of the jobs in the region typically required people to have a bachelor's degree or higher at entry. In this area, as in the rest of the county, bachelor's degree holders earned close to $18 more than those without a college degree. As workers move up the ranks in their jobs (from entry level wages to higher wages for their profession), bachelor's degrees command an increasingly higher premium (see Figure 1).

[8] Zip codes used to define the area included 91902, 91908, 91909, 91910, 91911, 91912, 91913, 91914, 91915, 91921, 91932, 91950, 91977, 91978, 92118, 92154, 92155, 92173.

## Business Hiring Needs & Challenges

### Hiring Needs

Several employers among our focus group participants were looking to hire people with very **specialized skills** (for example, one participant said, "*The type of cybersecurity compliance we're trying to enter in the field is extremely specialized*"), **combinations of skills** (e.g., "*somebody that has both* [teaching skills] *and the technology would be the hardest*"), or **experience** (e.g., "*...most of our positions at even the entry-level require some level of experience in* [our particular domain of public service]*...very few people possess that experience unless they're coming from another organization, like for example,* [a private charity in the same domain]. *And so, we are having challenges filling our positions.*"

### Skills

A few people in the focus groups mentioned that new graduates or young workers tend to lack soft skills, which employers value. For example,

*"Especially with COVID them being away for two years, we're losing kind of like the emotional intelligence component. So, teaching people soft skills or whatever you want to call it, that's super important...if you don't have the emotional intelligence or people skills, you're not going to last in our office."*

Employers indicated that work experience helped signal that a candidate has soft skills and that experience didn't have to be in their specific field but "*something where we can see that they can work in a regular place of business.*" Another participant reported,

*"Sometimes folks that have not gone to a four-year school and instead have been out waiting tables and interacting with folks are a little bit sharper on some of like the soft skills of understanding, being empathetic to other people, and understanding how to problem solve on the fly."*

The survey of businesses reinforced the importance of soft skills to employers, with 65% of respondents reporting that soft skills, such as communication, teamwork, etc., were either very or extremely important for job candidates seeking full-time positions in core business roles (see Figure 2, where skills and qualifications are ranked in descending order by which the greatest percentage of businesses ranked as either "very important" or "extremely important"). Interestingly, candidates having a bachelor's degree was rated as being very or extremely important by more businesses than having technical training/expertise specific to the position the candidate is applying for.

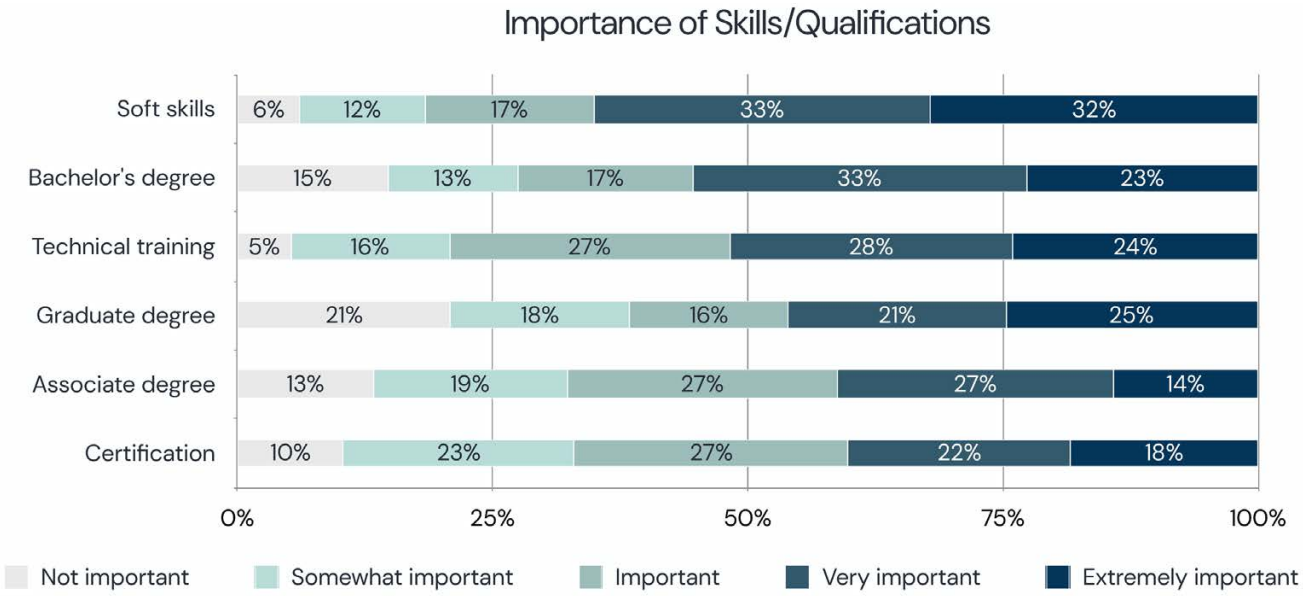



**Figure 2:** Importance of Job Skills/Qualifications for Those Doing Core Work of the Organization

In addition to people skills and problem-solving, participants mentioned specific soft skills, including fitting in with the **culture, professional networking,** and **communication with coworkers.**

Along with soft skills, participants cited other specific skills that they were looking for, including project management, teaching, public speaking, written communication, self-directed learning, interviewing skills, in/entrepreneurial skills, safety, ethics, creativity, adaptability, problem-solving, communication and networking, engineering, and software skills.

Related skills were often rated highly on the survey as well. In Figure 3, we show the five work skills rated either very or extremely important by the largest percentage of businesses in the survey, as well as skills related to those brought up in the qualitative data (for example, "instructing" for teaching skills, "active listening" and "speaking" for communication, etc.). All these skills were rated as very or extremely important by at least half of the 212 businesses surveyed, with active learning, critical thinking, and reading comprehension rated highly by close to three-quarters of businesses.

Employers also discussed common expectations in the talent pool that they struggled to meet:

*"A lot of people that the first question they ask is, is this remote or in office?...we tend to not hire fully remote people, but we see that that's where the talent pool is."*

*"And people want to get paid a lot and we're in education and we can't pay them that much."*

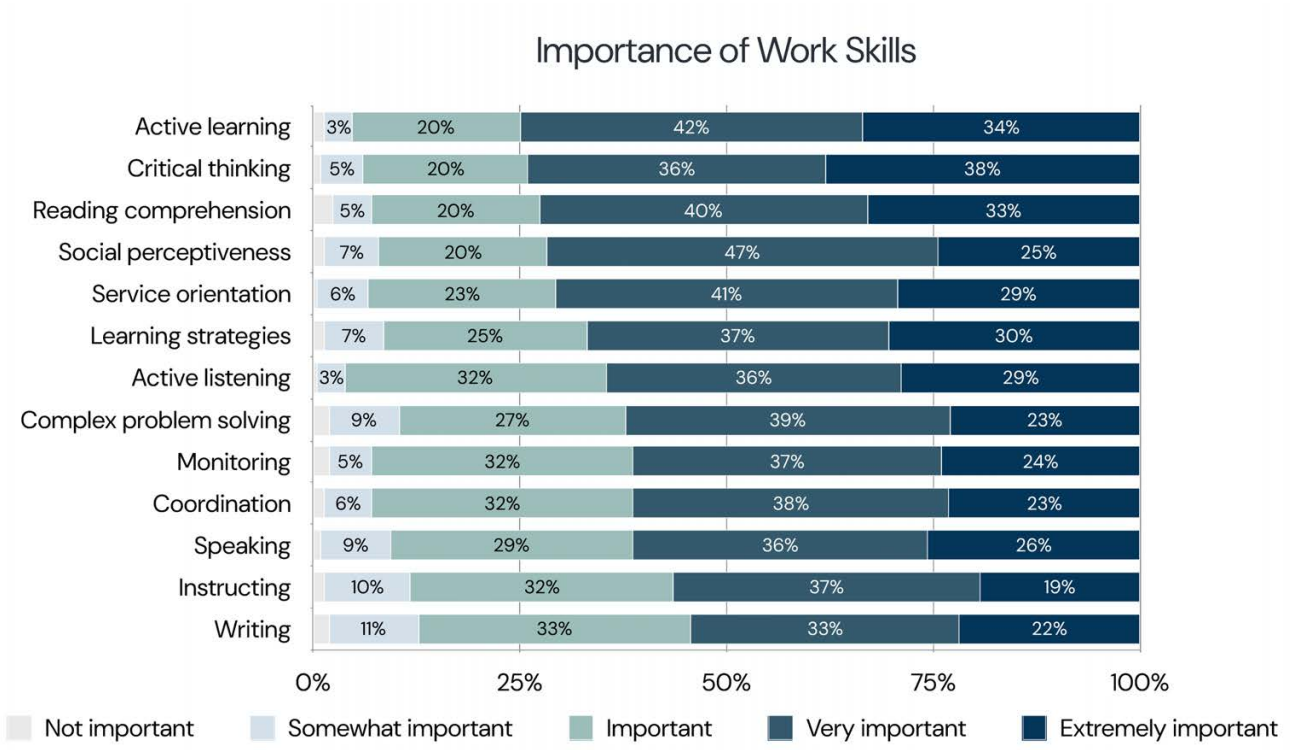



**Figure 3:** Importance of Work Skills for Those Doing Core Work of the Organization

## Worker Perspectives

### Work Landscape

Among respondents to our survey, 56% were working for pay at the time of the survey. Of those not working, approximately one-third had been actively looking for work in the previous month. Women were significantly less likely to be working than men,[9] though there was no difference by gender in reported job-seeking behaviors. While most racial groups were more likely to be working than not, White respondents were significantly less likely to be working. Hispanic respondents who were not currently working were significantly more likely to be seeking work than others.

The number of jobs worked by respondents differed by race and gender but not by region of the county (i.e., South County compared to the rest of the county). Multiracial, Hispanic, and Black respondents reported working two jobs more frequently than Asian respondents, who were most likely to report working one job. Men reported working both one and two jobs more frequently than women. Most respondents were working full-time (40 hours per week) in their primary job, and this did not differ by region, race, or gender.

[9] $p \leq 0.05$. This and all other statistical tests discussed are chi-square tests of independence.

We asked respondents who worked for pay about the match between their skills/training and their jobs. Most workers (69%) reported that their job was a good match for their skills/training, a little over one-quarter (26%) reported their job didn't take advantage of their skills/training, and 5% reported that their job was a little beyond their skills/training. There were no differences in reported skills (mis)match by region of the county, gender, or race.

Finally, we asked respondents who were working for pay how likely they were to search for a new job in the next year. Close to half of workers (46%) said they were somewhat or extremely likely to seek a new job in the next 12 months (see Figure 4). Turnover intentions were equally likely across region, gender, and race. This was somewhat lower than national turnover intention estimates, which ranged from 51%[10] to 56%[11] in 2023.

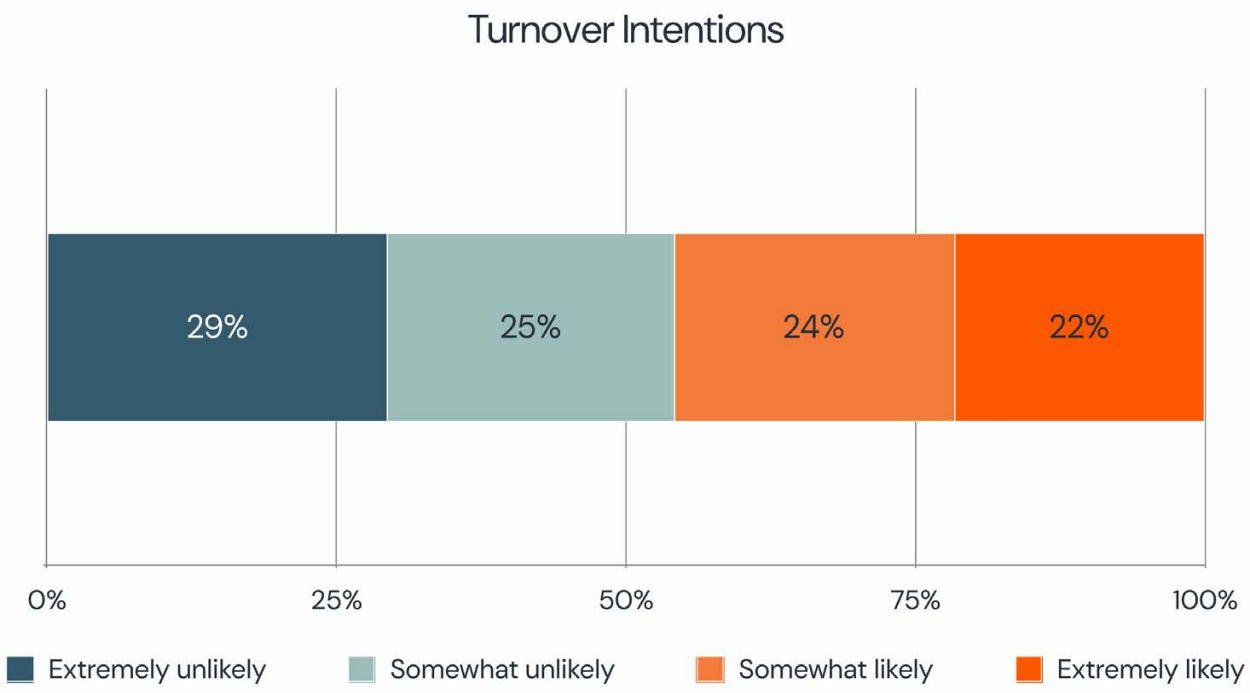



**Figure 4:** Likelihood of Seeking a New Job in Next 12 Months (Among Those Working for Pay)

[10] Mosser, M. (2023, July 27). *Half of Your Employees Are Looking to Leave. Gallup.* Retrieved from https://www.gallup.com/workplace/506819/half-employees-looking-leave.aspx

[11] Gillespie, L. (2023, April 3). *Survey: 56% of workers plan to look for a job in the next 12 months.* Bankrate. Retrieved October 24, 2023, from https://www.bankrate.com/personal-finance/job-seekers-survey/

**Job Challenges**

When asked how satisfied they were about their ability to get a job in the occupation or line of work they want, approximately one-third of San Diego County residents reported they were somewhat or very dissatisfied. There were no significant differences in satisfaction by region, gender, or race.

Figure 5 shows the job challenges reported by individuals who said they were somewhat or very dissatisfied with their ability to get their desired job.[12] Close to 30% each reported that there were not enough jobs available, the job they wanted was very competitive, and/or that the available jobs haven't paid enough. About 21% reported that they did not have the required work experience and 17% reported they did not have the required training, skills, education, or certification.

There were no significant differences by region, race, or gender in reported experiences of most of these job challenges, with two exceptions: Asian respondents were significantly more likely, and White respondents significantly less likely, to report that the job they wanted was very competitive. Women were significantly more likely than men to report that they lacked adequate child- or eldercare. (These bars are labeled with "*" in Figure 5).

Other challenges respondents listed included disability or illness (5%), age or retirement (2%), having a criminal record (1%), and being homeless, a lack of private or public transportation, having an obligation to the military that prevents looking for other work, having an expired professional credential, pursuing writing, and looking for part-time work (less than 1% each).

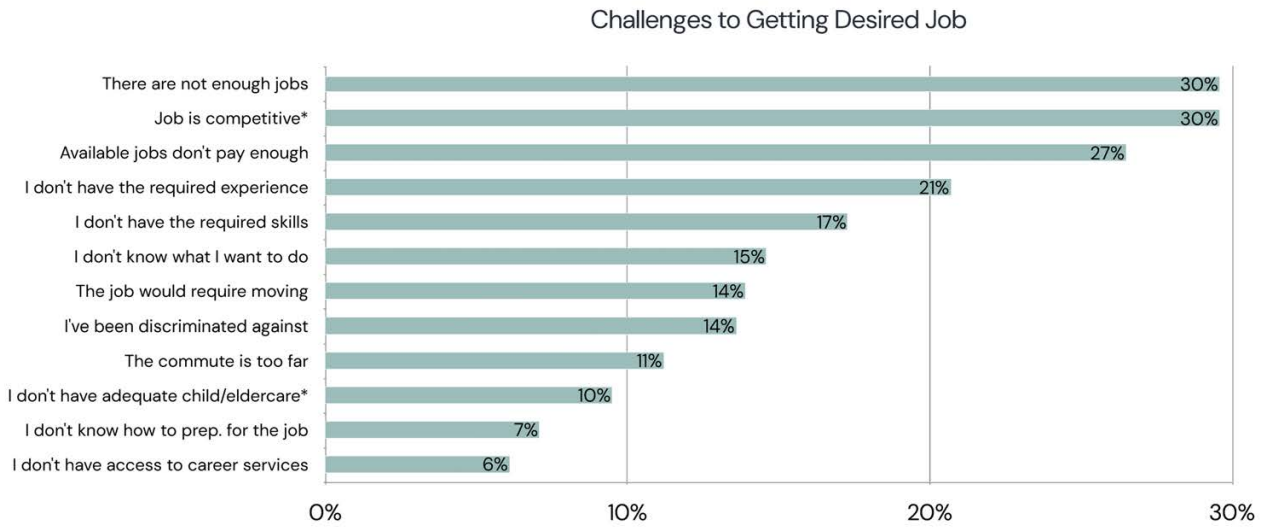



**Figure 5:** Challenges to Getting Desired Job (Of Those Dissatisfied with Ability to Get Job)

[12] Survey participants were asked to select all challenges that applied to them.

## Planning For The Future

Trends are changing our economy, job market, and training needs. To help the UNI Committee build programs that are flexible and resilient to changes in the economy and design curricula that support anticipated business needs, we 1) projected regional labor market information to 2023, 2) asked business leaders about the trends and challenges they expect in the short- and long-term and 3) generated a list of priority occupations.

Regardless of whether our participants successfully predict the future, their answers to questions about the future of their business and industry will help us understand the perspectives and behavior of employers as they consider their long-term outlook.

### Labor Market Projections

Over the next 10 years, the San Diego County economy is expected to grow by nearly 264,000 jobs. Over one-tenth of the job growth (30,286 jobs) is projected to be in priority jobs: those that pay a self-sustaining wage, are accessible for recent graduates, and have a sufficient number of projected openings (for a detailed discussion of priority occupations, see Preliminary Priority Occupations, below). The South County economy is expected to grow by about 25,500 jobs. Most (approximately 70%) of the priority occupations in the county are projected to require a bachelor's degree at entry. Figure 6 compares the number of priority jobs available in South County and the rest of San Diego County by typical entry level education for 2023 and 2033.

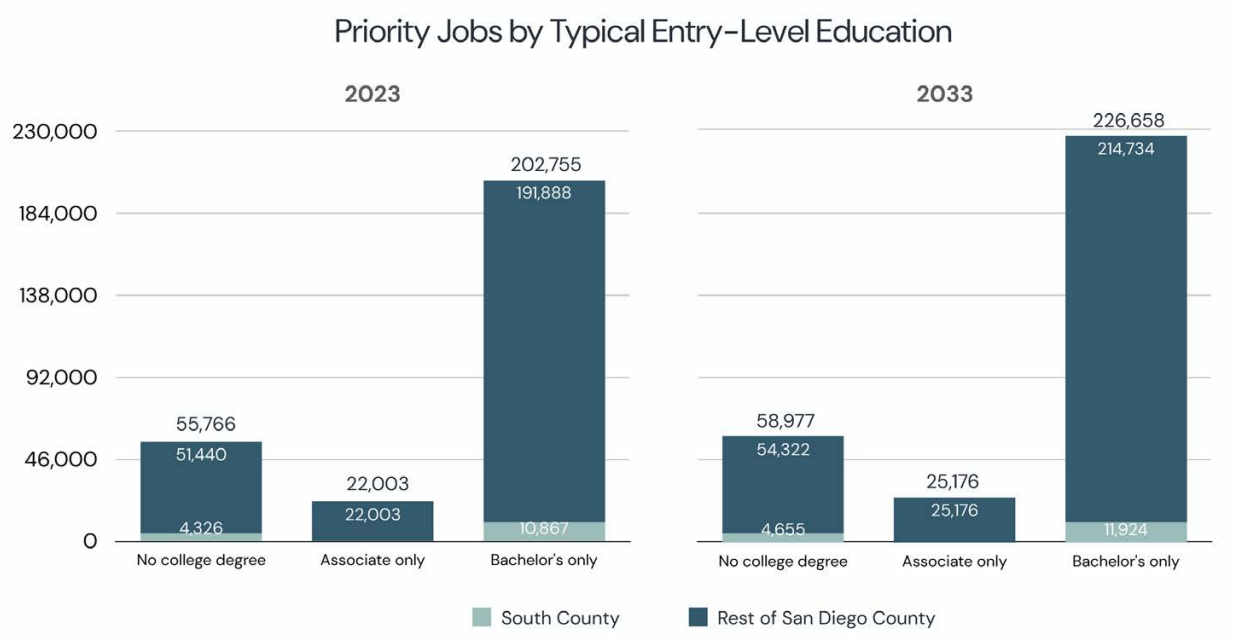



**Figure 6:** Priority Jobs by Typical Entry-Level Education

## Regional Business Outlook

We asked local business leaders about their expectations in the short-term and long-term future. Regardless of whether our participants successfully predict the future, their answers to questions about the future of their business and industry will help us understand the perspectives and behavior of employers as they consider their long-term outlook.

### *Five Years from Now*

Close to three-quarters of the business survey participants (see Figure 7) and nearly all of our focus group participants expected their businesses to grow over the next five years. They were optimistic about new markets and process improvements in the short-term future, and few expected large-scale disruptions. Survey participants were evenly split when asked whether they expected their hiring practices and/or goals to change in the next five years, with 51% responding yes and 49% responding no.

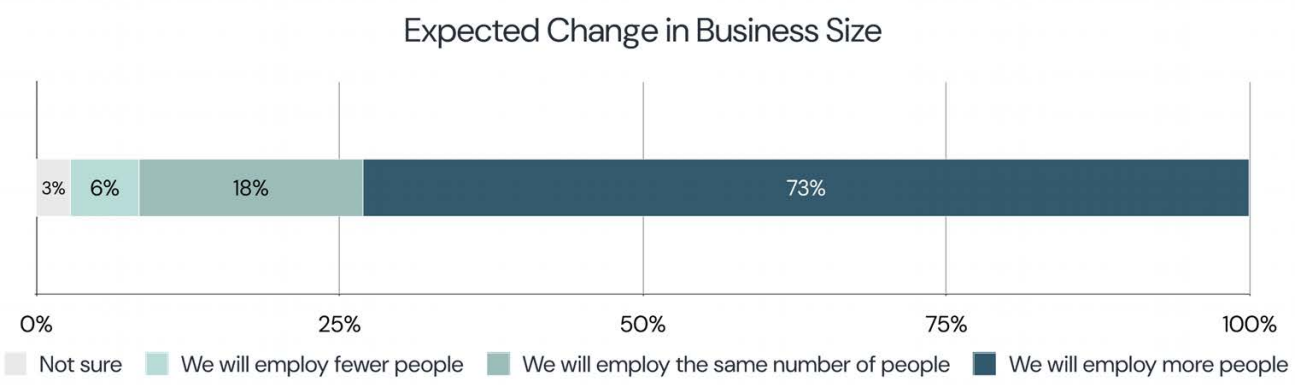



**Figure 7:** Expected Change in Business Size Over Next Five Years

In the near term, participants talked about the growth they expect in their businesses. Along with that growth, they anticipated **raising their hiring standards** and **improving their processes**. For example, "*…increas[ing their] efforts to promote diverse and inclusive recruitment practices,*" becoming "*…more in-depth and analytical,*" "*…hir[ing] more experience,*" or "*…requiring more bespoke training and less on the job training.*" Process improvements included, for example, "*…cross-functional collaboration, continuous feedback, and iterative improvements in hiring processes,*" "*…a stronger focus on remote work capabilities and fostering a diverse and inclusive workplace to attract top talent globally,*" and "*…creat[ing] a positive, professional, inclusive and transparent recruitment process that attracts high-quality candidates and enhances our employer brand.*"

Many mentioned **additional efficiencies from technology** in the near-term future, including automation and AI, but not major disruptions. In the five-year future, participants expect technology advancements will improve staff recruiting tools, manufacturing automation, education and training, marketing, and cybersecurity, and will enable remote and distributed teams.

***Fifty Years from Now***

Participants' 50-year visions showed much more variety. Respondents imagined everything from space tourism to gene-editing nanobots. In this section, we review patterns in participants' visions and their concerns about the future: what technology will change their industries? What new skills will be needed in their industry in 50 years? What jobs will be more and less relevant in the future?

**Technology**

In focus groups and in the survey, **Artificial Intelligence** (AI) was the most popular topic of the 50-year discussion. Participants most often mentioned AI as a generally transformational force, but participants offered many specific examples of impacts they expected, including skills and jobs that will benefit from AI and those that will be in less demand.

They expect increasing demand for some skills and jobs:

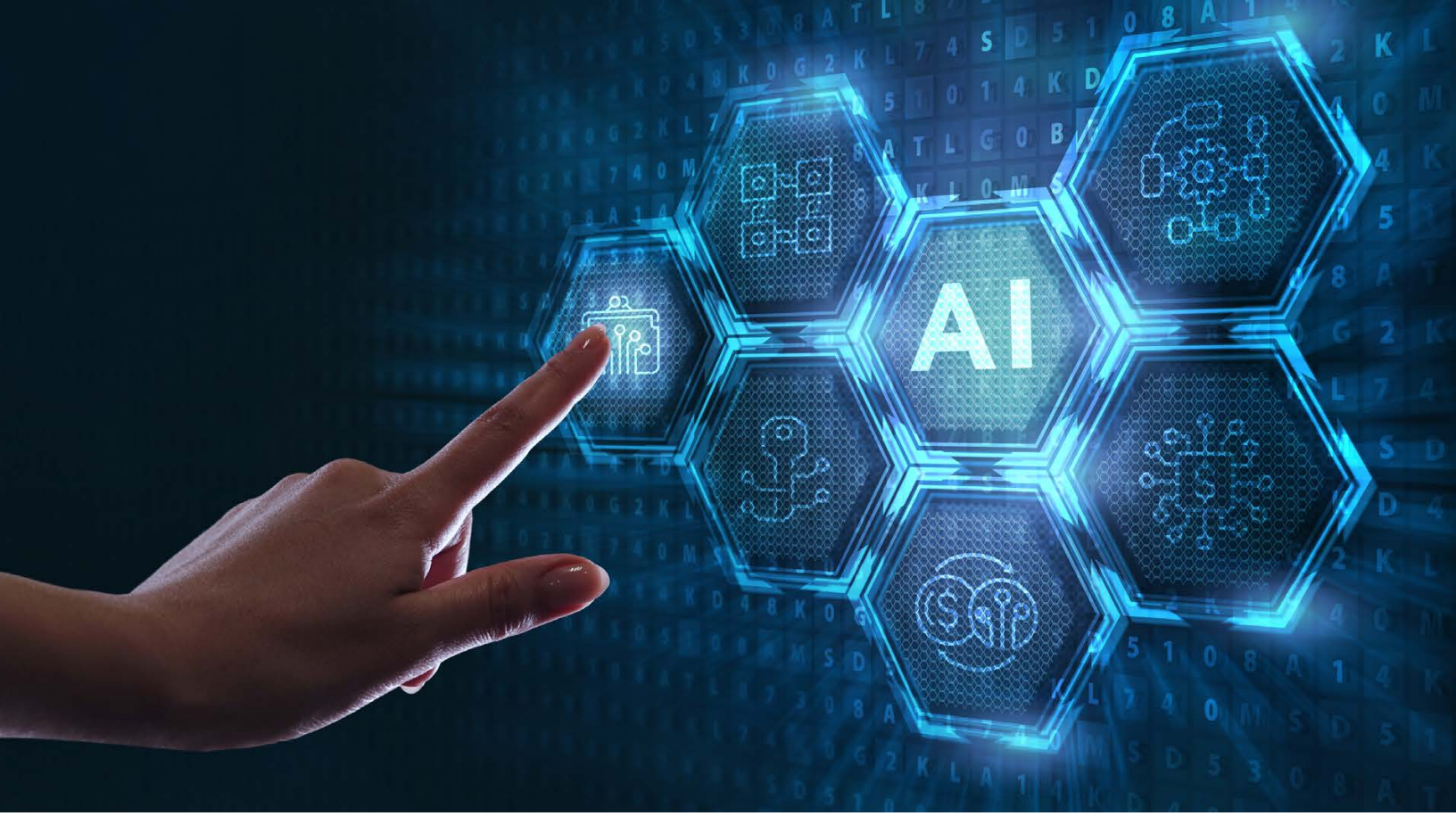
- Engineering, architects, and designers of AI
- Analysts and programmers
- "Digital organizers"
- People who can interpret and apply the outputs of AI
- Regulators, compliance officers, and auditors of AI systems and their outputs
- Data privacy and security
- Creative workers

They expect some jobs will change substantially:

- Therapy, education, customer service, and administration facilitated by AI
- Content creators will rely on AI
- Engineering may experience some deskilling as AI gets involved

And they expect some jobs will be replaced entirely. Participants expected replacement in:

- Customer support and operations roles
- Cashiers and customer service jobs
- Administrative positions




In 50 years, they predicted the need for skills in data analysis, GIS, cryptography, operating automated systems, building AI tools, building virtual reality environments, organizing data, working with automated assistants, and quality control. Participants discussed problem-solving, communication and networking, engineering, and software skills as part of both their current and future hiring needs.

There was a lot of difference in opinion among participants about **teaching and education:**

*"I don't see teachers in person being of much use."*

*"I don't think* [Chat GPT] *can replace the physical teacher teaching and lecturing, but I think it can help with instructional design, which is building courses."*

*"What we would consider mundane tasks, or repetitive tasks will for sure. . . be replaced with technology. And I think we'll see more cerebral think tanks for humans. And that's why education is going to become even more important."*

A few people discussed **AI ethics**, auditing, and transparency. New jobs mentioned in this category included AI Ethics Officers, AI regulators, AI auditors, and AI compliance officers. One respondent, for example, predicted that 50 years in the future, there will be:

*"Strong ethical guidelines and regulations govern the development, deployment, and usage of AI. There are international standards ensuring AI respects privacy, avoids discrimination, and operates transparently."*

Some participants mentioned where they thought they would see little change due to AI. Those areas include:

- Education, especially early childhood and musical education
- Hands-on services (like cooking and cleaning)
- Construction

Participants predicted that in 50 years, other technologies will impact the economy as well. Other technologies mentioned include robotics, virtual and augmented reality, quality control and monitoring technology, quantum computing, cryptography, novel materials and construction techniques, new manufacturing technologies, improved software, medical advancements (including nanoscale technologies, neural enhancements, 3D printed tissue), and climate change reversal.

Advancements in **robotics** were particularly salient for our participants. They expected higher demand for robotics engineers and programmers as robotics gets further integrated into **manufacturing, sanitary services, car repair, restaurants and bars, retail, shipping** and **delivery**.

Participants frequently described **virtual and augmented reality** as changing the job market. They anticipated demand for developers that can create virtual environments, including for shopping, assessments, job fairs, therapy, historical preservation, legal consultations, training, and education, and more demand for candidates who are comfortable working in virtual environments.

**Social Change**

Some people anticipated cultural or legal changes. **Cultural** changes mentioned included an aging population, Generation Z entering the workforce, shorter attention spans, a greater need for bilingual workers, and (non-specific) changes in consumer behavior.

Additionally, a few participants anticipated **more funding, more competition,** and more **social acceptance** for the kind of work they do.

The changes that participants anticipate in **government** include:

*"Technology will have automated many of the tedious aspects of economic development (e.g. site selection, infrastructure planning) and empowered the more complicated conversations surrounding workforce, education and land use."*

*"Reduction in paperwork, insurance reimbursement equivalent to professional fee advertised, enough providers to meet the demand for services."*

*"It will likely be more regulated. . . My field is new, and cutting edge and so there is a lot of opportunity for creativity and growth. As it becomes more established it will likely be less flexible."*

*"I anticipate a greater use of and reliance on social programs, this would mean more case managers, social workers, care givers, home health aides, etc."*

*"Early intervention services for young children will be available for all families at no cost."*

Participants predicted changes in transportation, logistics, architecture, infrastructure, and food production in response to **environmental concerns.** One respondent speculated that companies will take more responsibility for their environmental impact, writing:

*"HR will play a role in sustainability efforts, addressing climate change, and promoting eco-conscious practices."*

## Priority Occupations

To help guide bachelor's program development, we identified priority occupations that are in high demand in the county and represent substantial opportunity for graduates in the future. Identifying priority occupations proceeded in two stages: first identifying preliminary priority occupations based on current economic data, and then identifying future trends and adjusting the list of preliminary priority occupations to reflect the future trends.

### *Preliminary Priority Occupations*

One of the primary goals of the workforce needs analysis was to describe the "good" jobs available to recent college graduates who have earned a bachelor's degree. We considered jobs to be good if they pay a livable wage, are obtainable by recent graduates, and have enough job openings that graduates can reasonably expect to have access to them.

We created a preliminary list of priority occupations based on four criteria. To be considered a priority occupation, jobs must:

- Have 50 or more average openings per year
- Require less than five years of work experience at entry
- Require a bachelor's degree or less at entry
- Pay a self-sustaining wage at entry

Jobs must have 50 or more average openings per year to ensure that there will be enough jobs available for graduating students. They must require less than five years of work experience and a bachelor's degree or less at entry so that graduating students can meet the entry-level requirements. Finally, they must pay a self-sustaining wage of $21.98[13] at entry[14] to ensure that people taking these jobs can make ends meet without additional assistance.

Based on these criteria, we identified a preliminary list of 87 priority occupations in San Diego County (see Appendix II: Preliminary Priority Occupations). Few (0% in the South Bay region and 8% in San Diego County) of the priority jobs required an associate degree at entry while the majority (72% in South Bay, 73% in the entire county) required a bachelor's degree.

[13] The self-sufficiency standard enumerates the income people need to have to meet their needs without further assistance. University of Washington Center for Women's Welfare. (2020). Overview. Self Sufficiency Standard. Retrieved September 5, 2023, from https://selfsufficiencystandard.org/the-standard/overview/
At PIC, we believe people should make a self-sufficient wage in a 40-hour work week. We calculated the self-sufficient wage for summer 2023 by adjusting the 2021 self-sufficiency wage for a 40-hour work week and using the local Current Price Index from the Bureau of Labor Statistics. It is important to note that we consider this a wage floor for "good jobs" and that higher wages are necessary to sustain families.

[14] 10th percentile wages.

**Future-Adjusted Priority Occupations**

Our preliminary priority occupations list identified "good" jobs in 2023's economy, but how will legal, social, and technological changes impact the job market in 2033? We considered the impacts of changes to California employment law, an aging population, climate change, improvements in energy efficiency, the movement away from fossil fuel usage, nearshoring, and automation on currently existing jobs[15] in order to identify a future-adjusted priority occupation list (for more information, see Appendix I: Research Methodology).

We removed six occupations from our preliminary list (for example, we expect the credit analysis occupation to experience substantial deskilling due to automation, which is likely to reduce job quality, including pay). We added 67 occupations (many of them in the healthcare industry, due to the passage of California SB-525 that increases the minimum wage of healthcare workers), for a final list of 147 priority occupations (see Appendix III: Future-Adjusted Priority Occupations). From this point forward, when we refer to "priority occupations," we are referring to this future-adjusted list.

[15] We do not make predictions about jobs that do not yet exist, but completely new occupations only account for approximately 0.56% of new jobs in the United States each year. Lin, J. (2011). Technological adaptation, cities, and new work. *The Review of Economics and Statistics, 93*(2), 554–574.

# AI Impact on Existing Professions

**How do we predict and prepare for AI's impact on human labor?**

We can't tell how AI will impact one job, let alone a multi-disciplinary, interconnected industry. But we aren't completely ignorant about it, either. We can imagine several possible futures for an industry and consider how the decisions of other people— including those in the industries, technologists, and educators— can move us closer toward each of those futures. In this case study, we will review some possible futures of one multidisciplinary industry: film and television production.

Software driven by machine learning has been a part of the film and television industry for a long time. Recommendation algorithms drive advertising and decide what content Netflix puts on your home page, making a big impact on the demand side of the equation. Recently, AI tools are being incorporated more broadly into the creation side of the equation. Even "Everything, Everywhere, All at Once," which won seven Academy Awards, including Best Picture, used AI-driven tools for some minor special effects. It's not hard to imagine a near-future where AI tools write drafts of scripts, ad copy, and music; create special effects; dub or mimic actors' voices to change the dialog in films; and much more.

Generative AI-machine learning-based models that accept prompts and generate text, images, or video— has been advancing rapidly in 2023. The implementation of these models has already caused a stir in the film and TV production industry. Dozens of articles were published this year with titles like "Generative AI is upending the film industry," "'Of course it's disturbing': Will AI change Hollywood forever?" and "How will the Movies (as we know them) Survive the Next 10 years?"

### Substantial Replacement

In this future, AI takes over a lot of tasks currently done by humans, reducing the number of humans employed in the industry. This could look like AI replacing individual human jobs one at a time (e.g., an automated agent that replaces a writers' room, an automated agent that edits videos) or replacing tasks, and fewer people are needed to accomplish the tasks that remain.

Replacement would have a major, negative impact on employment in film and television production. It could also massively increase the quantity of content coming out of the industry. Many people believe that humans will not be as compelled by content that isn't guided by workers who understand the human experience, so it seems likely that the jobs that are not replaced will be focused on guiding outputs toward the topics, plots, and characters that humans find most interesting.

### Substantial Deskilling

In this world, robots don't take over our jobs— just the most interesting parts. Furniture makers are an example of a profession impacted by deskilling. At one time, skilled craftsmen created furniture. If you wanted a chair or a table, humans designed, measured, cut, assembled, and finished the piece. With the introduction of assembly line manufacturing, humans are still involved in the process, but their involvement requires much less skill.

Deskilling in film and television production could occur if generative AI is widely adopted, but it turns out the models need a lot of handholding. So instead of writing a script or editing a video, someone would be carefully writing prompts, editing outputs, stitching them together, and refining the final product. Even if the same number of people are employed, these jobs require fewer or different skills. Very often, this results in formerly well-paying jobs becoming low-wage work.

### Human + AI Teams

Research in human computer interaction suggests that people could work with AI in a similar way that they collaborate with humans. However, in order for this not to constitute replacement, the automated agents would need to be doing something that humans couldn't or wouldn't otherwise be doing. Human-AI collaboration may not risk jobs, for example, when robots rescue earthquake survivors or neural networks condense large data sets into a model.

By this definition, some Human + AI collaboration is already going on in film, for example when we recruit AI to do special effects tasks that would be prohibitively expensive if done by a human. If we incorporate AI into our workflow in this way, though, it will be very easy to then start using the same software for tasks that would simply be somewhat more expensive for a human to do. That's where we get into deskilling or replacement.

### AI-Supported, Human-Led

In this future, AI is framed as an assistant to human workers, allowing humans to do their regular jobs, but faster or better than they could do them without. This could constitute deskilling or replacement, but it doesn't need to. For example, humans assigned to come up with a title for a television episode could use a generative AI to suggest dozens of titles that they can use to seed brainstorming.

Some see this as the future of AI in TV and film, writing articles like "How AI will augment human creativity in film production." Others see similar pitfalls as exist with human-AI teams: if the AI can take over tasks that would normally be done by a human for less money and in less time, it seems unlikely that studios and other people in power would be content limiting AI's input to assisting expensive human labor.

### AI Banned

In light of the threats of AI to humans (not only in replacing human labor, but also in algorithmic bias, wealth concentration, and the risks of general intelligence, for example) some advocate banning or restricting the development and use of AI systems. This future could include either banning AI tools in general or banning certain AI tools, and the ban could span a country, an industry, or a company.


# Education Needs Assessment

To complement the workforce needs assessment, we described the education needs of residents and businesses. We used a resident survey to uncover educational challenges, opportunities, and interests and asked business leaders about their education and training needs.

## Resident Challenges & Opportunities

In addition to asking residents about the difficulties they had finding a job, we asked about some of the challenges and opportunities they had experienced with higher education. This information will help academic planning that is responsive to local needs. We learned about residents' satisfaction with their ability to earn a bachelor's degree, some of the challenges that prevented people from being completely satisfied with their ability to do so, how much people believed getting degrees and certifications would help their future job prospects, who is interested in enrolling soon, and potential students' preferences for course modality.

We learned from participants in the business survey and focus groups what training providers they like to hire from, and some participants also had advice for developing new programs. This information, combined with the workforce needs assessment, can be used to start planning for the new academic programs with an eye towards what locals want out of their education.

## Educational Challenges

We asked San Diego County residents how satisfied they were with their ability to earn a bachelor's degree if they wanted it. Close to one-third of residents who had not already earned a bachelor's degree reported they were somewhat or very dissatisfied. Level of satisfaction did not vary significantly by region of the county, race, or gender.

When asked what factors have prevented them from getting the degree they want, two-thirds of residents who reported being dissatisfied with their ability to earn a bachelor's degree said that at least one of the contributing factors was that the cost of tuition was too high (see Figure 8). The other two highly reported factors were "I cannot afford to take time away from work to go to school" and "I have to put my other expenses (e.g., bills, rent/mortgage, children's college tuition, etc.) above going to school." Only the opportunity cost measure of not being able to afford time away from work had any significant variation by the tested metrics, with multiracial respondents more likely to report they could not afford to take time away from work to go to school than other groups (this significant difference is indicated with a star in Figure 8). Other reasons that respondents listed in the open-ended responses included illness and disability (3%), age and/or being retired (3%), and discrimination, fear, overall expense, and not qualifying for financial aid (less than 1% each).

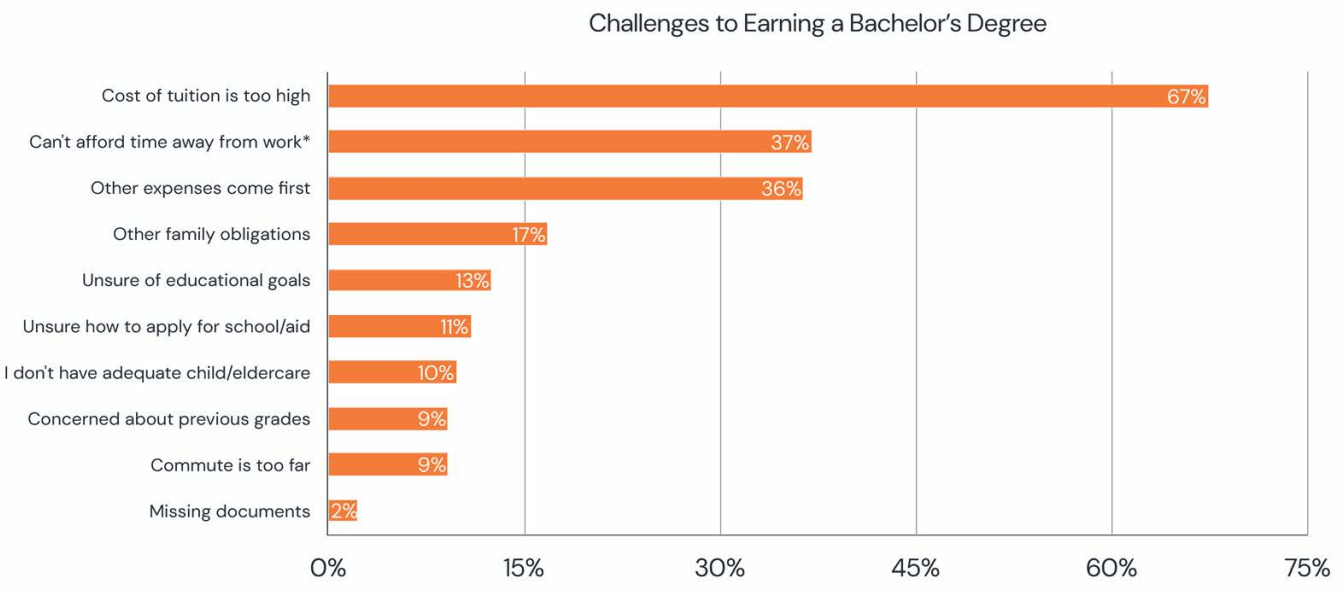



**Figure 8:**
Challenges to Earning a Bachelor's Degree (Among Those Dissatisfied with Their Ability To Do So)

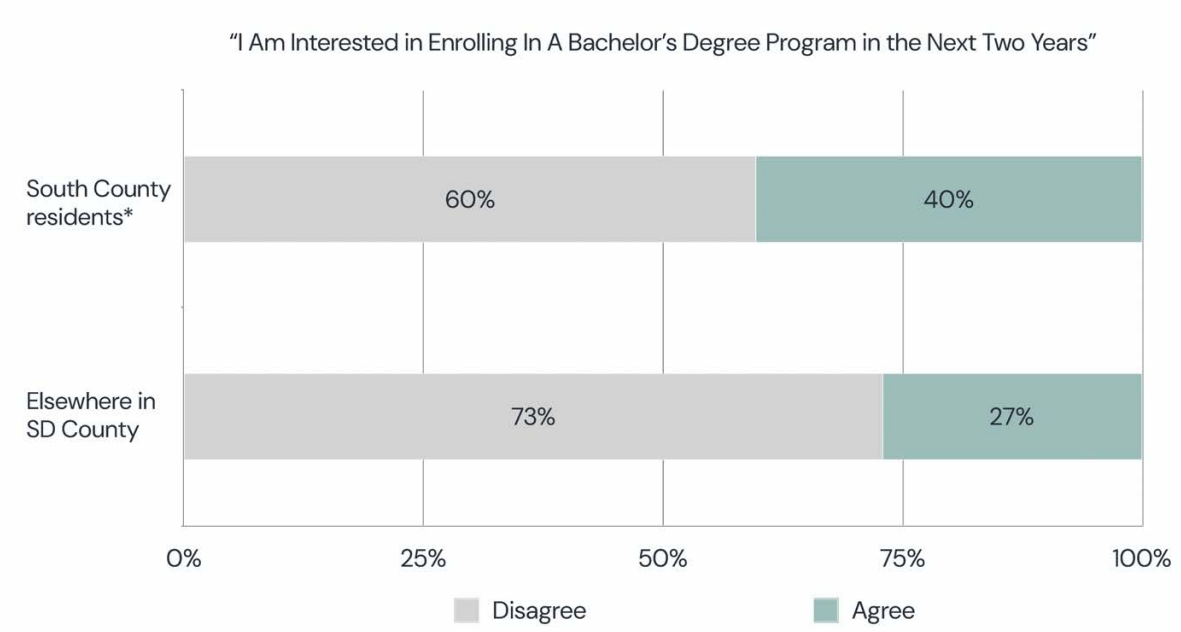



**Figure 9:** Percent of Residents Interested in Enrolling in a Bachelor's Degree Program by Region

## Educational Opportunities

When asked how much getting a bachelor's degree would help their future job prospects (for example, by helping them obtain a new job, get a promotion, increase earning potential, etc.), 44% of county residents without a bachelor's degree reported it would help either somewhat or a great deal. White residents were significantly more likely to answer "not at all" than other racial groups.

The analogous question about occupation-specific certifications produced similar results. Overall, 45% of residents reported it would help their job prospects either somewhat or a great deal to obtain an occupation-specific certification (though it is important to note that when asked about which certification would help, many respondents wrote in some type of degree. For more information, see Program Interests & Modality Preferences). Residents of South County were more likley than residents elsewhere in the county to report a certification would help their job prospects a great deal. White residents were more likely to report "not at all" and, in this case, multiracial residents were more likely to report that an occupation-specific certification would help their job prospects a great deal than were other racial groups. No differences were observed by gender for either question.

Nearly 30% of San Diego County residents overall reported interest in enrolling in a bachelor's degree program in the next two years[16] and reported interest differed significantly by region of the county and race. Figure 9 shows that South County residents were more likely to report interest in enrolling in a bachelor's degree program in the near future. There were no reported differences by gender, but White residents were less interested in enrolling when compared to other racial groups.

[16] We asked about interest in enrolling in the next two years to give respondents a specific, short-term timeframe to reference. This was meant to capture actual intent of enrolling in the near future and to exclude people who consider a bachelor's degree a "someday, maybe" goal.

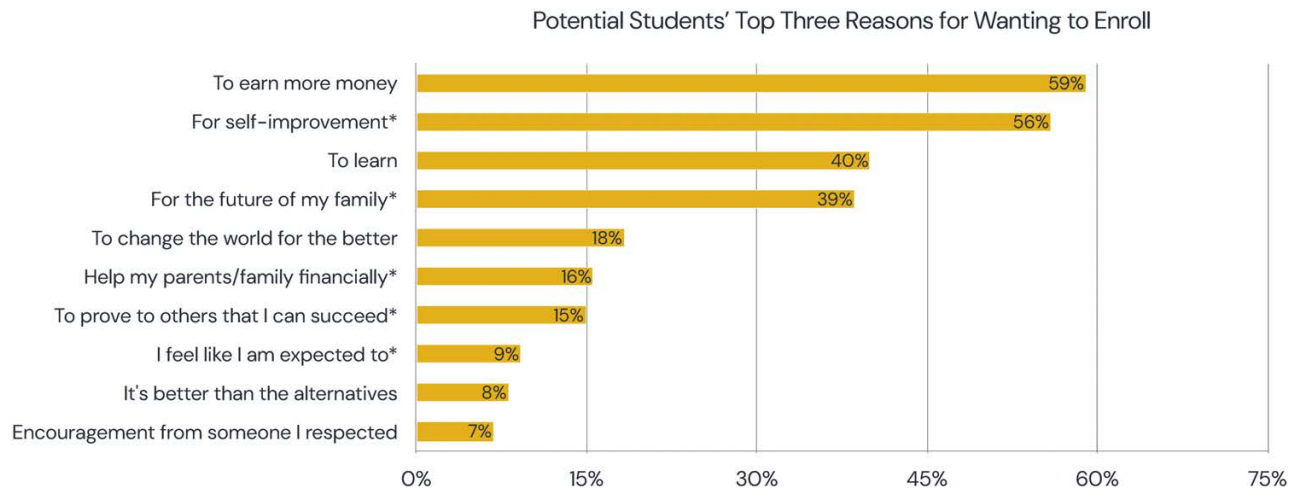



**Figure 10:** Potential Students' Top Three Reasons for Wanting to Enroll

When asked for the top three reasons they were interested in enrolling in a bachelor's program, close to 60% each selected "To help me earn more money" and "For self-improvement" (see Figure 10).[17] Approximately 40% each selected "To learn" and "For the future of my family." Eighteen percent selected "To change the world for the better" and about 15% each selected "It would allow me to help my parents or family financially" and "To prove to others that I can succeed." Less than 10% each selected "I feel like I am expected to," "It's better than the alternatives," and "Someone I admired or respected encouraged me to go." Women were significantly more likely to report wanting to enroll for self-improvement and for the future of their families than men, and men were more likely to report wanting to enroll to prove they could succeed. Asian respondents were most likely to report both wanting to enroll to help their parents or family financially and because they felt they were expected to.

## Program Interests & Modality Preferences

We asked people who were dissatisfied with their ability to earn a bachelor's degree what they would like to study if they had no barriers to access. While 56% said they were unsure, the remainder wrote in fields of study they would be interested in pursuing. The most popular fields included business (such as marketing), technology (such as computer science or information technology), healthcare (such as kinesiology or nursing), and arts (such as photography or music).

The section on Educational Opportunities shows that nearly half of county residents said that an occupation-specific certification would help their job prospects. Many of the write-in answers to the follow-up question of what certification would help their job prospects were degree focused (e.g., "psychology degree," "Masters degree," "Law Degree"), but other

[17] Options based on the Student Motivation for Attending University (SMAU)- Revised scale. Phinney, J. S., Dennis, J., & Osorio, S. (2006). Reasons to attend college among ethnically diverse college students. *Cultural Diversity and Ethnic Minority Psychology, 12*(2), 347.

commonly reported certifications included technology-focused certifications (such as for information security), commercial driver's licenses, teaching certifications, healthcare-focused certifications (e.g., ultrasound technician), and nursing certifications.

Finally, we asked residents who reported interest in enrolling in a bachelor's program in the next two years to select all the ways they would like to take classes. Figure 11 shows 62% of potential students were interested in online, asynchronous courses, with women significantly more likely than men to select this option. The next most popular option was in person, during the day, with no significant differences by region, race, or gender in preferences for this type of class. In-person, evening classes were selected by approximately one-third of potential students and preferred by men. Online, synchronous classes taught either in the evening or during the day were selected by about 21% of potential students each and were less popular among South County residents than among residents elsewhere in the county.

From our survey, we learned that almost 30% of all San Diego County residents and 40% of those living in South San Diego County are interested in earning a bachelor's degree. The most popular programs of interest are business, technology, healthcare, and the arts. The factors holding residents back are largely direct costs and opportunity costs. Those who are interested in a bachelor's degree are approximately equally interested in both the financial and personal development benefits of the degree. The majority of respondents are interested in online asynchronous classes, especially female respondents.

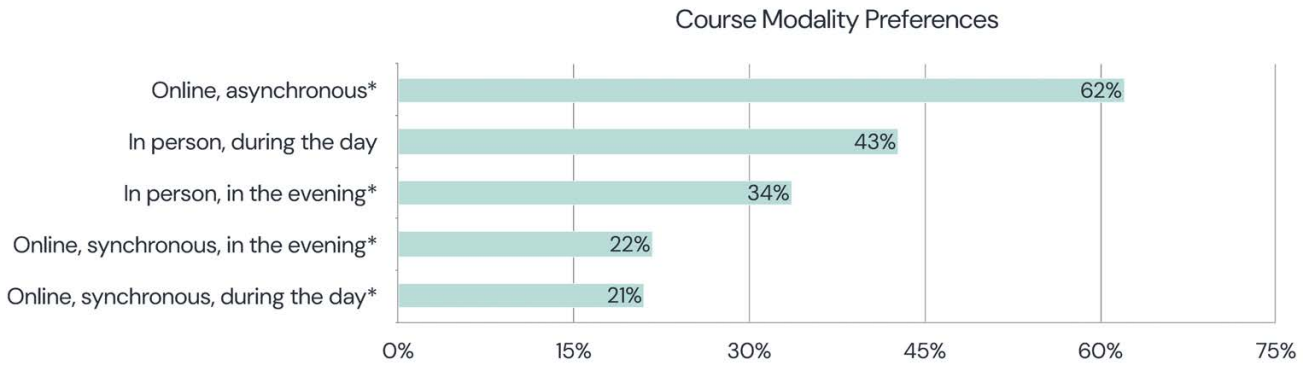



**Figure 11:** Course Modality Preferences of Potential Students

## Business Perspectives on Training & Education

We learned from participants in the business survey and focus groups what training providers they like to hire from, and some participants also had advice for developing new programs. This information, combined with the workforce needs assessment, can be used to start planning for the new academic programs with a focus on what locals want out of their education.

### Training Providers

We asked focus group participants whether they had training providers they liked to hire from. They said:

*"We've worked in the past with NFAR, so that's the **National Foundation for Autism Research.** So folks that are helping people that are on the autism spectrum, they've been a great source of talent for us."*

*"We might want to partner with like an **Operation Code** or a **Code Platoon** versus a private for-profit program."*

*"A lot of great candidates from some of the community colleges: **Grossmont, Southwestern, City College**, and then **San Diego College of Continuing Education.**"*

*"**San Diego County Office of Education, juvenile court,** and **Community Schools.** I feel like when we have an opportunity to give back to some of our most needy students in the county, we love to be able to do that."*

*"Love to see students from like **CSU San Marcos**. I think a lot of those students are crushing it out there."*

*"We work with local nonprofits with, like, for example, **Kitchens for Good,** to help us get some candidates that are willing to learn."*

When asked what kinds of new training providers they would like to see, focus group participants identified programs including culinary schools, social services programs, cybersecurity, and data analysis. Several folks described instead what they were looking for in a training approach. For example,

*"...cooperative education models. So schools or programs that are doing experiential learning, tied directly with industry."*

*"If there was more training around just business development, just business structure, I think that would be good."*

*"...providers that we tend to avoid referring folks to or getting folks from are gonna be folks that are not providing transparent outcomes data."*

*"If they don't have a human component to their mission, then they're probably not in alignment with my core values."*

## Advice

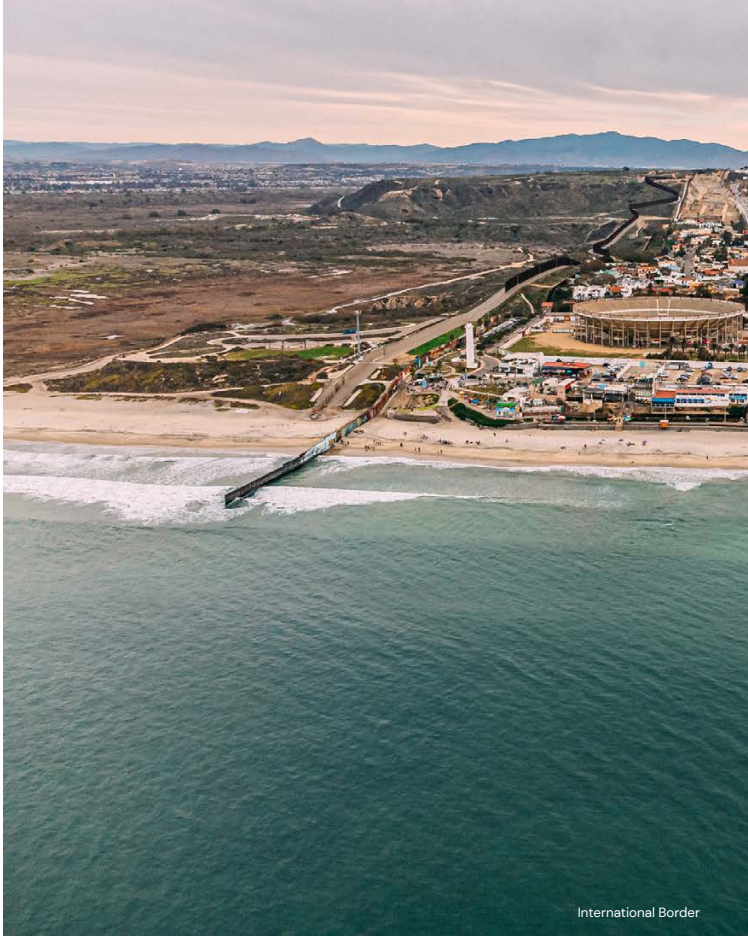
A few participants gave direct advice about developing new programs.

*"Engage and get learners some credit for that institution . . . while they're going through high school so that we're really talking about degree completion and not necessarily starting from scratch in this new institution. I think . . . those schools that can do that [will] stand out and provide more value. You know, to people considering all their options."*

*"I think when you have more representation of Black faculty, tenured faculty, students are more likely to see themselves at that institution, and they're more likely to be retained, more likely to continue to come, be mentored and graduate, be motivated, kind of work through life while they're in college."*

*"The first thing is a more of a willingness to go beyond just the isolated, everything on main campus, and instead really be partnering in a meaningful way with outside community-based organizations whether that be better and more frequent volunteer opportunities [or] opportunities to get some work experience and get college credit for it."*

*"I would also always advocate for affordability."*


International Border

## Priority Programs

One of the primary goals of the education needs analysis was to create a list of high-priority academic programs that would prepare students for the regional workforce. We did this by identifying the academic programs that teach skills and knowledge required by professionals in the Priority Occupations.[18] A complete list of priority programs is available in Appendix IV: Priority Academic Programs. Next, we discuss the availability of these programs in the region.[19]

[18] We did this using the CIP 2020 to SOC 2018 Crosswalk, a joint effort by statisticians at the National Center for Education Statistics and the Bureau of Labor Statistics to match academic programs with occupations based on skills and knowledge. Retrieved from https://nces.ed.gov/ipeds/cipcode/resources.aspx?y=55
Universities in Mexico do not use CIP codes, so we matched those programs based on a keyword search of the titles of programs offered at the universities compared to the titles of programs in the CIP 2020 to SOC 2018 Crosswalk file.

[19] Colleges and universities assign the CIP code of a program by first selecting the two-digit series that the program fits in (for example, 13 for Education, 14 for Engineering, 27 for Mathematics and Statistics, etc.) and then selecting the six-digit programs within that category based on the descriptions presented by the NCES. National Center for Education Statistics. (2020). Frequently Asked Questions for CIP Website and CIP Wizard 2020 Version 1.0. Retrieved from https://nces.ed.gov/ipeds/cipcode/Files/CIP_FAQ_Document_2020.pdf. The college or university is then free to name the program as they wish (they are not constrained by the CIP names). This means that it may appear from the title that they have a program corresponding to an occupation, but it may not align with that occupation based on the CIP code. The University of California San Diego, for example, offers a Master of Arts in Teaching and Learning: Bilingual Education (ASL – English). The CIP code, however, is 13.0101, for Education, General, not for bilingual education.

## Met & Unmet Need: South County

Currently, there is no bachelor's-granting institution in South County, a region of approximately 585,000 people[20] (18% of San Diego County's population). Southwestern College is the only public college in the area, offering a variety of associate degree and certificate programs to close to 24,000 students in the 2022-2023 academic year.[21] Over 3,000 awards were earned that academic year, including 1,005 associate for transfer degrees, 1,038 associate degrees, 1,058 certificates, and one other credit award.[22]

Of the 147 priority occupations identified in the workforce needs analysis, 48 have an associated academic program at Southwestern College. There is a mismatch, however, between the level of education offered at Southwestern College and the typical entry-level education at most of those jobs (see Table 1). Twenty-five of the occupations typically require a bachelor's degree at entry and seven typically require less than an associate degree. This leaves sixteen priority occupations for which an academic program exists in South County that conveys the required skills or knowledge and meets the typical entry-level requirements of the job.

**Table 1:** Priority Occupations with Associated Academic Programs at SWC

| Program exists, but typical entry-level education is bachelor's degree: | |
|---|---|
| Administrative services managers | Airline pilots, copilots, & flight engineers |
| Biological scientists, all other | Chemists |
| Cost estimators | Computer systems analysts |
| Computer programmers | Compensation, benefits, & job specialists |
| Database administrators | Database architects |
| Data scientists | Exercise physiologists |
| Facilities managers | Geographers |
| Geoscientists | Information security analysts |
| Network & computer systems administrators | Logisticians |
| Occupational health & safety specialists | Project management specialists |
| Registered nurses | Sales managers |
| Secondary school teachers | Social science research assistants |
| Software developers | |

| Program exists, typical entry-level education is associate degree or certificate: | |
|---|---|
| Calibration technicians | Dental hygienists |
| Emergency medical technicians | Engineering technicians, exc. drafters |
| First-line supervisors of firefighters | Health information technicians |
| Industrial engineering technicians | Licensed practical & vocational nurses |
| Medical assistants | Medical records specialists |

[20] United States Census Bureau. (n.d.). DP05: ACS Demographic and Housing Estimates. Retrieved from https://data.census.gov/table?q=population&g=860XX00US91902,91910,91911,91913,91914,91915,91932,91950,91977,91978,92118,92154,92155,92173.

[21] The number of students (including dual-enrolled high-school students) who received an end-of-term grade in a for-credit course. Southwestern College. (2023). Enrollment and Course Outcomes Dashboard. Retrieved from https://public.tableau.com/app/profile/southwesterncollege/viz/EnrollmentandCourseOutcomesDashboard/EnrollmentandCourseOutcomesDashboard.

[22] California Community Colleges Chancellor's Office Management Information Systems Data Mart. (2013). Program Awards Summary Report. Retrieved from https://datamart.cccco.edu/Outcomes/Program_Awards.aspx.

**Table 1 Continued:** Priority Occupations with Associated Academic Programs at SWC

| Program exists, typical entry-level education is associate degree or certificate (cont'd): | |
|---|---|
| Nursing assistants | Ophthalmic medical technicians |
| Paralegals & legal assistants | Paramedics |
| Surgical assistants | Surgical technologists |

| Program exists, but typical entry-level education is less than an associate degree: | |
|---|---|
| Commercial pilots | Correctional officers & jailers |
| Detectives & investigators | Executive secretaries & administrative assistants |
| First-line supervisors of police | Healthcare support workers, other |
| Police & sheriff's patrol officers | |

**San Diego County**

San Diego County is home to 16 universities – three public; eight private, non-profit; and five private, for-profit institutions. For this project, we focused on public universities (as those that are most accessible) and provided additional information about private universities that were participating in the University Now Initiative in the supplementary data file.


The three public universities – California State University San Marcos, San Diego State University, and University of California San Diego – offered a total of 242 bachelor's degree programs associated with priority occupations. California State University San Marcos offered 59 priority degree programs, SDSU offered 100 priority degree programs, and UCSD offered 83 priority degree programs. Because the degree programs often convey the skills and knowledge necessary for more than one occupation (a degree in computer science, for example, is associated with the SOC codes for computer systems analysts, information security analysts, database architects, computer programmers, software developers, and data scientists), the 242 degree programs provided education associated with 45 priority occupations. Table 2 lists occupations for which the typical entry level education is a bachelor's degree and there is no associated academic program at public universities in San Diego County. Additionally, it lists the degree programs associated with each that may be a potential area for concentration for the new university.

**Table 2:** Occupations for Which the Typical Entry-Level Education is a Bachelor's Degree and There are No Bachelor's Degree Programs at San Diego County Public Universities

| Occupation | CIP | Academic Program |
|---|---|---|
| Adult basic/secondary ed. & ESL instructors | 13.0201 | Bilingual & multilingual education |
| | 13.0202 | Multicultural education |
| | 13.0299 | Bilingual, multilingual, & multicultural education, other |
| | 13.1201 | Adult & continuing education & teaching |
| | 13.1401 | Teaching English as a second or foreign language/ESL language instructor |
| | 13.1402 | Teaching French as a second or foreign language |
| | 13.1499 | Teaching English or French as a second or foreign language, other |
| | 13.1502 | Adult literacy tutor/instructor |
| Agricultural engineers | 14.0301 | Agricultural engineering |
| Airline pilots, copilots, & flight engineers | 49.0102 | Airline/commercial/professional pilot and flight crew |
| | 49.0108 | Flight instructor |
| Clinical laboratory technologists & technicians* | | - |
| Database administrators | 11.0101 | Computer & information sciences, general |
| | 11.0802 | Data modeling/warehousing & database administration |
| | 11.1003 | Computer & information systems security/auditing/information assurance |
| Education administrators, all other | 13.0402 | Administration of special education |
| | 13.0403 | Adult & continuing education administration |
| | 13.0404 | Educational, instructional, & curriculum supervision |
| | 13.0406 | Higher education/higher education administration |
| | 13.0410 | Urban education & leadership |
| | 13.0411 | Superintendency & educational system administration |
| | 13.0412 | International school administration/leadership |
| | 13.0413 | Education entrepreneurship |
| | 13.0499 | Educational administration & supervision, other |
| | 52.0206 | Non-profit/public/organizational management |
| Food scientists & technologists | 01.0000 | Agriculture, general |
| | 01.0701 | International agriculture |
| | 01.1001 | Food science |
| | 01.1002 | Food technology & processing |
| | 01.1003 | Brewing science |
| | 01.1004 | Viticulture & enology |
| | 01.1005 | Zymology/fermentation science |
| | 01.1099 | Food science & technology, other |
| | 12.0509 | Culinary science/culinology |
| Foresters | 03.0101 | Natural resources/conservation, general |

* No educational program teaching the knowledge and skills for this occupation was identified by BLS and NCES statisticians.

| Occupation | CIP | Academic Program |
|---|---|---|
| Foresters | 03.0201 | Environmental/natural resources management & policy, general |
| | 03.0501 | Forestry, general |
| | 03.0502 | Forest sciences & biology |
| | 03.0506 | Forest management/forest resources management |
| | 03.0508 | Urban forestry |
| | 03.0509 | Wood science & wood products/pulp & paper technology/technician |
| | 03.0510 | Forest resources production & management |
| | 03.0599 | Forestry, other |
| Materials scientists | 19.0904 | Textile science |
| | 40.1001 | Materials science |
| | 40.1002 | Materials chemistry |
| | 40.1099 | Materials sciences, other |
| Mining & geological engineers | 14.0802 | Geotechnical & geoenvironmental engineering |
| | 14.2101 | Mining & mineral engineering |
| | 14.3901 | Geological/geophysical engineering |
| Network and computer systems administrators | 11.0101 | Computer & information sciences, general |
| | 11.1001 | Network & system administration/administrator |
| | 11.1003 | Computer & information systems security/auditing/information assurance |
| Nuclear engineers | 14.2301 | Nuclear engineering |
| Operations research analysts | 14.3701 | Operations research |
| | 52.1301 | Management science |
| Recreational therapists | 51.2309 | Therapeutic recreation/recreational therapy |
| Sales engineers* | | - |
| Sales reps., wholesale & mfg., technical & scientific products | 01.0105 | Agricultural/farm supplies retailing & wholesaling |
| | 52.1801 | Sales, distribution, & marketing operations, general |
| | 52.1899 | General merchandising, sales, & related marketing operations, other |
| | 52.1902 | Fashion merchandising |
| | 52.1904 | Apparel & accessories marketing operations |
| | 52.1909 | Special products marketing operations |
| Special ed. teachers, kindergarten and elementary school; Special ed. teachers, secondary school | 13.1001 | Special education & teaching, general |
| | 13.1003 | Education/teaching of individuals with hearing impairments including deafness |
| | 13.1005 | Education/teaching of individuals with emotional disturbances |
| | 13.1006 | Education/teaching of individuals with intellectual disabilities |
| | 13.1007 | Education/teaching of individuals with multiple disabilities |
| | 13.1008 | Education/teaching of individuals with orthopedic & other physical health impairments |
| | 13.1009 | Education/teaching of individuals with vision impairments including blindness |

* No educational program teaching the knowledge and skills for this occupation was identified by BLS and NCES statisticians.

| Occupation | CIP | Academic Program |
|---|---|---|
| Special ed. teachers, kindergarten and elementary school; Special ed. teachers, secondary school | 13.1011 | Education/teaching of individuals with specific learning disabilities |
| | 13.1012 | Education/teaching of individuals with speech or language impairments |
| | 13.1013 | Education/teaching of individuals with autism |
| | 13.1014 | Education/teaching of individuals who are developmentally delayed |
| | 13.1016 | Education/teaching of individuals with traumatic brain injuries |
| | 13.1017 | Education/teaching of individuals in elementary special education programs |
| Technical writers | 09.0908 | Technical & scientific communication |
| | 19.0202 | Family & consumer sciences/human sciences communication |
| | 23.1301 | Writing, general |
| | 23.1303 | Professional, technical, business, & scientific writing |
| | 52.0501 | Business/corporate communications, general |
| | 52.0502 | Grantsmanship |
| | 52.0599 | Business/corporate communications, other |
| Therapists, all other | 51.2300 | Rehabilitation & therapeutic professions, general |
| | 51.2301 | Art therapy/therapist |
| | 51.2302 | Dance therapy/therapist |
| | 51.2305 | Music therapy/therapist |
| | 51.2313 | Animal-assisted therapy |
| | 51.2315 | Drama therapy/therapist |
| | 51.2316 | Horticulture therapy/therapist |
| | 51.2317 | Play therapy/therapist |
| | 51.2399 | Rehabilitation & therapeutic professions, other |
| | 51.3601 | Movement therapy & movement education |

For students interested in studying at a public university in Tijuana and later working in the US, six institutions exist. Instituto Politécnico Nacional offers three priority bachelor's degree programs, Instituto Tecnológico de Tijuana offers 17, Universidad Autónoma de Baja California offers 31, Universidad Pedagógica Nacional en Tijuana offers six, and Universidad Tecnológica de Tijuana offers 11 (El Colegio de la Frontera Norte is a public university but only offers graduate-level education). Thirty-one of the 65 priority occupations requiring a bachelor's degree at entry had an academic program available at a public university in Tijuana.

Table 3 provides an example of the links between the workforce needs assessment, education needs assessment, and the information presented in the supplementary data file. We present the top 20 priority occupations by projected annual job openings, their associated academic programs, and information about their regional availability at public institutions, impaction status, and prioritization by residents.

**Table 3:** Table 3: Selected Priority Occupations, Associated Academic Programs, Regional Availability, and Resident Priority

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 29-1141 | Registered nurses | 51.3801 | Registered Nursing/ Registered Nurse | CSUSM*, SDSU*, SWC (AS only), UABC | ◇ |
| | | 51.3802 | Nursing Administration | | |
| | | 51.3803 | Adult Health Nurse/Nursing | | |
| | | 51.3805 | Family Practice Nurse/Nursing | | |
| | | 51.3806 | Maternal/Child Health & Neonatal Nurse/Nursing | | |
| | | 51.3808 | Nursing Science | | |
| | | 51.3809 | Pediatric Nurse/Nursing | | |
| | | 51.3810 | Psychiatric/Mental Health Nurse/Nursing | | |
| | | 51.3811 | Public Health/Community Nurse/Nursing | | |
| | | 51.3812 | Perioperative/Operating Room & Surgical Nurse/Nursing | | |
| | | 51.3813 | Clinical Nurse Specialist | | |
| | | 51.3814 | Critical Care Nursing | | |
| | | 51.3815 | Occupational & Environmental Health Nursing | | |
| | | 51.3816 | Emergency Room/Trauma Nursing | | |
| | | 51.3818 | Nursing Practice | | |
| | | 51.3819 | Palliative Care Nursing | | |
| | | 51.3820 | Clinical Nurse Leader | | |
| | | 51.3821 | Geriatric Nurse/Nursing | | |
| | | 51.3822 | Women's Health Nurse/Nursing | | |
| | | 51.3824 | Forensic Nursing | | |
| | | 51.3899 | Registered Nursing, Nursing Administration, Nursing Research & Clinical Nursing, Other | | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 15-1252 | Software developers | 11.0102 | Artificial Intelligence | | |
| | | 11.0103 | Information Technology | CSUSM, SDSU*, SWC (AA only), UCSD* | |
| | | 11.0104 | Informatics | | |
| | | 11.0201 | Computer Programming/Programmer, General | SWC (AS & CT only) | ◇ |
| | | 11.0202 | Computer Programming, Specific Applications | | ◇ |
| | | 11.0203 | Computer Programming, Vendor/Product Certification | | |
| | | 11.0204 | Computer Game Programming | | |
| | | 11.0205 | Computer Programming, Specific Platforms | | |
| | | 11.0401 | Information Science/Studies | | |
| | | 11.0701 | Computer Science | CSUSM, SDSU*, SWC (AA & AS only), UABC, UCSD* | ◇ |
| | | 11.0804 | Modeling, Virtual Environments & Simulation | | |
| | | 11.0902 | Cloud Computing | | |
| | | 14.0901 | Computer Engineering, General | SDSU*, UCSD*, Instituto Tecnológico de Tijuana | |
| | | 14.0903 | Computer Software Engineering | CSUSM*, UABC | |
| | | 15.1204 | Computer Software Technology/ Technician | | |
| | | 30.0801 | Mathematics & Computer Science | UCSD | |
| | | 30.1601 | Accounting & Computer Science | | |
| | | 30.3901 | Economics & Computer Science | | |
| | | 30.4801 | Linguistics & Computer Science | | |
| | | 30.7001 | Data Science, General | | |
| 13-1082 | Project management specialists | 11.1005 | Information Technology Project Management | | |
| | | 52.0101 | Business/Commerce, General | CSUSM*, SWC (AA, AS, & CT only) | ◇ |
| | | 52.0201 | Business Administration & Management, General | CSUSM*, IPN, SDSU*, SWC (AA, AS, & CT only), UABC | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 13-1082 | Project management specialists | 52.0211 | Project Management | | |
| | | 52.0216 | Science/Technology Management | | |
| | | 52.2002 | Construction Project Management | | |
| 25-2021 | Elementary school teachers, except special education | 13.0201 | Bilingual & Multilingual Education | | |
| | | 13.1202 | Elementary Education & Teaching | Universidad Pedagógica Nacional en Tijuana | |
| | | 13.1206 | Teacher Education, Multiple Levels | | |
| | | 13.1207 | Montessori Teacher Education | | |
| | | 13.1208 | Waldorf/Steiner Teacher Education | | |
| | | 13.1210 | Early Childhood Education & Teaching | CSUSM, Universidad Pedagógica Nacional en Tijuana | |
| | | 13.1211 | Online Educator/Online Teaching | | |
| | | 13.1212 | International Teaching & Learning | | |
| | | 13.1213 | Science, Technology, Engineering, & Mathematics (STEM) Educational Methods | | |
| | | 13.1338 | Environmental Education | | |
| | | 13.1339 | Communication Arts & Literature Teacher Education | | |
| | | 13.1401 | Teaching English as a Second or Foreign Language/ESL Language Instructor | | |
| | | 13.1402 | Teaching French as a Second or Foreign Language | | |
| | | 13.1499 | Teaching English or French as a Second or Foreign Language, Other | | |
| | | 45.0199 | Social Sciences, Other | | |
| 11-2022 | Sales managers | 19.0203 | Consumer Merchandising/Retailing Management | | |
| | | 51.2011 | Pharmaceutical Marketing & Management | | |
| | | 52.0101 | Business/Commerce, General | See above | |
| | | 52.0201 | Business Administration & Management, General | See above | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 11-2022 | Sales managers | 52.1401 | Marketing/Marketing Management, General | CSUSM*, SDSU*, UABC, Universidad Tecnológica de Tijuana | |
| 11-9111 | Medical and health services managers | 01.8201 | Veterinary Administrative Services, General | | |
| | | 01.8202 | Veterinary Office Management/Administration | | |
| | | 26.0509 | Infectious Disease & Global Health | | |
| | | 44.0503 | Health Policy Analysis | | |
| | | 51.0701 | Health/Health Care Administration/Management | | |
| | | 51.0702 | Hospital & Health Care Facilities Administration/Management | | |
| | | 51.0704 | Health Unit Manager/Ward Supervisor | | |
| | | 51.0706 | Health Information/Medical Records Administration/Administrator | | |
| | | 51.0718 | Long Term Care Administration/Management | | |
| | | 51.0719 | Clinical Research Coordinator | | |
| | | 51.072 | Regulatory Science/Affairs | | |
| | | 51.0721 | Disease Registry Data Management | | |
| | | 51.0722 | Healthcare Innovation | | |
| | | 51.2001 | Pharmacy | | |
| | | 51.2002 | Pharmacy Administration & Pharmacy Policy & Regulatory Affairs | | |
| | | 51.2007 | Pharmacoeconomics/ Pharmaceutical Economics | | |
| | | 51.2008 | Clinical, Hospital, & Managed Care Pharmacy | | |
| | | 51.2011 | Pharmaceutical Marketing & Management | | |
| | | 51.2201 | Public Health, General | SDSU*, UCSD* | |
| | | 51.2208 | Community Health & Preventive Medicine | UCSD* | |
| | | 51.2210 | International Public Health/International Health | | |
| | | 51.2211 | Health Services Administration | | |
| | | 51.2213 | Patient Safety & Healthcare Quality | | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 11-9111 | Medical and health services managers | 51.2214 | Public Health Genetics | | |
| | | 51.2299 | Public Health, Other | UCSD* | |
| | | 51.3206 | Arts in Medicine/Health | | |
| | | 51.3299 | Health Professions Education, Ethics, & Humanities, Other | | |
| | | 51.3802 | Nursing Administration | See above | |
| | | 51.3818 | Nursing Practice | See above | |
| | | 51.3820 | Clinical Nurse Leader | See above | |
| | | 52.0206 | Non-Profit/Public/Organizational Management | | |
| | | 52.0210 | Research & Development Management | | |
| | | 52.0214 | Research Administration | | |
| | | 52.0216 | Science/Technology Management | | |
| 25-2031 | Secondary school teachers, except special and career/ technical education | 13.0201 | Bilingual & Multilingual Education | See above | |
| | | 13.1203 | Junior High/Intermediate/Middle School Education & Teaching | | |
| | | 13.1205 | Secondary Education & Teaching | Universidad Pedagógica Nacional en Tijuana | |
| | | 13.1206 | Teacher Education, Multiple Levels | See above | |
| | | 13.1207 | Montessori Teacher Education | See above | |
| | | 13.1208 | Waldorf/Steiner Teacher Education | See above | |
| | | 13.1211 | Online Educator/Online Teaching | See above | |
| | | 13.1212 | International Teaching & Learning | See above | |
| | | 13.1213 | Science, Technology, Engineering, & Mathematics (STEM) Educational Methods | See above | |
| | | 13.1302 | Art Teacher Education | | |
| | | 13.1304 | Driver & Safety Teacher Education | | |
| | | 13.1305 | English/Language Arts Teacher Education | | |
| | | 13.1306 | Foreign Language Teacher Education | | |
| | | 13.1307 | Health Teacher Education | | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 25-2031 | Secondary school teachers, except special and career/ technical education | 13.1308 | Family & Consumer Sciences/Home Economics Teacher Education | | |
| | | 13.1309 | Technology Teacher Education/Industrial Arts Teacher Education | | |
| | | 13.1311 | Mathematics Teacher Education | CSUSM, UCSD, UABC | |
| | | 13.1312 | Music Teacher Education | | |
| | | 13.1314 | Physical Education Teaching & Coaching | | |
| | | 13.1315 | Reading Teacher Education | | |
| | | 13.1316 | Science Teacher Education/General Science Teacher Education | | |
| | | 13.1317 | Social Science Teacher Education | | |
| | | 13.1318 | Social Studies Teacher Education | | |
| | | 13.1321 | Computer Teacher Education | | |
| | | 13.1322 | Biology Teacher Education | | |
| | | 13.1323 | Chemistry Teacher Education | | |
| | | 13.1324 | Drama & Dance Teacher Education | | |
| | | 13.1325 | French Language Teacher Education | | |
| | | 13.1326 | German Language Teacher Education | | |
| | | 13.1328 | History Teacher Education | | |
| | | 13.1329 | Physics Teacher Education | | |
| | | 13.1330 | Spanish Language Teacher Education | | |
| | | 13.1331 | Speech Teacher Education | | |
| | | 13.1332 | Geography Teacher Education | | |
| | | 13.1333 | Latin Teacher Education | | |
| | | 13.1335 | Psychology Teacher Education | | |
| | | 13.1337 | Earth Science Teacher Education | | |
| | | 13.1338 | Environmental Education | | |
| | | 13.1339 | Communication Arts & Literature Teacher Education | UABC | |
| | | 13.1401 | Teaching English as a Second or Foreign Language/ESL Language Instructor | See above | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 25-2031 | Secondary school teachers, except special and career/ technical education | 13.1402 | Teaching French as a Second or Foreign Language | | |
| | | 13.1499 | Teaching English or French as a Second or Foreign Language, Other | | |
| | | 16.0101 | Foreign Languages & Literatures, General | | |
| | | 16.0300 | East Asian Languages, Literatures, & Linguistics, General | | |
| | | 16.0301 | Chinese Language & Literature | | |
| | | 16.0302 | Japanese Language & Literature | SDSU* | |
| | | 16.0303 | Korean Language & Literature | | |
| | | 16.0399 | East Asian Languages, Literatures, & Linguistics, Other | | |
| | | 16.0402 | Russian Language & Literature | SDSU* | |
| | | 16.0500 | Germanic Languages, Literatures, & Linguistics, General | | |
| | | 16.0501 | German Language & Literature | | |
| | | 16.0599 | Germanic Languages, Literatures, & Linguistics, Other | | |
| | | 16.0900 | Romance Languages, Literatures, & Linguistics, General | | |
| | | 16.0901 | French Language & Literature | SDSU*, SWC (AA only) | |
| | | 16.0902 | Italian Language & Literature | SWC (AA only) | |
| | | 16.0905 | Spanish Language & Literature | CSUSM, SDSU*, SWC (AA & CP only), UABC, UCSD | |
| | | 16.0999 | Romance Languages, Literatures, & Linguistics, Other | | |
| | | 16.1001 | American Indian/Native American Languages, Literatures, & Linguistics | | |
| | | 16.1101 | Arabic Language & Literature | | |
| | | 16.1102 | Hebrew Language & Literature | | |
| | | 16.1200 | Classics & Classical Languages, Literatures, & Linguistics, General | | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 25-2031 | Secondary school teachers, except special and career/ technical education | 16.1202 | Ancient/Classical Greek Language & Literature | | |
| | | 16.1203 | Latin Language & Literature | | |
| | | 16.1299 | Classics & Classical Languages, Literatures, & Linguistics, Other | | |
| | | 16.1409 | Hawaiian Language & Literature | | |
| | | 16.1499 | Southeast Asian & Australasian/Pacific Languages, Literatures, & Linguistics, Other | | |
| | | 16.1601 | American Sign Language (ASL) | SWC (CT only) | |
| | | 16.1602 | Linguistics of ASL & Other Sign Languages | | |
| | | 16.9999 | Foreign Languages, Literatures, & Linguistics, Other | | |
| | | 19.0101 | Family & Consumer Sciences/Human Sciences, General | | |
| | | 23.0101 | English Language & Literature, General | CSUSM, SDSU*, SWC (AA & CN only), UCSD | |
| | | 26.0101 | Biology/Biological Sciences, General | CSUSM*, SDSU*, SWC (AS only), UCSD* | |
| | | 27.0101 | Mathematics, General | CSUSM, SDSU*, SWC (AS only), UCSD | |
| | | 30.0101 | Biological & Physical Sciences | SWC (AA only) | |
| | | 30.3601 | Cultural Studies & Comparative Literature | | |
| | | 30.3801 | Earth Systems Science | | |
| | | 30.4101 | Environmental Geosciences | | |
| | | 30.4501 | History & Language/Literature | | |
| | | 40.0101 | Physical Sciences, General | | |
| | | 40.0501 | Chemistry, General | CSUSM, SDSU*, SWC (AS only), UCSD | |
| | | 40.0801 | Physics, General | SDSU*, SWC (AS only), UCSD | |
| | | 45.0101 | Social Sciences, General | CSUSM, SDSU* | |
| | | 45.0199 | Social Sciences, Other | See above | |
| | | 45.0601 | Economics, General | CSUSM, SDSU*, SWC (AA only), UABC | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 25-2031 | Secondary school teachers, except special and career/ technical education | 45.1001 | Political Science & Government, General | CSUSM, SDSU*, SWC (AA only), UABC, UCSD | |
| | | 45.1002 | American Government & Politics (United States) | | |
| | | 45.1003 | Canadian Government & Politics | | |
| | | 45.1099 | Political Science & Government, Other | UCSD | |
| | | 50.0701 | Art/Art Studies, General | SDSU*, SWC (AA only) | |
| | | 50.0901 | Music, General | CSUSM, SDSU*, SWC (AA, CP, & CT only), UCSD | |
| | | 54.0101 | History, General | CSUSM, SDSU*, SWC (AA only), UABC, UCSD | |
| | | 54.0102 | American History (United States) | | |
| 13-1041 | Compliance officers | 3.0103 | Environmental Studies | CSUSM, SDSU*, UCSD | |
| | | 3.0104 | Environmental Science | SDSU* | |
| | | 3.0208 | Environmental/Natural Resources Law Enforcement & Protective Services | | |
| | | 3.0209 | Energy & Environmental Policy | | |
| | | 30.4101 | Environmental Geosciences | See above | |
| | | 43.0121 | Suspension & Debarment Investigation | | |
| | | 51.0717 | Medical Staff Services Technology/Technician | | |
| | | 51.0720 | Regulatory Science/Affairs | See above | |
| | | 51.2213 | Patient Safety & Healthcare Quality | See above | |
| | | 52.1001 | Human Resources Management/Personnel Administration, General | | |
| | | 52.1002 | Labor & Industrial Relations | | |
| 15-1211 | Computer systems analysts | 11.0101 | Computer & Information Sciences, General | SWC (CP only) | |
| | | 11.0103 | Information Technology | See above | |
| | | 11.0501 | Computer Systems Analysis/Analyst | | |
| | | 11.0901 | Computer Systems Networking & Telecommunications | | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 13-1081 | Logisticians | 52.0201 | Business Administration & Management, General | See above | |
| | | 52.0203 | Logistics, Materials, & Supply Chain Management | CSUSM*, Instituto Tecnológico de Tijuana, SWC (AA, AS & CT only) | |
| | | 52.0205 | Operations Management & Supervision | CSUSM* | |
| 17-2051 | Civil engineers | 14.0801 | Civil Engineering, General | Instituto Tecnológico de Tijuana, SDSU*, UABC | |
| | | 14.0802 | Geotechnical & Geoenvironmental Engineering | | |
| | | 14.0803 | Structural Engineering | UCSD* | |
| | | 14.0804 | Transportation & Highway Engineering | | |
| | | 14.0805 | Water Resources Engineering | | |
| | | 14.0899 | Civil Engineering, Other | | |
| | | 14.3301 | Construction Engineering | | |
| 19-1029 | Biological scientists, all other | 26.0101 | Biology/Biological Sciences, General | See above | |
| | | 26.0204 | Molecular Biology | UCSD | |
| | | 26.0207 | Structural Biology | | |
| | | 26.0208 | Photobiology | | |
| | | 26.0209 | Radiation Biology/Radiobiology | | |
| | | 26.0210 | Biochemistry & Molecular Biology | | |
| | | 26.0299 | Biochemistry, Biophysics & Molecular Biology, Other | | |
| | | 26.0301 | Botany/Plant Biology | | |
| | | 26.0305 | Plant Pathology/Phytopathology | | |
| | | 26.0307 | Plant Physiology | | |
| | | 26.0308 | Plant Molecular Biology | | |
| | | 26.0399 | Botany/Plant Biology, Other | | |
| | | 26.0401 | Cell/Cellular Biology & Histology | CSUSM* | |
| | | 26.0403 | Anatomy | | |
| | | 26.0404 | Developmental Biology & Embryology | | |
| | | 26.0406 | Cell/Cellular & Molecular Biology | UCSD* | |
| | | 26.0407 | Cell Biology & Anatomy | | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| | | 26.0499 | Cell/Cellular Biology & Anatomical Sciences, Other | | |
| | | 26.0503 | Medical Microbiology & Bacteriology | | |
| | | 26.0504 | Virology | | |
| | | 26.0505 | Parasitology | | |
| | | 26.0506 | Mycology | | |
| | | 26.0507 | Immunology | | |
| | | 26.0508 | Microbiology & Immunology | | |
| | | 26.0509 | Infectious Disease & Global Health | See above | |
| | | 26.0702 | Entomology | | |
| | | 26.0707 | Animal Physiology | | |
| | | 26.0801 | Genetics, General | | |
| | | 26.0802 | Molecular Genetics | | |
| | | 26.0803 | Microbial & Eukaryotic Genetics | | |
| | | 26.0804 | Animal Genetics | | |
| | | 26.0805 | Plant Genetics | | |
| | | 26.0807 | Genome Sciences/Genomics | | |
| | | 26.0899 | Genetics, Other | | |
| 19-1029 | Biological scientists, all other | 26.0910 | Pathology/Experimental Pathology | | |
| | | 26.1001 | Pharmacology | | |
| | | 26.1004 | Toxicology | | |
| | | 26.1101 | Biometry/Biometrics | | |
| | | 26.1102 | Biostatistics | UCSD* | |
| | | 26.1104 | Computational Biology | | |
| | | 26.1199 | Biomathematics, Bioinformatics, & Computational Biology, Other | | |
| | | 26.1201 | Biotechnology | CSUSM | |
| | | 26.1301 | Ecology | CSUSM* | |
| | | 26.1302 | Marine Biology & Biological Oceanography | UCSD | |
| | | 26.1303 | Evolutionary Biology | | |
| | | 26.1304 | Aquatic Biology/Limnology | | |
| | | 26.1305 | Environmental Biology | | |
| | | 26.1306 | Population Biology | | |
| | | 26.1307 | Conservation Biology | | |
| | | 26.1308 | Systematic Biology/Biological Systematics | | |
| | | 26.1310 | Ecology & Evolutionary Biology | | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 19-1029 | Biological scientists, all other | 26.1311 | Epidemiology & Biostatistics | | |
| | | 26.1399 | Ecology, Evolution, Systematics & Population Biology, Other | UCSD* | |
| | | 26.1501 | Neuroscience | | |
| | | 26.1502 | Neuroanatomy | | |
| | | 26.1503 | Neurobiology & Anatomy | UCSD | |
| | | 26.1504 | Neurobiology & Behavior | | |
| | | 26.1599 | Neurobiology & Neurosciences, Other | UCSD* | |
| | | 26.9999 | Biological & Biomedical Sciences, Other | | |
| | | 27.0306 | Mathematical Biology | UCSD | |
| | | 30.1901 | Nutrition Sciences | SDSU* | |
| | | 30.2701 | Human Biology | | |
| | | 30.3201 | Marine Sciences | | |
| | | 42.2706 | Behavioral Neuroscience | | |
| 41-4011 | Sales representatives, wholesale and manufacturing, technical and scientific products | 52.1804 | Selling Skills & Sales Operations | | |
| 17-2141 | Mechanical engineers | 14.1101 | Engineering Mechanics | | |
| | | 14.1901 | Mechanical Engineering | Instituto Tecnológico de Tijuana, SDSU*, UABC, UCSD* | |
| | | 14.4101 | Electromechanical Engineering | Instituto Tecnológico de Tijuana | |
| 19-2199 | Engineers, all other | 14.0101 | Engineering, General | | |
| | | 14.0103 | Applied Engineering | | |
| | | 14.0401 | Architectural Engineering | | |
| | | 14.0702 | Chemical & Biomolecular Engineering | | |
| | | 14.0802 | Geotechnical & Geoenvironmental Engineering | See above | |
| | | 14.0805 | Water Resources Engineering | See above | |
| | | 14.1003 | Laser & Optical Engineering | | |
| | | 14.1004 | Telecommunications Engineering | | |
| | | 14.1101 | Engineering Mechanics | See above | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 19-2199 | Engineers, all other | 14.1201 | Engineering Physics/Applied Physics | | |
| | | 14.1301 | Engineering Science | | |
| | | 14.2401 | Ocean Engineering | | |
| | | 14.2701 | Systems Engineering | | |
| | | 14.3301 | Construction Engineering | | |
| | | 14.3401 | Forest Engineering | | |
| | | 14.3601 | Manufacturing Engineering | | |
| | | 14.3801 | Surveying Engineering | | |
| | | 14.3901 | Geological/Geophysical Engineering | | |
| | | 14.4001 | Paper Science & Engineering | | |
| | | 14.4101 | Electromechanical Engineering | See above | |
| | | 14.4201 | Mechatronics, Robotics, & Automation Engineering | UABC, Universidad Tecnológica de Tijuana | |
| | | 14.4301 | Biochemical Engineering | Instituto Tecnológico de Tijuana | |
| | | 14.4401 | Engineering Chemistry | | |
| | | 14.4501 | Biological/Biosystems Engineering | UCSD* | |
| | | 14.4701 | Electrical & Computer Engineering | | |
| | | 14.4801 | Energy Systems Engineering, General | | |
| | | 14.4802 | Power Plant Engineering | | |
| | | 14.4899 | Energy Systems Engineering, Other | | |
| | | 14.9999 | Engineering, Other | UCSD | |
| | | 15.1502 | Engineering Design | | |
| | | 15.1601 | Nanotechnology | Instituto Tecnológico de Tijuana | |
| | | 51.2312 | Assistive/Augmentative Technology & Rehabilitation Engineering | | |
| 17-2061 | Computer hardware engineers | 14.0901 | Computer Engineering, General | See above | |
| | | 14.0902 | Computer Hardware Engineering | | |
| | | 14.1001 | Electrical & Electronics Engineering | CSUSM*, Instituto Tecnológico de Tijuana, UABC | |

* Impacted program

| SOC Code | Occupation | CIP Code | Academic Program | Availabilty/ Impaction | Resident Priority |
|---|---|---|---|---|---|
| 17-2061 | Computer hardware engineers | 14.4701 | Electrical & Computer Engineering | See above | |
| 15-1244 | Network and computer systems administrators | 11.0101 | Computer & Information Sciences, General | See above | |
| | | 11.1001 | Network & System Administration/Administrator | | |
| | | 11.1003 | Computer & Information Systems Security/Auditing/Information Assurance | | |
| 29-2018 | Clinical laboratory technologists and technicians | - | - | | |
| 11-3012 | Administrative services managers | 01.8202 | Veterinary Office Management/Administration | See above | |
| | | 51.0711 | Medical/Health Management & Clinical Assistant/Specialist | | |
| | | 52.0101 | Business/Commerce, General | See above | |
| | | 52.0201 | Business Administration & Management, General | See above | |
| | | 52.0202 | Purchasing, Procurement/Acquisitions & Contracts Management | | |
| | | 52.0204 | Office Management & Supervision | SWC (CP & CT only) | |
| | | 52.0207 | Customer Service Management | | |
| 13-1051 | Cost estimators | 14.1801 | Materials Engineering | | |
| | | 14.1901 | Mechanical Engineering | See above | |
| | | 14.3301 | Construction Engineering | See above | |
| | | 14.3601 | Manufacturing Engineering | See above | |
| | | 15.1001 | Construction Engineering Technology/Technician | | |
| | | 52.0101 | Business/Commerce, General | See above | |
| | | 52.0201 | Business Administration & Management, General | See above | |

* Impacted program

# Pathways to Future Programs

How exactly do programs for emerging occupations develop successfully?

Emerging occupations are difficult to design training programs for. By their nature, they are unfamiliar and uncertain: the skills and content knowledge graduates need change quicker than legacy programs, and faculty with real-life experience with the profession are difficult to find. We will use the field of Data Science – a young, growing profession – as an example of successful development of academic programs alongside an emerging occupation.

Today, organizations hire Data Scientists to help them structure, explore, and address difficult and quickly changing business problems using organizational data, and often several, very large data sets. Data Scientists need to be able to understand data types and structures, to clean and manipulate data collected for one purpose to address another, to do sophisticated data analysis, and to interpret the results of their analysis to solve business problems. Before people were hired for the job title "Data Scientist," these tasks were often done by workers with broader statistical backgrounds.

Today, Data Science bachelor's programs are ubiquitous and very popular among students. They don't often live in statistics departments – more often, these programs are founded within computer science or engineering, management, or library and information science departments.

Data science programs often focus on producing the most accurate predictions of a variable of interest based on a suite of related variables using machine learning techniques, which were first developed in psychiatry, over inferring relationships between variables using traditional statistical methods. They support the aspects of the Data Scientist's job that are not covered by a traditional statistics education, like data manipulation, understanding the context of disparate data sources, and data storytelling.

The professional practice of Data Science can be looked at from many angles: computer scientists use many of the same programming languages and techniques; management programs train students to identify and address business problems; library and information departments think deeply about the nature, structure, and context of information. A data science department could be built on any of these strong foundations. It is unlikely that a College of Data Science would be created without first starting in another department and building on that expertise before breaking off into its own department.

Schools with successful data science programs develop out of a school's strengths in existing programs. Their strong reputations allow them to attract excellent faculty. Their trust within their larger institution allows them to build flexible programs, in which they can change curricula guided by trends in the growing profession. Their local credibility makes it easier to build external partners for projects, internships, and more, giving students real world experience in the profession as it exists that year.

When building new programs for emerging professions, we recommend the UNI Committee think carefully about where to house the new program, selecting a department whose existing programs shares skill sets with the emerging profession and one that has a strong reputation and current faculty.

# Concluding Thoughts

A bachelor's granting institution is needed in Southern San Diego County. Government officials have been working to achieve this goal since at least 1986,[23] and data from the current workforce and education needs report supports the necessity of such an institution. More than a quarter of San Diego County's 2.24 million jobs require a bachelor's degree at entry. About 70% of today's priority occupations – those that pay good wages and are accessible to recent graduates – require a bachelor's degree. Across industries, a bachelor's degree can help workers command higher wages at their jobs and a liberal arts education typically encompasses many of the soft skills employers say they want in their employees, such as active learning, critical thinking, and reading comprehension.

Residents want degrees and are hopeful about the ability to improve their lives through education. Though there was no difference by region of the county on reported satisfaction with their ability to get the job they want, South County residents were significantly more likely to report that a bachelor's degree would improve their job prospects. Approximately 40% of adult residents in the southern parts of the county and about 27% elsewhere in the county are interested in enrolling in a bachelor's degree program in the near future.

[23] Bernstein, L. (1986, April 1). South Bay Plans to Lure a University to the Area. *Los Angeles Times*. Retrieved from https://www.latimes.com/archives/la-xpm-1986-04-01-me-1560-story.html.

## Content

Potential students were particularly interested in studying business, technology, healthcare, and the arts. When planning programs, the academic planning committee could:

**Emphasize inclusion of programs focused on business, technology, healthcare, and the arts** (e.g., adding healthcare careers is in line with the future adjusted priority programs and demand from prospective students)

**Emphasize applications within popular industries** (e.g., integrating technology project content into project management coursework).

When designing curricula, consider emphasizing the skill sets that business leaders in our study feel are lacking in entry-level talent:

### Communication skills

| | |
|---|---|
| Public speaking | Active listening |
| Teaching | Written communication |
| Interviewing skills | Reading comprehension |
| Networking | Social perceptiveness |

### Flexible thinking skills

| | |
|---|---|
| Creativity | Adaptability |
| Critical thinking | Problem-solving |

### Independence

| | |
|---|---|
| Active learning | Entrepreneurial skills |
| Project management | |

### Technical skills

| | |
|---|---|
| Engineering | Software skills |

These skills offer an opportunity for new programs to differentiate themselves from current education offerings and provide a head start for graduates. Consider also incorporating the insights of Advancing San Diego,[24] which uses the talent pipeline management framework to identify the in-demand skills and competencies employers in important local industries need in their workforce.

When considering the short-term future, business leaders were focused on growing their businesses and improving their processes. Imagining their industry in 50 years, business leaders were concerned about the impacts of AI and other emerging technologies, like virtual reality, robotics and more. Ensuring that students have the skills to use these emerging technologies, interpret their outputs, and act ethically in a workplace alongside automated agents will help them prepare for this future.

[24] San Diego Regional Economic Development Corporation. (2023). Advancing San Diego. Retrieved from https://www.sandiegobusiness.org/about-edc/our-initiatives/advancing-san-diego/.

## Structure

More than 60% of prospective students prefer online asynchronous classes, and residents cited opportunity costs as a barrier to a degree. However, this doesn't mean that residents are interested in perfunctory or easy classes: residents interested in bachelor's degree programs are about equally motivated by self-improvement benefits as financial ones. This also does not negate the need for a physical university. Institutions of higher education offer a central location where students can receive services such as physical and mental health care, academic advising and assistance, library services, legal services, and meal assistance, to name a few.

They also offer a place for meeting, socializing, and culture building with peers and faculty, and student clubs and organizations are a vital part of the experience of many students.

To help prospective students commit to a bachelor's degree, reduce both direct and opportunity costs. In addition to tuition assistance, support for child and eldercare, income replacement, and flexible schedules can help mitigate the opportunity costs of a bachelor's degree for students. Online, asynchronous classes allow students to do their coursework around their work schedules so they can earn an income while they are attending school.

As programs grow, we recommend that the UNI committee consider prioritizing those that:

Lead to high-quality, high-demand jobs that meet the economic needs of the future
(see Appendix III: Future-Adjusted Priority Occupations)

Build on Southwestern College's strengths and existing programs where possible by making transfer pathways from SWC to the newly created university clear to students and easy to access

Meet needs that are unmet by existing public universities in the region
(see Table 2)

# Appendix I:
# Research Methodology

## Resident Survey

We conducted a representative sample survey of 1,000 San Diego County residents from August 2023 to September 2023. The survey was offered online (available on both web and mobile browsers) in English and Spanish to adults (ages 18 and older). Respondents matched the target population on age, sex, and zip code of residence (see Figure 12).

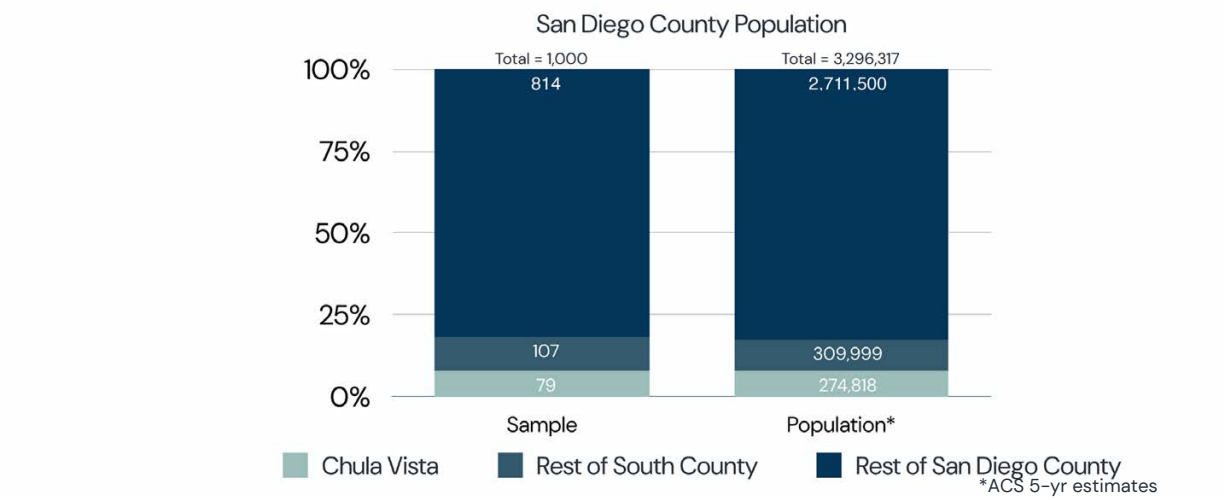



**Figure 12:** Sample & Population Comparison- San Diego County

At PIC, we do not capture race in the same way the US Census Bureau does. The Census Bureau asks two separate questions, one about race (where respondents can select all that apply to five major categories – White, Black or African American, American Indian or Alaska Native, Asian, or Pacific Islander – or have the option to write in an answer under "Some other race") and one about ethnicity (asking whether the respondent is of Hispanic, Latino, or Spanish origin). Approximately two-thirds of Hispanic Americans consider their Latino identity to be part of their racial identity,[25] so we include "Hispanic or Latina/o/x" among the racial identities survey respondents can select from. We also include the option "Middle Eastern or North African," allow respondents to select as many options as apply to them, and do not prioritize Hispanic ethnicity when analyzing data on race. We believe our method of capturing race is more in line with people's experiences but has a downside in that our counts are not directly comparable to the US Census population estimates. In Figure 13 we present an inclusive count[26] of the number of people who responded to the survey by race.

[25] Parker, K., Horowitz, J. M., Morin, R. (2015). Multiracial in America. Pew Research Center. Retrieved from https://www.pewresearch.org/social-trends/2015/06/11/multiracial-in-america/.

[26] People who selected more than one race were counted in every category they selected with the exception of White. The White category only includes people who selected White and no other races. The total number of people exceeds 1,000 because of this inclusive count.

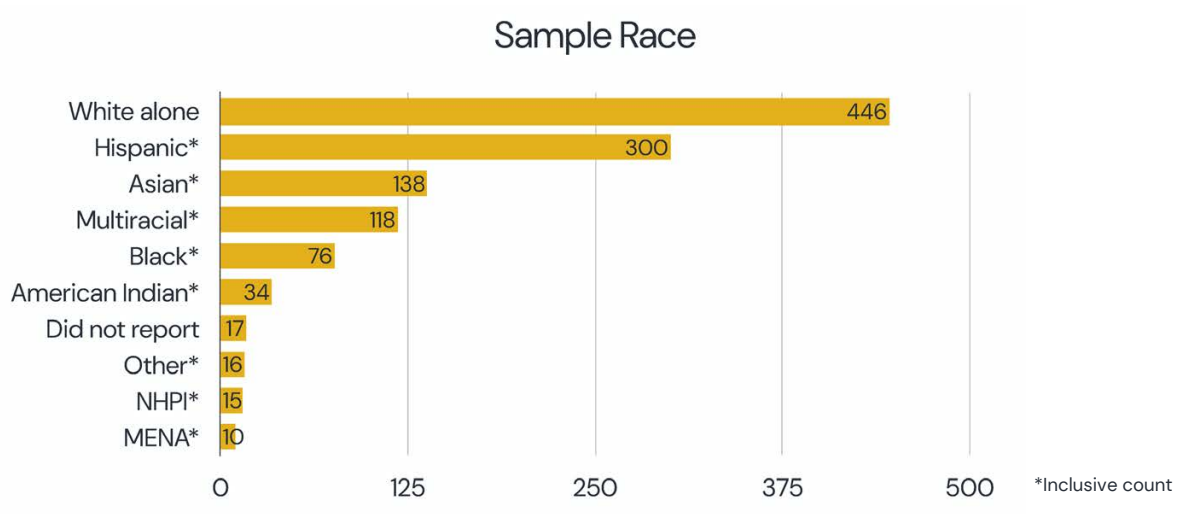



**Figure 13:** Respondent Race in Representative Sample Survey of San Diego County Residents

## Business Survey

To gather information from business professionals, we conducted a web survey from September 2023 to October 2023. Surveys were available in English and Spanish. The San Diego Workforce Partnership invited San Diego County businesses to participate in the survey, Consejo de Desarrollo Económico de Tijuana and Centro Metropolitano de Información Económica y Empresarial invited businesses in Baja California to participate, and PIC researchers reached out directly to Orange County businesses to invite participation. We also engaged a panel survey company to get additional responses. In total, we received 131 responses from San Diego County businesses, 64 from Orange County businesses, and 17 from Baja California businesses.

Most of the respondents to the business survey represented private, for-profit businesses (see Figure 14). The industries represented are presented in Figure 15; the most common were retail trade; manufacturing; information; professional, scientific and technical; and construction.

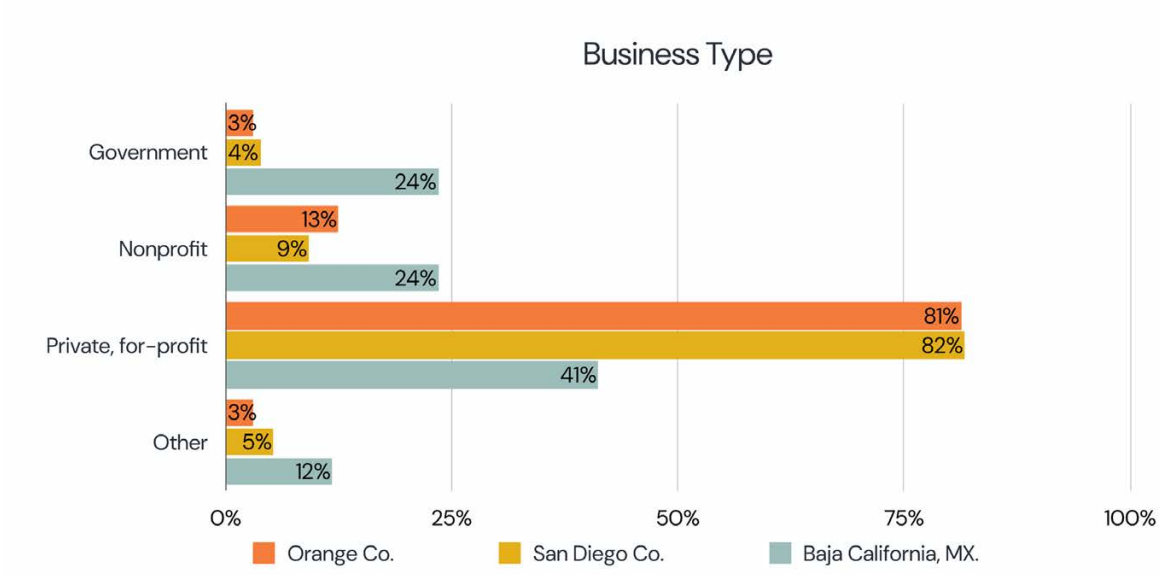



**Figure 14:** Business Type

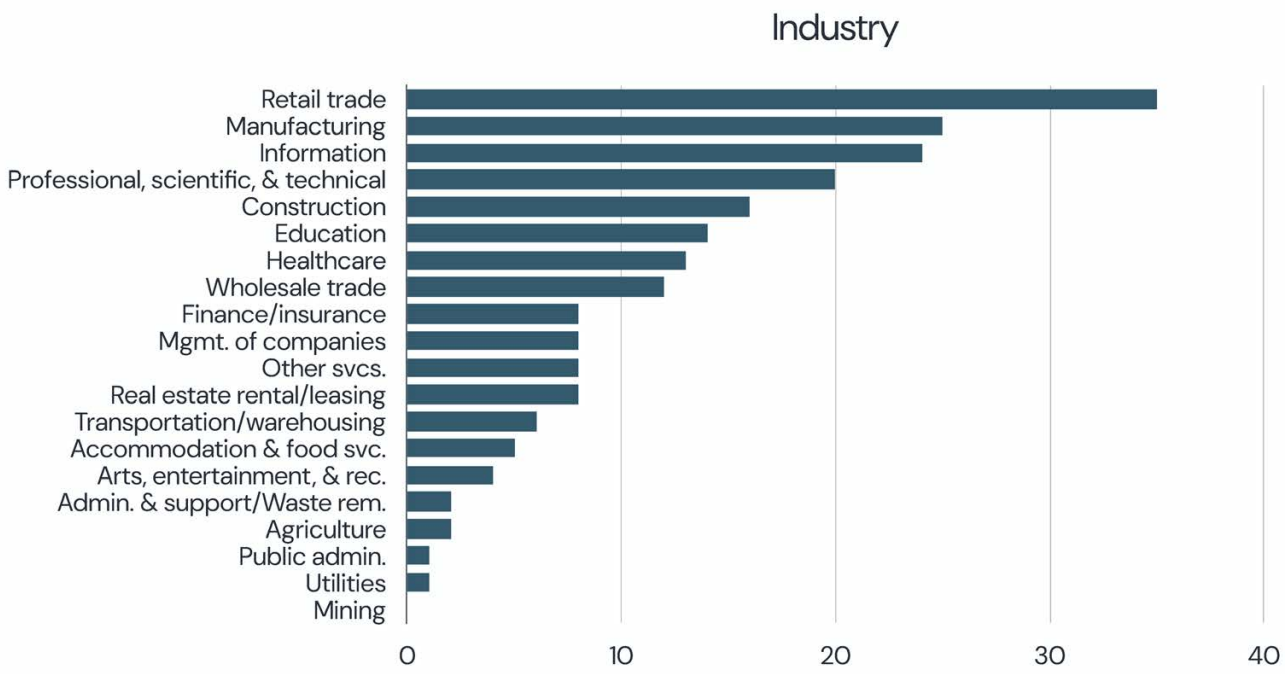



**Figure 15:** Industry of Responding Businesses

## Business Focus Groups

We collected data about employers' hiring needs and ideas about the future of their industries. We conducted three focus groups with a total of nine participants. One participant was a sole proprietor who occasionally hires help, one business employed 350 people, two participants worked for organizations with more than a thousand employees, and the rest ranged between four and 28 employees. All these businesses were located in South San Diego County. Focus groups lasted between thirty minutes and one hour and were conducted virtually.

## Priority Occupations

As described in the report, we started with a list of preliminary priority occupations which met our standards for job market demand and job quality in 2023:

1. Have 50 or more average openings per year
2. Require less than five years of work experience at entry
3. Require a bachelor's degree or less at entry
4. Pay a self-sustaining wage at entry

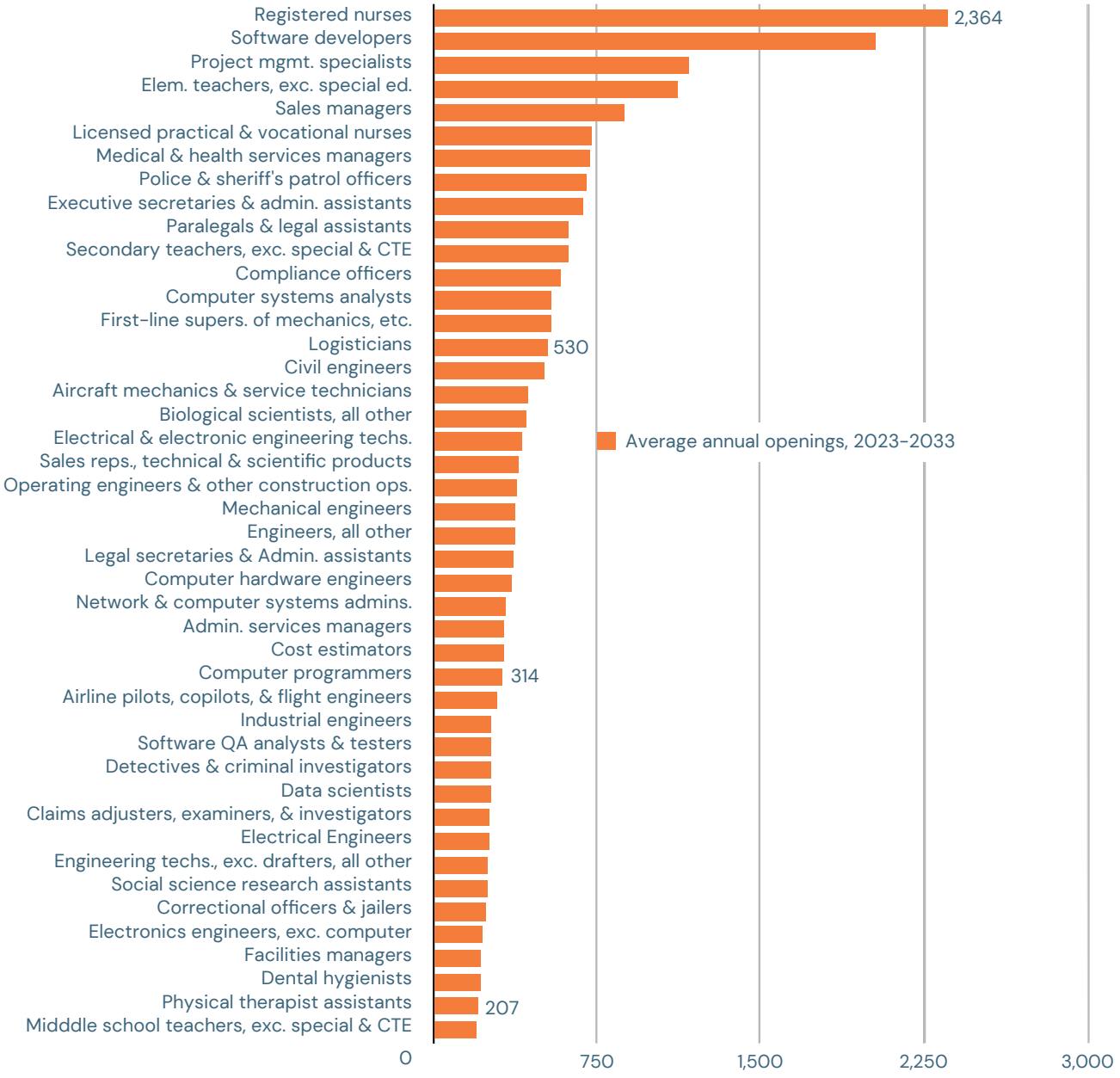
Then, we used business concerns from the focus groups and a literature review to identify eight trends that we expect to impact the local job market over the next 10 years. Each trend could have more than one type of impact on occupations. Those trends included:

1. **Automation:** Increasing integration of machine learning-based tools across industries. Includes recommendation algorithms, image and text generation, K means/clustering, image recognition, and more. Although most of these innovations are implemented in software, this trend includes some additional robotics as well.
    a. **Harm:** Automation could replace a substantial number of jobs in a given occupation (this could be software automation, robotics, or both).
    b. **Smaller harm:** Automation could deskill an occupation by replacing human labor with automated labor for some tasks, but not all.
    c. **Benefit:** Demand for jobs necessary to build or manage automated tools will likely increase.
2. **Marketization of previously unpaid domestic work:** Increasingly, the economy is monetizing or professionalizing tasks that were previously done by household members without pay. For example, grocery delivery and early childhood care (UTK) both increase the number of people being paid for previously unpaid labor. We expect this trend to continue as adult household members staying at home becomes increasingly unaffordable and gig work continues to be a flexible way to create and supplement income.
    a. **Small benefit:** Although there will increasingly be opportunities to make money doing these previously unpaid jobs, thus far such jobs are low-quality. For example, many provide low wages (e.g., childcare) and many don't offer stable hours or key benefits like health insurance (e.g., gig work).
3. **California employment law changes:** In response to the marketization of previously unpaid domestic labor and automation, California is continuing to change its employment law. For example, AB 701 and AB 1651 regulate the use of certain technologies in the workplace, and new laws protect trucking and app-based delivery workers from being misclassified. Additional labor may be required to accomplish or document compliance with these laws.
    a. **Small benefit:** Additional regulations will add additional demand for workers to comply and document compliance. We expect these effects will be persistent if the regulations add complexity. This impact is small because we expect that in most cases, it will simply expand the scope of existing workers and will add a small number of additional jobs.
4. **Aging Population:** The increasing average age of the population due to birth rates over time and increased life expectancy will increase the need for services of all kinds except those primarily used by young people and increase demand for healthcare.
    a. **Benefit:** An aging population will likely increase the demand for healthcare.
    b. **Benefit:** An aging population will likely increase the demand for most services.
5. **Energy Efficiency Improvements:** Increasing concern about climate change and laws (especially CA state laws) drive the implementation of energy efficiency technologies.

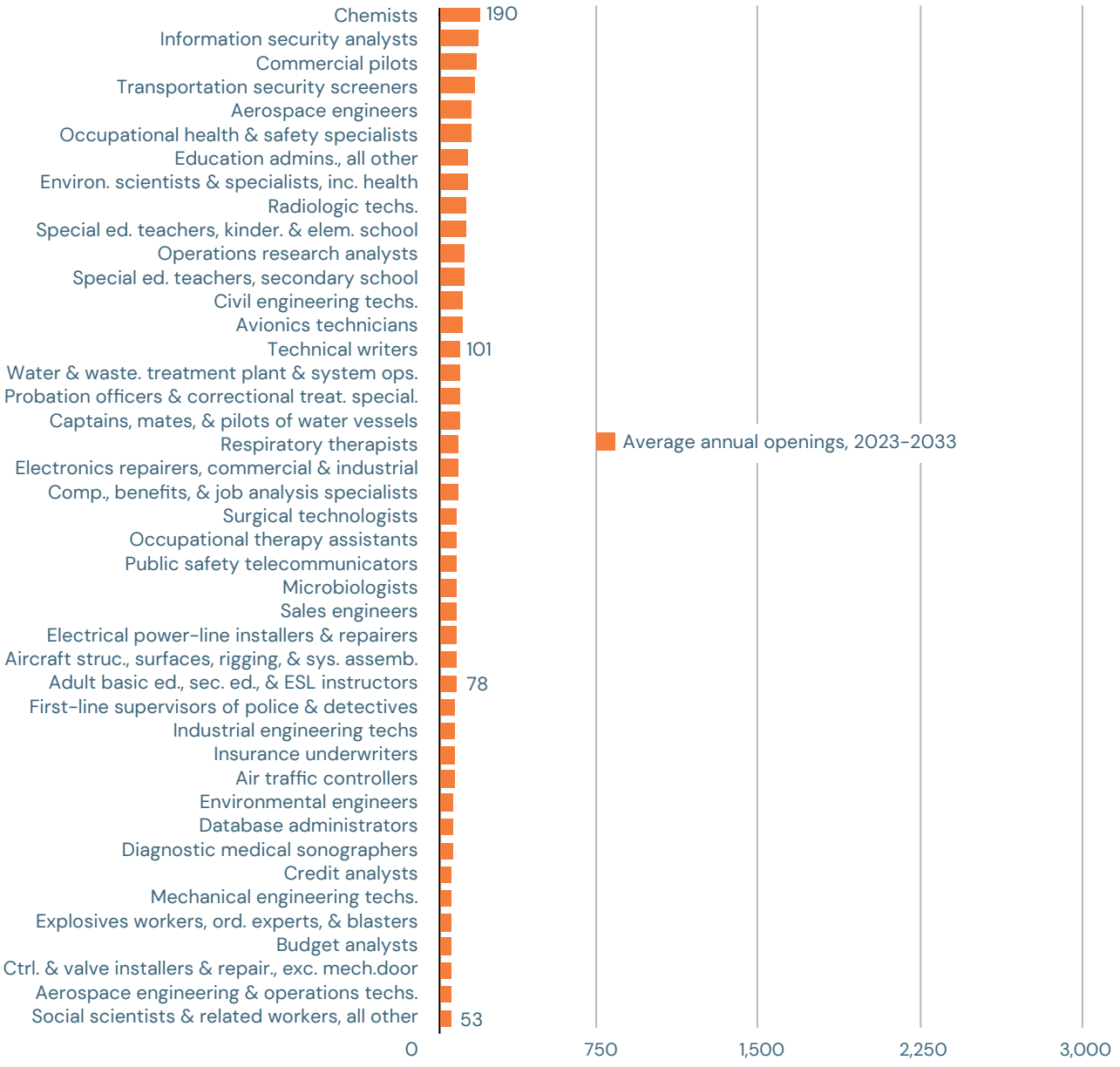
4.
5. **Energy Efficiency Improvements:** Increasing concern about climate change and laws (especially California state laws) drive the implementation of energy efficiency technologies.
    a. **Benefit:** Some jobs' outlook will be improved by increased demand for the development and installation of energy efficiency technologies.
    b. **Small harm:** Jobs involved in the provision of energy may be harmed by the implementation of energy efficiency technologies. This harm is somewhat mitigated by increased demand created by increased electrification and the federal programs designed to support these workers to reskill for related occupations.
6. **California moving away from fossil fuels:** In response to climate goals, resources are being directed toward ambitious expansion in green energy. In 10 years, we expect more jobs in green energy provision such as solar, wind, and hydropower. We expect fossil fuel jobs to continue to contract as California moves towards electric vehicles and residential heating/cooking.
    a. **Harm:** We expect less demand for workers procuring, treating, transporting, or selling fossil fuels.
    b. **Harm:** We expect less demand for workers who specialize in repairing and maintaining internal combustion engines across the state.
    c. **Benefit:** Jobs related to battery manufacturing, electric vehicle charging, electric vehicle repair, generating clean energy, and electrifying buildings currently heated by fossil fuels.
7. **Impacts of climate change:** global temperatures are likely to continue to rise, increasing fires, floods, wildfires, and food shortages. We expect this to result in increasing demand for recovery after these disasters and enhancement of infrastructure against future disasters.
    a. **Benefit:** We anticipate increased demand for workers in disaster relief or climate resilience.
8. **Nearshoring:** We expect companies to continue to move manufacturing to Mexico to reduce logistical costs and risks from supply chain disruptions. Note that this trend does not predict an increase in goods manufactured, but rather a small number of additional jobs to enact and facilitate manufacturing in Mexico.
    a. **Benefit:** A small number of jobs needed to facilitate nearshoring will experience a long-lasting, positive impact.

We started with two sets of occupations: those in the preliminary priority occupations list and all other occupations that met our priority occupations criteria except for lacking sufficient average annual job openings or providing a self-sustaining wage. Occupations on the preliminary occupations list were assumed to be included in the future-adjusted priority occupations list unless they were net-negatively impacted by future trends. Other occupations were only included if they were net-benefited by future trends. For example, if an occupation was harmed by a trend listed above as a "small harm" but benefited by a trend listed as a "benefit," it was included because the benefit outweighs the small harm. If an occupation was harmed and benefited by trends with the same weight (e.g., a "benefit" and a "harm" or a "small benefit" and a "small harm") it was not included on the future adjusted list.

# Appendix II:
## Preliminary Priority Occupations



# Appendix II:
## Preliminary Priority Occupations (continued)

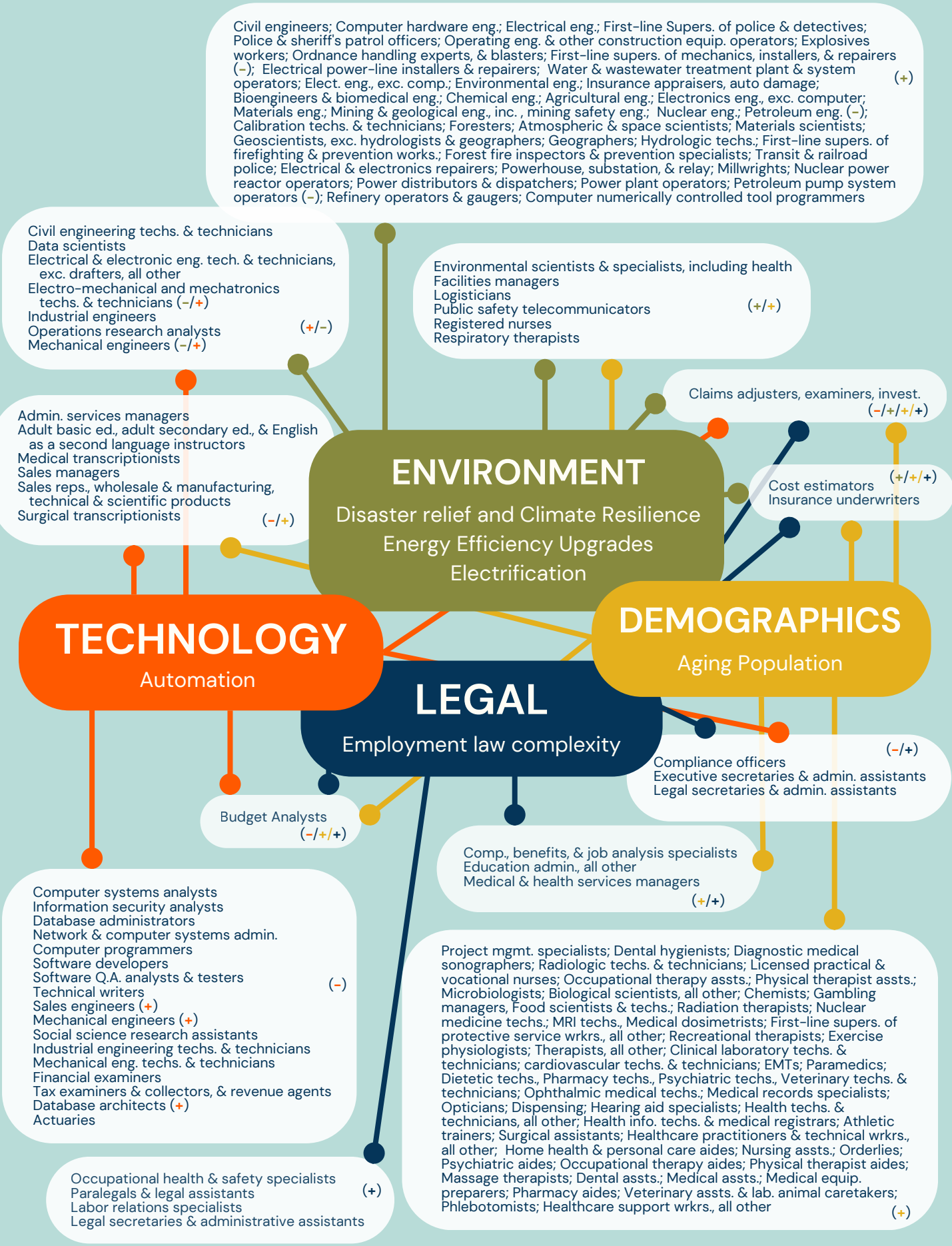


# Appendix III:
## Future-Adjusted Priority Occupations

The figure on the next page demonstrates the impact of current trends on future occupations. We used business concerns from the focus groups and a literature review to identify trends that we expect to impact the local job market over the next 10 years. These trends are included in the broad categories identified in the visual below: the environment, including disaster relief and climate resilience; technology, including automation; demographics, including the aging of the population; and legal changes, like increasing employment law complexity. Trends may have a combination of positive, negative, or intersecting effects on future occupations. We estimate their impact by classifying expected effects into "harm," "small harm," "benefit," and "small benefit." For more information on how we estimated impact, refer to the section on Priority Occupations in Appendix I: Research Methodology.

In the visual below, this is represented by the color-coded plus and minus signs. For example, we expect technology will have a negative impact on Claims adjusters, examiners, and investigators. Legal and demographic trends, however, are expected to have a positive impact on this occupation. The color-coded lines connect the trend category and the occupations likely to be affected by the future trends. In the top center box, for example, we see the tag for the environment, which has five lines connecting it to different occupation groups. From left to right, we see it first connect to the box which includes Civil engineering technologists and technicians, which is expected to be impacted positively by the environment and negatively by technology. The next line connects to a group of occupations including Civil engineers, which is mostly expected to be impacted positively by the environment, followed by the tag connecting to Environmental scientists and specialists and others, where environmental and demographic trends are expected to have a positive impact. Next, we see this box connected to Claims adjusters, examiners, and investigators, expected to increase due to environmental trends, Finally, the environment connects to Cost estimators and Insurance underwriters, which we expect to be impacted positively by environmental, legal, and demographic trends.

We also identified which occupations from our original list of priority occupations would be unimpacted by the previously mentioned trends, ranging from aerospace engineers and avionics technicians to elementary school teachers and probation officers. For a full list of possible unimpacted occupations, see the list "Preliminary priority occupations that were unaffected by future projections."


Civil engineers; Computer hardware eng.; Electrical eng.; First-line Supers. of police & detectives; Police & sheriff's patrol officers; Operating eng. & other construction equip. operators; Explosives workers; Ordnance handling experts, & blasters; First-line supers. of mechanics, installers, & repairers (–); Electrical power-line installers & repairers; Water & wastewater treatment plant & system operators; Elect. eng., exc. comp.; Environmental eng.; Insurance appraisers, auto damage; Bioengineers & biomedical eng.; Chemical eng.; Agricultural eng.; Electronics eng., exc. computer; Materials eng.; Mining & geological eng., inc. , mining safety eng.; Nuclear eng.; Petroleum eng. (–); Calibration techs. & technicians; Foresters; Atmospheric & space scientists; Materials scientists; Geoscientists, exc. hydrologists & geographers; Geographers; Hydrologic techs.; First-line supers. of firefighting & prevention works.; Forest fire inspectors & prevention specialists; Transit & railroad police; Electrical & electronics repairers; Powerhouse, substation, & relay; Millwrights; Nuclear power reactor operators; Power distributors & dispatchers; Power plant operators; Petroleum pump system operators (–); Refinery operators & gaugers; Computer numerically controlled tool programmers (+)
Civil engineering techs. & technicians
Data scientists
Electrical & electronic eng. tech. & technicians, exc. drafters, all other
Electro-mechanical and mechatronics techs. & technicians (–/+)
Industrial engineers
Operations research analysts (+/–)
Mechanical engineers (–/+)
Environmental scientists & specialists, including health
Facilities managers
Logisticians
Public safety telecommunicators (+/+)
Registered nurses
Respiratory therapists
Claims adjusters, examiners, invest. (–/+/+/+)
Admin. services managers
Adult basic ed., adult secondary ed., & English as a second language instructors
Medical transcriptionists
Sales managers
Sales reps., wholesale & manufacturing, technical & scientific products
Surgical transcriptionists (–/+)
ENVIRONMENT
Disaster relief and Climate Resilience
Energy Efficiency Upgrades
Electrification
Cost estimators (+/+/+)
Insurance underwriters
TECHNOLOGY
Automation
DEMOGRAPHICS
Aging Population
LEGAL
Employment law complexity
Compliance officers (–/+)
Executive secretaries & admin. assistants
Legal secretaries & admin. assistants
Budget Analysts (–/+/+)
Comp., benefits, & job analysis specialists
Education admin., all other
Medical & health services managers (+/+)
Computer systems analysts
Information security analysts
Database administrators
Network & computer systems admin.
Computer programmers
Software developers
Software Q.A. analysts & testers (–)
Technical writers
Sales engineers (+)
Mechanical engineers (+)
Social science research assistants
Industrial engineering techs. & technicians
Mechanical eng. techs. & technicians
Financial examiners
Tax examiners & collectors, & revenue agents
Database architects (+)
Actuaries
Project mgmt. specialists; Dental hygienists; Diagnostic medical sonographers; Radiologic techs. & technicians; Licensed practical & vocational nurses; Occupational therapy assts.; Physical therapist assts.; Microbiologists; Biological scientists, all other; Chemists; Gambling managers, Food scientists & techs.; Radiation therapists; Nuclear medicine techs.; MRI techs., Medical dosimetrists; First-line supers. of protective service wrkrs., all other; Recreational therapists; Exercise physiologists; Therapists, all other; Clinical laboratory techs. & technicians; cardiovascular techs. & technicians; EMTs; Paramedics; Dietetic techs., Pharmacy techs., Psychiatric techs., Veterinary techs. & technicians; Ophthalmic medical techs.; Medical records specialists; Opticians; Dispensing; Hearing aid specialists; Health techs. & technicians, all other; Health info. techs. & medical registrars; Athletic trainers; Surgical assistants; Healthcare practitioners & technical wrkrs., all other; Home health & personal care aides; Nursing assts.; Orderlies; Psychiatric aides; Occupational therapy aides; Physical therapist aides; Massage therapists; Dental assts.; Medical assts.; Medical equip. preparers; Pharmacy aides; Veterinary assts. & lab. animal caretakers; Phlebotomists; Healthcare support wrkrs., all other (+)
Occupational health & safety specialists
Paralegals & legal assistants (+)
Labor relations specialists
Legal secretaries & administrative assistants

Preliminary priority occupations that were unaffected by future projections:

| |
|---|
| Aerospace engineering & operations technologists & technicians |
| Aerospace engineers |
| Aircraft mechanics & service technicians |
| Aircraft structure, surfaces, rigging, & system assemblers |
| Airline pilots, copilots, & flight engineers |
| Air traffic controllers |
| Avionics technicians |
| Captains, mates, & pilots of water vessels |
| Commercial pilots |
| Control & valve installers & repairers, except mechanical door |
| Correctional officers and jailers |
| Detectives and criminal investigators |
| Electrical & electronics repairers, commercial & industrial equipment |
| Elementary school teachers, except special education |
| Engineers, all other |
| Mechanical engineers |
| Middle school teachers, except special & career/technical education |
| Probation officers & correctional treatment specialists |
| Secondary school teachers, except special & career/technical education |
| Social scientists & related, all other |
| Special education teachers, kindergarten & elementary school |
| Special education teachers, secondary school |
| Transportation security screeners |

# Appendix IV:
# Priority Academic Programs

### AGRICULTURE, AGRICULTURAL OPERATIONS, & RELATED SCIENCES

Agriculture, general
Ag. mech. & equip./machine tech./technician
International agriculture
Food science
Food technology & processing
Brewing science
Viticulture & enology
Zymology/fermentation science
Food science & technology, other
Soil microbiology
Veterinary administrative services, general
Veterinary office mgmt./administration

### NATURAL RESOURCES & CONSERVATION

Natural resources/conservation, general
Environmental studies
Environmental science
Environ./nat. resources mgmt. & policy, general
Environmental/natural resources law enforcement & protective services
Energy & environmental policy
Forestry, general
Forest sciences & biology
Forest mgmt./forest resources mgmt.
Urban forestry
Forest resources production & mgmt.
Wood sci. & wood products/pulp & paper tech./technician
Forestry, other

### COMPUTER & INFORMATION SCIENCES & SUPPORT SERVICES

Computer & information sciences, general
Artificial intelligence
Information technology
Informatics
Computer programming/programmer, general
Computer programming, specific applications
Computer programming, vendor/product cert.
Computer game programming
Computer programming, specific platforms
Computer programming, other
Information science/studies
Computer systems analysis/analyst
Computer science
Data modeling/warehousing & DB admin.
Computer graphics
Modeling, virtual environs. & simulation
Computer systems networking & telecom.
Cloud computing
Network & system admin./administrator
Sys., networking, & LAN/WAN mgmt./mgr.
Computer & ISS auditing/info. assurance
Information technology project mgmt.

### PERSONAL & CULINARY SERVICES

Culinary science/culinology

## EDUCATION

Bilingual & multilingual education
Multicultural education
Bilingual, multilingual, & multicultural ed., other
Educational leadership & admin., general
Administration of special education
Adult & continuing education administration
Edu., instructional, & curriculum supervision
Higher education/higher education admin.
Urban education & leadership
Superintendency & educational system admin.
International school administration/leadership
Education entrepreneurship
Educational admin. & supervision, other
Educational evaluation & research
Educational statistics & research methods
Ed. assessment, testing, & measurement
Learning sciences
Ed. assessment, evaluation, & research, other
Special education & teaching, general
Education/teaching of individuals with hearing impairments including deafness
Education/teaching of individuals with intellectual disabilities
Education/teaching of individuals with orthopedic & physical health impairments
Education/teaching of individuals with specific learning disabilities
Education/teaching of individuals who are developmentally delayed
Education/teaching of individuals in secondary special education programs
Teaching English as a second or foreign language/ESL language instructor
Teaching English or French as a second or foreign language, other
Education/teaching of individuals with autism
Chemistry teacher education
Drama & dance teacher education
French language teacher education
German language teacher education
Adult & continuing education & teaching
Elementary education & teaching
Secondary education & teaching
Teacher education, multiple levels
Montessori teacher education
Waldorf/Steiner teacher education
Early childhood education & teaching
Online educator/online teaching
International teaching & learning
STEM educational methods
Art teacher education
Driver & safety teacher education
English/language arts teacher education
Foreign language teacher education
Health teacher education
Family & consumer sci./home ec., teacher ed.
Tech. teacher ed./industrial arts teacher ed.
Mathematics teacher education
Music teacher education
Physical education teaching & coaching
Reading teacher education
Science teacher ed./gen. Science teacher ed.
Social science teacher education
Social studies teacher education
Computer teacher education
Biology teacher education
Education/teaching of individuals with emotional disturbances
Education/teaching of individuals with multiple disabilities
Education/teaching of individuals with vision impairments including blindness
Education/teaching of individuals with speech or language impairments
Education/teaching of individuals with traumatic brain injuries
Junior high/intermediate/middle school education & teaching
Teaching French as a 2nd or foreign language
Communication arts & literature teacher education
Speech teacher education
Geography teacher education
Latin teacher education
Psychology teacher education
Earth science teacher education
Environmental education
Spanish language teacher education
Health occupations teacher education
History teacher education
Physics teacher education
Adult literacy tutor/instructor

## ENGINEERING

Engineering, general
Applied engineering
Aerospace, aeronautical, & astronautical/space engineering, general
Astronautical engineering
Mechanical engineering
Agricultural engineering
Architectural engineering
Bioengineering & biomedical engineering
Ceramic sciences & engineering
Chemical engineering
Chemical & biomolecular engineering
Chemical engineering, other
Civil engineering, general
Geotechnical & geoenvironmental engineering
Structural engineering
Transportation & highway engineering
Water resources engineering
Civil engineering, other
Computer engineering, general
Computer hardware engineering
Computer software engineering
Electrical & electronics engineering
Laser & optical engineering
Telecommunications engineering
Electrical, electronics, & comms. eng., other
Engineering mechanics
Engineering physics/applied physics
Engineering science
Environmental/environ. health engineering
Materials engineering
Aerospace, aeronautical, & astronautical/space engineering, other
Metallurgical engineering
Mining & mineral engineering
Nuclear engineering
Ocean engineering
Systems engineering
Textile sciences & engineering
Polymer/plastics engineering
Construction engineering
Forest engineering
Industrial engineering
Manufacturing engineering
Operations research
Surveying engineering
Geological/geophysical engineering
Paper science & engineering
Electromechanical engineering
Mechatronics, robotics, & automation eng.
Biochemical engineering
Engineering chemistry
Biological/biosystems engineering
Electrical & computer engineering
Energy systems engineering, general
Power plant engineering
Energy systems engineering, other
Engineering, other

## ENGINEERING TECHNOLOGIES/TECHNICIANS

Engineering technologies/technicians, general
Applied engineering technologies/technicians
Architectural engineering tech./technicians
Civil engineering technologies/technicians
Water quality & wastewater treatment mgmt. & recycling technology/technician
Laser & optical technology/technician
Telecommunications technology/technician
Integrated circuit design tech./technician
Audio engineering technology/technician
Electrical/electronic eng. tech./technicians, other
Biomedical technology/technician
Computer software technology/technician
Occ. safety & health technology/technician.
Industrial safety technology/technician
Process safety technology/technician
Aeronautical/aerospace eng. tech./technician
Mechanical/mechanical engineering technology/technician
Auto. engineering technology/technician
Marine engineering technology/technician
Motorsports engineering tech./technician
Mech. eng. related tech./technicians, other
Mining technology/technician
Construction engineering tech./technician
Hydraulics & fluid power technology/technician
Computer engineering technology/technician

## ENGINEERING TECHNOLOGIES/TECHNICIANS CONTINUED

Instrumentation technology/technician
Robotics technology/technician
Automation engineer technology/technician
Mechatronics, robotics, & automation engineering technology/technician
Electromechanical tech./technicians, other
HVAC & refrigeration eng. tech./technician
Electrical, elec., & comm. eng. tech./technician
Environmental control tech./technicians, other
Plastics & polymer engineering tech./technician
Metallurgical technology/technician
Industrial technology/technician
Manufacturing engineering tech./technician
Welding engineering technology/technician
Chemical engineering technology/technician
Semiconductor manufacturing tech./technician
Composite materials technology/technician
Industrial production tech./technicians, other
Computer/comp. systems tech./technician
Computer hardware technology/technician
Electromechanical/electromechanical engineering technology/technician
Computer eng. tech./technicians, other
Nuclear engineering technology/technician
Engineering/industrial management
Engineering design
Packaging science
Nanotechnology
Energy systems technology/technician
Power plant technology/technician
Solar energy technology/technician
Wind energy technology/technician
Hydroelectric energy technology/technician
Geothermal energy technology/technician
Energy systems tech./technicians, other

## FOREIGN LANGUAGES, LITERATURES, & LINGUISTICS

Foreign languages & literatures, general
Linguistic, comparative, & related language studies & services, other
East Asian languages, lit., & linguistics, gen.
Chinese language & literature
Japanese language & literature
Korean language & literature
East Asian languages, lit., & linguistics, other
Russian language & literature
Germanic languages, lit., & linguistics, general
German language & literature
Germanic languages, literature, & linguistics, other
Romance languages, lit., & linguistics, general
French language & literature
Italian language & literature
Spanish language & literature
American Indian/Native American languages, literatures, & linguistics
Romance languages, lit., & linguistics, other
Arabic language & literature
Hebrew language & literature
Classics & classical lang., lit., & linguistics, gen.
Ancient/classical Greek language & literature
Latin language & literature
Classics & classical lang., lit., & linguistics, other
Hawaiian language & literature
Southeast Asian & Australasian/Pacific languages, literatures, & linguistics, other
American Sign Language (ASL)
Linguistics of ASL & other sign languages
Foreign languages, lit., & linguistics, other

## FAMILY & CONSUMER SCIENCES/HUMAN SCIENCES

Family & consumer sciences/human sci., general
Consumer merchandising/retailing mgmt.
Facilities planning & management
Adult development & aging
Textile science

## LEGAL PROFESSIONS & STUDIES

Legal studies
Legal administrative assistant/secretary
Legal assistant/paralegal

## ENGLISH LANGUAGE & LITERATURE/LETTERS

English language & literature, general

## BIOLOGICAL & BIOMEDICAL SCIENCES

Biology/biological sciences, general
Molecular biology
Structural biology
Photobiology
Radiation biology/radiobiology
Biochemistry & molecular biology
Biochemistry, biophysics & molecular bio., other
Botany/plant biology
Plant pathology/phytopathology
Plant physiology
Plant molecular biology
Botany/plant biology, other
Cell/cellular biology & histology
Anatomy
Developmental biology & embryology
Cell/cellular & molecular biology
Cell biology & anatomy
Cell/cellular biology & anatomical sciences, other
Microbiology, general
Medical microbiology & bacteriology
Virology
Parasitology
Mycology
Immunology
Microbiology & immunology
Infectious disease & global health
Microbiological sciences & immunology, other
Entomology
Animal physiology
Genetics, general
Molecular genetics
Microbial & eukaryotic genetics
Animal genetics
Plant genetics
Genome sciences/genomics
Genetics, other
Exercise physiology & kinesiology
Pathology/experimental pathology
Pharmacology
Toxicology
Molecular toxicology
Environmental toxicology
Biometry/biometrics
Biostatistics
Bioinformatics
Computational biology
Biomath., bioinformatics, & comp. bio., other
Biotechnology
Ecology
Marine biology & biological oceanography
Evolutionary biology
Aquatic biology/limnology
Environmental biology
Population biology
Conservation biology
Systematic biology/biological systematics
Ecology & evolutionary biology
Epidemiology & biostatistics
Ecology, evo., systematics & pop. bio., other
Neuroscience
Neuroanatomy
Neurobiology & anatomy
Neurobiology & behavior
Neurobiology & neurosciences, other
Biological & biomedical sciences, other

## MATHEMATICS & STATISTICS

- Mathematics, general
- Applied mathematics, general
- Computational mathematics
- Computational & applied mathematics
- Financial mathematics
- Mathematical biology
- Applied mathematics, other
- Statistics, general
- Mathematical statistics & probability
- Mathematics & statistics
- Applied statistics, general
- Mathematics & statistics, other

## MILITARY TECHNOLOGIES

- Signal/geospatial intelligence
- Engineering acoustics
- Operational oceanography
- Undersea warfare
- Aerospace ground equipment technology
- Air & space operations technology
- Radar communications & systems technology

## MULTI/INTERDISCIPLINARY STUDIES

- Biological & physical sciences
- Peace studies & conflict resolution
- Mathematics & computer science
- Biopsychology
- Gerontology
- Historic preservation & conservation, general
- Historic preservation & conservation, other
- Accounting & computer science
- Behavioral sciences
- Nutrition sciences
- Holocaust & related studies
- Intercultural/multicultural & diversity studies
- Cultural studies/critical theory & analysis
- Human biology
- Dispute resolution
- Computational science
- Marine sciences
- Sustainability studies
- Anthrozoology
- Climate science
- Cultural studies & comparative literature
- Earth systems science
- Economics & computer science
- Economics & foreign language/literature
- Environmental geosciences
- Geoarchaeology
- Geobiology
- Geography & environmental studies
- History & language/literature
- History & political science
- Linguistics & anthropology
- Linguistics & computer science
- Mathematics & atmospheric/oceanic science
- Philosophy, politics, & economics
- Data science, general
- Data science, other
- Data analytics, general
- Business analytics
- Data visualization
- Financial analytics
- Data analytics, other

## PARKS, RECREATION, LEISURE, & FITNESS STUDIES

- Parks, recreation, & leisure facilities mgmt., gen.
- Exercise science & kinesiology

## PHYSICAL SCIENCES

Physical sciences, general
Atmospheric sciences & meteorology, general
Atmospheric chemistry & climatology
Atmospheric physics & dynamics
Meteorology
Atmospheric sciences & meteorology, other
Chemistry, general
Analytical chemistry
Inorganic chemistry
Organic chemistry
Physical chemistry
Polymer chemistry
Chemical physics
Environmental chemistry
Forensic chemistry
Theoretical chemistry
Cheminformatics/chemistry informatics
Chemistry, other
Geology/earth science, general
Geochemistry
Geophysics & seismology
Paleontology
Hydrology & water resources science
Geochemistry & petrology
Oceanography, chemical & physical
Geological & earth sciences/geosciences, other
Physics, general
Materials science
Materials chemistry
Materials sciences, other

## SCIENCE TECHNOLOGIES/TECHNICIANS

Science technologies/technicians, general
Nuclear/nuclear power technology/technician
Physical science tech./technicians, other
Science technologies/technicians, other

## PSYCHOLOGY

Psychology, general
Behavioral neuroscience
Psychometrics & quantitative psychology

## SECURITY & PROTECTIVE SERVICES

Criminal justice & corrections, general
Corrections
Criminal justice/law enforcement admin.
Criminal justice/safety studies
Criminal justice/police science
Security & loss prevention services
Juvenile corrections
Securities services administration/management
Law enforcement investigation & interviewing
Law enforce., record-keeping & evidence mgmt.
Critical incident response/special police ops.
Protective services operations
Suspension & debarment investigation
Maritime law enforcement
Cultural/archaeological resources protection
Corrections & criminal justice, other
Fire prevention & safety technology/technician
Fire services administration
Fire science/Firefighting
Fire/arson investigation & prevention
Fire protection, other
Homeland security
Crisis/emergency/disaster management
Critical infrastructure protection
Terrorism & counterterrorism operations
Homeland security, other
Security science & technology, general
Criminalistics & criminal science
Cyber/computer forensics & counterterrorism
Cybersecurity defense strategy/policy
Financial forensics & fraud investigation
Geospatial intelligence
Law enforcement intelligence analysis
Security science & technology, other

## PUBLIC ADMINISTRATION & SOCIAL SERVICES PROFESSIONS

Public policy analysis, general
Education policy analysis
Health policy analysis
International policy analysis
Social work

## SOCIAL SCIENCES

Social sciences, general
Research methodology & quantitative methods
Survey research/methodology
Social sciences, other
Demography & population studies
Applied demography
Demography, other
Economics, general
Applied economics
Econometrics & quantitative economics
Development economics & international dev.
Geography
Geographic information science & cartography
Geography, other
Political science & government, general
American government & politics (US)
Canadian government & politics
Political economy
Political science & government, other
Sociology, general
Applied/public sociology
Geography & anthropology
Social sciences, other

## CONSTRUCTION TRADES

Elec. & power trans. installation/installer, general
Lineworker
Electrical & power transmission installers, other
Building/property maintenance
Building/construction site mgmt./manager
Building construction technology/technician
Well drilling/driller
Blasting/blaster

## MECHANIC & REPAIR TECHNOLOGIES/TECHNICIANS

Mechanics & repairers, general
Computer installation & repair tech./technician
Industrial electronics technology/technician
Electrical/electronics maintenance & repair technologies/technicians, other
Heavy equipment maintenance technology/technician
Industrial mechanics & maintenance technology/technician
Vehicle maintenance & repair technology/technician, general
Autobody/collision & repair technology/technician
Airframe mechanics & aircraft maintenance technology/technician
Aircraft powerplant technology/technician
Avionics maintenance technology/technician
Recreation vehicle (RV) service technician
High performance & custom engine technician/mechanic
Energy systems installation & repair technology/technician
Solar energy system installation & repair technology/technician
Wind energy system installation & repair technology/technician
Hydroelectric energy system installation & repair technology/technician
Geothermal energy system installation & repair technology/technician

## PRECISION PRODUCTION

- Computer numerically controlled (CNC) machinist technology/CNC machinist

## TRANSPORTATION & MATERIALS MOVING

- Airline/commercial/prof. pilot & flight crew
- Air traffic controller
- Construction/heavy equipment/earthmoving equipment operation
- Flight instructor
- Mobile crane operator/operation
- Commercial fishing
- Marine science/merchant marine officer

## VISUAL & PERFORMING ARTS

- Art/art studies, general
- Music, general

## HEALTH PROFESSIONS & RELATED CLINICAL SCIENCES

- Dental assisting/assistant
- Health/health care administration/management
- Dental hygiene/hygienist
- Hospital & health care facilities admin./mgmt.
- Health unit coordinator/ward clerk
- Health unit manager/ward supervisor
- Health info./med. records admin./administrator
- Health info./med. records technology/technician
- Medical transcription/transcriptionist
- Medical office computer specialist/assistant
- Medical/health mgmt. & clinical asst./specialist
- Medical insurance coding specialist/coder
- Medical insurance specialist/medical biller
- Health/medical claims examiner
- Medical staff services technology/technician
- Long term care administration/management
- Clinical research coordinator
- Regulatory science/affairs
- Disease registry data management
- Healthcare innovation
- Healthcare info., privacy assurance & security
- Health & medical administrative services, other
- Medical/clinical assistant
- Occupational therapist assistant
- Pharmacy technician/assistant
- Physical therapy assistant
- Anesthesiologist assistant
- Pathology/pathologist assistant
- Medicinal & pharmaceutical chemistry
- Pharmacoeconomics/pharmaceutical econ.
- Clinical, hospital, & managed care pharmacy
- Pharmaceutical marketing & management
- Public health, general
- Environmental health
- Occupational health & industrial hygiene
- Community health & preventive medicine
- International public health/international health
- Health services administration
- Patient safety & healthcare quality
- Public health genetics
- Public health, other
- Rehab. & therapeutic professions, general
- Art therapy/therapist
- Dance therapy/therapist
- Music therapy/therapist
- Therapeutic recreation/recreational therapy
- Kinesiotherapy/kinesiotherapist
- Assistive/augmentative tech. & rehab. Eng.
- Animal-assisted therapy
- Drama therapy/therapist
- Horticulture therapy/therapist
- Play therapy/therapist
- Rehab. & therapeutic professions, other
- Health aide
- Medication aide
- Rehabilitation aide
- Physical therapy technician/aide

## HEALTH PROFESSIONS & RELATED CLINICAL SCIENCES CONTINUED

Respiratory therapy technician/assistant
Chiropractic technician/assistant
Radiologist assistant
Lactation consultant
Speech-language pathology assistant
Allied health & medical assisting services, other
Cardiovascular technology/technologist
Electrocardiograph technology/technician
Electroneurodiagnostic/ electroencephalographic technology/ technologist
Asian bodywork therapy
Nuclear medical technology/technologist
Perfusion technology/perfusionist
Medical radiologic tech./sci. - radiation therapist
Respiratory care therapy/therapist
Surgical technology/technologist
Gene/genetic therapy
Radiologic technology/science - radiographer
Diagnostic med. sonography/sonographer & ultrasound tech.
Polysomnography
Hearing instrument specialist
Mammography technology/technician
MRI tech./technician
Hyperbaric medicine technology/technician
Intraoperative neuromonitoring tech./technician
Orthopedic technology/technician
Optometric technician/assistant
Phlebotomy technician/phlebotomist
Renal/dialysis technologist/technician
Sterile processing technology/technician
Psychiatric/mental health services technician
Opticianry/ophthalmic dispensing optician
Allied health diagnostic, intervention, & treatment professions, other
Ophthalmic technician/technologist
Orthoptics/orthoptist
Pharmacy administration & pharmacy policy & regulatory affairs
Pharmacy
Cardiopulmonary technology/technologist
Radiation protection/health physics technician
Medical informatics
Bioethics/medical ethics
Medical/health humanities
Arts in medicine/health
Health profess. ed., ethics, & humanities, other
Traditional Chinese medicine & herbology
Massage therapy/therapeutic massage
Emergency medical technology/technician (EMT paramedic)
Somatic bodywork
Somatic bodywork & related services, other
Movement therapy & movement education
Herbalism/herbalist
Registered nursing/registered nurse
Nursing administration
Adult health nurse/nursing
Family practice nurse/nursing
Maternal/child health & neonatal nurse/nursing
Nursing science
Pediatric nurse/nursing
Psychiatric/mental health nurse/nursing
Public health/community nurse/nursing
Periop./op. room & surgical nurse/nursing
Clinical nurse specialist
Critical care nursing
Occupational & environmental health nursing
Emergency room/trauma nursing
Nursing practice
Palliative care nursing
Clinical nurse leader
Geriatric nurse/nursing
Women's health nurse/nursing
Forensic nursing
Registered nursing, nursing administration, nursing research & clinical nursing, other
Licensed practical/vocational nurse training
Nursing assistant/aide & patient care asst./aide
Practical nursing, vocational nursing & nursing assistants, other

## BUSINESS, MANAGEMENT, MARKETING, & RELATED SUPPORT SERVICES

Business/commerce, general
Finance, general

## BUSINESS, MANAGEMENT, MARKETING, & RELATED SUPPORT SERVICES CONTINUED

- Business admin. & management, general
- Purchasing, procurement/acquisitions & contracts management
- Logistics, materials, & supply chain management
- Office management & supervision
- Operations management & supervision
- Non-profit/public/organizational management
- Customer service management
- Research & development management
- Project management
- Research administration
- Risk management
- Science/technology management
- Accounting
- Accounting & finance
- Admin. assistant & secretarial science, general
- Executive assistant/executive secretary
- Public finance
- Human resources management/personnel administration, general
- Hotel/motel administration/management
- Casino management
- Financial risk management
- Labor & industrial relations
- Labor studies
- Management information systems, general
- Management science
- Business statistics
- Actuarial science
- Marketing/marketing management, general
- Insurance
- Selling skills & sales operations
- Construction project management

## HISTORY

- History, general
- American history (United States)

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## Acknowledgements

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