Information and Communication Technologies

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Advisors

Adam Dotty, Technical Services Director, San Bernardino Superintendent of Schools
Christopher Love, Owner, Sirius Omega Cybersolutions
Erinea House, Outreach & Recruitment Coordinator, Center for Cyber & AI, CSUSB
Jeffrey Huynh, Technology Support Specialist II, San Bernardino Valley College
Nathan Vincent, CEO / Managing Consultant, EQL Consulting LLC
Rashad Naime, Software Engineer, Hounder
Ryan Ritualo, IT Manager, East Valley Water District

K12 Educational Participants

Angela Hatter, Principal, Colton Joint Unified School District Adult Education
Christopher Avella, Teacher, Riverside Unified
David Aman, K12 Pathway Coordinator, Colton-Redlands-Yucaipa ROP
Doris Hernandez, Work Based Learning Technician, Colton Joint Unified
Evelia Terriquez, Work Based Learning Technician, Colton Joint Unified
James Hattar, Curriculum Developer/TOA, Colton-Redlands-Yucaipa ROP
Jessica Boucher, Project Specialist, San Bernardino County Superintendent of Schools
Joana Salazar, CTE Business/English Teacher, San Andreas High
Mark Ullrich, CTE Teacher, Fontana Unified
Michael Yu, College and Career Readiness Teacher, San Bernardino City Unified
Phillip Alvarez, CTE Instructor, San Bernardino City Unified
Sean Baldwin, Teacher/GIS, Colton-Redlands-Yucaipa ROP

Minutes

The Information and Communication Technologies Advisory panel brought together industry leaders representing cybersecurity, software development, IT infrastructure, higher education, and public sector technology services. The following summarizes key discussion themes and recommendations shared during the advisory.

Question 1: What emerging trends and technologies do you believe will drive the most change in this industry over the next 3-5 years, and what should teachers and students focus on to stay ahead?

Adam Dotty: Emphasized that while artificial intelligence is a major focus across the industry, a significant concern is the growing tendency for individuals to bypass foundational technical skills. He explained that many students are attempting to move directly into specialized areas such as cybersecurity or cloud computing without first developing a strong understanding of core concepts like programming, networking, routing, and systems design. With the increasing accessibility of AI tools, students may rely on these technologies to complete tasks without fully understanding how systems function. He stressed that reinforcing foundational knowledge remains critical and should continue to be a primary focus to ensure students are prepared for long-term success in IT and engineering fields.

Christopher Love: Emphasized the importance of moving beyond broad, certification-based instruction and providing students with hands-on experience using industry-standard, vendor-specific tools. He explained that while general certifications such as Security+ or Cloud+ are valuable, they often do not fully prepare students for workforce expectations. Exposure to platforms such as Microsoft Azure, AWS, Splunk, and SolarWinds allows students to develop practical skills that are directly aligned with industry needs.

He also highlighted the importance of helping students understand industry trends and workforce demands. Encouraging students to research emerging technologies, funding streams, and evolving career opportunities can help them make more informed decisions about their future pathways. Integrating these discussions into classroom instruction, particularly at the early high school level, supports students in connecting their learning to real-world applications and long-term career planning.

Rashad Naime: Highlighted the increasing use of content management systems within enterprise environments, noting that many modern applications and websites are built on platforms such as WordPress and Drupal. He emphasized that students often lack early exposure to these tools, despite their widespread use in industry. Developing skills in these platforms provides a practical entry point into software development and web-based careers.

He also noted the growing role of artificial intelligence tools, such as GitHub Copilot, in supporting development workflows. These tools function as assistants that can enhance productivity and problem-solving when used effectively. Learning how to leverage AI as a

support tool, while still maintaining strong foundational skills, will be an important competency for future developers.

Erinea House: Emphasized that while artificial intelligence continues to expand across the industry, it is not the only emerging area of importance. She highlighted the growing integration of robotics within cybersecurity and technology fields, noting that students are increasingly interacting with advanced technologies such as robotic systems, autonomous devices, and AI-driven tools. These technologies are already being implemented in educational settings and are expected to play a larger role in the workforce.

She stressed the importance of early exposure and hands-on learning opportunities at the K–12 level. Experiences such as working in a Security Operations Center (SOC), monitoring network traffic, and interacting with real systems allow students to connect theoretical knowledge to practical application. She also emphasized that students must be able to communicate their technical knowledge effectively, as communication skills are essential for employability alongside technical competence.

Ryan Ritualo: Emphasized that artificial intelligence will significantly impact how organizations operate over the next three to five years, particularly in the integration of systems, software, and hardware. He explained that future IT professionals will need to understand not only how AI functions, but also how to support and maintain AI-driven systems within complex environments. Preparing students to work within these evolving systems will be critical as AI becomes more embedded in organizational infrastructure.

He also highlighted the importance of providing students with exposure to real-world problem-solving scenarios. While classroom instruction establishes foundational knowledge, it often does not fully reflect the challenges encountered in the workplace. Exposure to areas such as help desk support, application development, network engineering, and systems administration can help students better understand industry expectations and develop the adaptability needed to succeed in the field.

Jeffrey Huynh: Highlighted the rapid growth of esports as an emerging area that integrates multiple aspects of information and communication technologies. He explained that esports programs require a combination of technical and collaborative skills, including network infrastructure, hardware configuration, broadcasting, and team coordination. These programs are expanding across educational institutions and are creating new pathways for student engagement in technology.

He noted that esports environments provide opportunities for students to develop both technical skills and transferable skills such as communication, teamwork, and project management. Students involved in these programs gain experience in areas such as system setup, streaming technologies, and digital content production. He also emphasized that increasing grant funding and institutional support are contributing to the growth of esports, making it a significant area to watch in both education and workforce development.

Question 2: How should our Career Technical Education (CTE) pathways adapt to ensure students are well-equipped to meet future demands and changes in this industry?

Adam Dotty: Emphasized that CTE pathways should balance certifications with practical experience to better prepare students for employment. He explained that entry-level certifications such as CompTIA A+, Network+, and Security+ can help students get past initial hiring filters, but they must be paired with hands-on experience to be meaningful in the hiring process. He also highlighted alternative and emerging credentials, such as Google's prompt engineering and help desk certifications, as additional entry points into the field.

He stressed the importance of providing students with opportunities to work in real or simulated environments, such as utilizing free-tier cloud platforms like AWS and Microsoft Azure. Allowing students to build and manage their own projects within these environments helps develop practical skills that can substitute for early work experience. He noted that when students are able to demonstrate completed projects and applied knowledge, they are better positioned to compete for internships and entry-level roles.

Christopher Love: Emphasized that CTE pathways must prioritize real-world application by creating opportunities for students to engage in authentic, hands-on experiences within their school environment. He explained that educators should collaborate across departments and work closely with site administration to identify ways to build, implement, and sustain technical infrastructure on campus, such as network systems or cybersecurity-related projects. These types of experiences allow students to apply their learning in meaningful ways while contributing to the school community.

He also highlighted the importance of building structured pathways that include certifications, dual enrollment, and clear transitions to postsecondary education or workforce opportunities. Additionally, he stressed that programs must be supported by a strong school culture that integrates CTE into the broader campus environment. Creating clubs, dedicating time for student engagement, and connecting learning to current events and real-world issues can increase student interest and participation. He noted that when students are immersed in both the technical and social aspects of the field, they develop stronger communication skills, professional behaviors, and a deeper understanding of how their skills apply beyond the classroom.

Erinea House: Emphasized the importance of expanding student exposure to the wide range of opportunities within the technology field. She explained that many students enter CTE pathways with a limited understanding of available career options, often assuming that the field is limited to coding or programming. Providing exposure to diverse roles, including areas such as cybersecurity, social engineering, and technical communication, helps students identify pathways that align with their interests and strengths.

She also highlighted the value of integrating collaboration across different pathways and subject areas on campus. Connecting students to opportunities beyond their immediate classroom

environment allows them to see how technology intersects with other industries. Additionally, she emphasized the importance of leveraging available resources, such as labor market tools and career exploration platforms, to help students understand job demand, required skills, and potential earnings. Creating opportunities for peer learning through clubs and collaborative environments also supports student engagement and helps educators better understand student interests and learning needs.

Rashad Naime: Emphasized that CTE pathways should focus on helping students build a strong portfolio of work that demonstrates their technical abilities. He explained that in fields such as software development, employers often prioritize demonstrated experience over certifications alone. Encouraging students to create and maintain development portfolios, such as GitHub repositories with completed projects, allows them to showcase their skills in a tangible way.

He also highlighted the importance of communication skills within technical roles. Students must be able to clearly explain their work, collaborate with others, and interact with clients or team members. Developing both technical and communication skills ensures that students are better prepared for real-world work environments. He noted that encouraging students to explore different areas within development, rather than limiting themselves to a single specialization early on, can help build a more versatile and competitive skill set.

Ryan Ritualo: Emphasized that educators should actively engage with industry professionals and organizations to stay informed about emerging trends and bring relevant knowledge back into the classroom. He explained that ongoing communication and collaboration with industry partners allows educators to better understand evolving technologies and workplace expectations, which can then be integrated into instructional practices.

He also stressed the importance of developing both technical and soft skills in students, along with the ability to adapt to changing environments. Exposure remains a critical factor, as students will encounter a wide range of systems, tools, and processes throughout their careers. Preparing students to be flexible and adaptable ensures they can transition successfully between different roles and technologies. He noted that by providing students with deeper exposure and advanced preparation, educators can help them enter the workforce at a higher level of readiness compared to previous generations.

Jeffrey Huynh: Emphasized that CTE pathways should incorporate opportunities for students to develop both technical and transferable skills through experiential learning environments, even when traditional work-based learning opportunities are limited. He explained that involvement in student organizations, clubs, and project-based activities can provide valuable experience in areas such as planning, resource management, teamwork, and event coordination.

He highlighted that these types of experiences help students learn how to operate within an organization, manage responsibilities, and execute projects from start to finish. While these activities may not always be directly technical, they build essential workplace skills that are critical for success. Providing students with opportunities to engage in these experiences helps

bridge the gap between classroom learning and real-world expectations, particularly for students who may not yet have access to internships or employment opportunities.

Question 3: What essential skills, educational qualifications, and certifications are currently required to gain employment in your industry, and how might these requirements change in the near future?

Ryan Ritualo: Emphasized that soft skills are becoming increasingly important in the IT field, particularly as roles require more direct interaction with end users. He explained that technicians are often the first point of contact for support requests and must be able to communicate effectively, provide in-person assistance, and build positive relationships with customers. While technical skills remain critical, strong communication and interpersonal skills are now essential for success.

He also outlined typical educational and experience expectations within the public sector. Entry-level roles often require one to two years of experience, which can be gained through internships, volunteering, or other hands-on opportunities. For more advanced roles, such as network or systems administration, a bachelor's degree is often preferred; however, certifications and demonstrated knowledge can carry significant weight in hiring decisions. He noted that candidates with certifications such as Cisco's CCNA may be prioritized over those with degrees alone due to their practical relevance. As individuals advance into higher-level roles, a combination of education, certifications, and experience becomes increasingly important, particularly in competitive applicant pools.

Erinea House: Highlighted that industry-recognized certifications such as CompTIA Security+ and Cisco CCNA are highly valuable for students entering the field, particularly at the high school level. She explained that students who are able to earn or work toward these certifications gain a competitive advantage by demonstrating both technical knowledge and initiative. Programs that provide hands-on networking experiences, such as using tools like Cisco Packet Tracer, help prepare students for these certification pathways.

She also emphasized the importance of leveraging structured programs, scholarships, and apprenticeships to support student entry into the workforce. Opportunities such as government-funded cybersecurity programs, local apprenticeships, and workforce partnerships can provide financial support, hands-on experience, and direct pathways into employment. Additionally, she noted the value of participation in competitions such as CyberPatriot and regional cybersecurity events, as these experiences demonstrate student engagement and commitment to the field. She stressed that certifications, hands-on experience, and participation in extracurricular opportunities collectively help students stand out and prepare for workforce entry, particularly for those who may need to enter the workforce earlier due to financial responsibilities.

Rashad Naime: Emphasized that while certifications and degrees are important for gaining initial access to job opportunities, employers place significant value on practical application and demonstrated skills. In the software development field, the ability to show completed work, such as functional websites, applications, or code repositories, is often more impactful than credentials alone.

He explained that students should focus on building practical experience through projects that demonstrate their ability to apply what they have learned. This includes developing both front-end and back-end skills, as well as the ability to clearly communicate their development process and technical decisions. He noted that employers are looking for candidates who can not only complete technical tasks, but also explain their work and collaborate effectively within a team environment.

Adam Dotty: Emphasized that while it is possible to enter the field without a bachelor's degree, many organizations still use a degree as a threshold requirement for advancement, creating a "glass ceiling" for individuals without one. He explained that employees may be able to gain entry-level positions through certifications and experience, but advancement into higher-level roles often requires a formal degree.

He also highlighted the importance of differentiating oneself in a competitive job market. While many candidates possess similar technical certifications, additional skills, particularly in customer service, can help candidates stand out. He noted that experiences such as customer service training or roles in customer-facing environments demonstrate the ability to communicate effectively and work with others, which are highly valued in IT roles. These types of skills can provide a competitive edge when candidates have otherwise similar technical backgrounds.

Jeffrey Huynh: Emphasized the importance of creating accessible opportunities for students to gain real-world experience, particularly for those who may not have access to traditional internships or employment. He explained that institutions can support this by developing volunteer-based or entry-level opportunities, such as campus help desk environments, where students can gain hands-on experience while building technical and communication skills.

He highlighted that these types of experiences help students develop the ability to work with diverse populations, manage real user issues, and operate within an organizational setting. Even informal or volunteer-based roles can provide valuable exposure that strengthens a student's resume and prepares them for entry-level positions. Providing these opportunities helps bridge the gap between classroom learning and workforce expectations.

Christopher Love: Emphasized the importance of combining technical skills, formal education, and personal development to prepare students for long-term success. He explained that foundational certifications such as ITF+, A+, Network+, and Cloud+ can support entry into the field, while degrees, particularly at the two-year or four-year level, are often necessary for career advancement. He noted that the bachelor's degree frequently serves as a threshold for higher-level roles.

He also highlighted the importance of developing project management and customer service skills as part of CTE pathways. Incorporating these competencies into instruction helps students understand how to manage tasks, work with clients, and operate in professional environments. Additionally, he stressed the value of building a strong portfolio of work that demonstrates increasing levels of complexity over time. Students who can clearly articulate their experience, projects, and growth are more competitive in interviews.

Beyond technical and academic preparation, he emphasized the importance of resilience and adaptability. He noted that students must be prepared to face challenges, learn from failure, and continue developing their skills over time. Building this mindset is essential for long-term success in a rapidly evolving industry.

Question 4: What are a few occupations within the industry that do not require advanced degrees yet offer a living wage? Additionally, what advice would you give to a recent high school graduate that would help them gain employment in your industry?

Rashad Naime: Explained that entry-level roles such as junior developers or front-end specialists can provide a pathway into the industry without requiring advanced degrees. He emphasized that the most important factor for securing these roles is the ability to demonstrate practical skills. Creating and deploying simple websites or applications, even at a basic level, can help students show employers that they are capable of performing real development work.

He advised students to focus on building tangible projects that can be shared during the hiring process. Even small-scale applications hosted on platforms such as AWS can serve as evidence of technical ability. Demonstrating practical experience is often the key factor in gaining entry into development roles, where on-the-job learning continues to build more advanced skills.

Erinea House: Emphasized that students should take full advantage of opportunities available to them during college in order to build experience and clarify their career direction. She explained that simply attending classes and earning a degree is often not sufficient to prepare students for employment. Instead, students should actively participate in clubs, competitions, and departmental programs to gain hands-on experience and build professional networks.

She highlighted that students who engage in these opportunities are more likely to secure internships, scholarships, and employment because they develop both technical and professional skills. She encouraged students to seek out mentorship, connect with faculty, and explore available programs to better understand career pathways. Getting involved allows students to gain a competitive edge and enter the workforce with greater confidence and preparation.

Ryan Ritualo: Explained that entry-level opportunities such as internships and technician roles can lead to living-wage careers, particularly within public agencies and utility organizations. He emphasized that many organizations actively recruit from student programs and partnerships, such as those developed through county offices of education and career technical education pathways.

He advised students to participate in clubs, programs, and internship opportunities to build connections and gain exposure to the field. These experiences often serve as direct pipelines into employment, with many internships transitioning into part-time or full-time positions. He noted that students who actively engage in these opportunities are more likely to stand out and successfully enter the workforce.

Christopher Love: Emphasized that students must shift their mindset as they transition from high school into the workforce, recognizing that they are now competing with experienced professionals rather than peers. He explained that success in the industry requires initiative,

confidence, and a willingness to seek out opportunities rather than waiting for them to be provided.

He advised students to be proactive, build connections, and remain enthusiastic when pursuing opportunities. Developing resilience and the ability to learn from failure is critical, as challenges are a natural part of career growth. He also stressed the importance of strong interpersonal skills, noting that students must be willing to communicate, engage with others, and present themselves professionally in order to stand out in competitive hiring environments.

Nathan Vincent: Highlighted that many traditional entry-level roles are becoming less available due to the increasing impact of artificial intelligence and automation. As a result, students must find alternative ways to enter the field and gain experience. He explained that one effective strategy is to pursue employment in organizations that have IT departments, even if the initial role is not directly technical.

He emphasized that gaining an understanding of business operations is critical, as IT functions are designed to support broader organizational goals. By learning how technology integrates with business processes, individuals can become more valuable and better positioned for advancement. He also noted that volunteering for opportunities, demonstrating initiative, and seeking ways to apply technical skills within a business context can help students transition into IT roles and build long-term career pathways.

Audience Questions

Audience Question 1: *What types of performance-based assessments or practical evaluations are used during hiring processes to determine whether candidates can demonstrate the technical skills required for the role?*

Rashad Naime: Explained that performance-based assessments are commonly used in the hiring process, particularly in development roles. Candidates may be given a project with a defined timeframe, such as building a website or application using a specific programming language, to demonstrate their ability to apply technical skills in a practical setting. He also noted that employers may include programming logic assessments, which present real-world scenarios and require candidates to problem-solve through multiple-choice or structured responses. These types of evaluations help determine whether candidates can effectively apply their knowledge in situations similar to those encountered on the job.

Christopher Love: Explained that his program is intentionally designed around project-based learning to prepare students for these types of hiring practices. Students regularly complete hands-on tasks that mirror real-world expectations, ensuring they are able to demonstrate their skills when asked. He emphasized that students should not include skills on their resumes that they cannot perform, and that documentation such as videos, projects, and system builds are used to validate their experience.

He also noted that students are trained to approach technical demonstrations with confidence, including tasks such as building virtual machines or configuring systems in cloud environments. By consistently practicing these skills in the classroom, students are better prepared to successfully complete performance-based assessments during interviews.

Adam Dotty: Explained that hiring processes may include both hands-on technical tasks and scenario-based assessments. In some cases, candidates are asked to complete practical exercises, such as logging into a system and performing specific functions. In other instances, candidates are presented with troubleshooting scenarios, such as diagnosing a network outage, and asked to explain their thought process.

He emphasized that these types of assessments are often less about identifying a single correct answer and more about evaluating how candidates approach problem-solving. Employers are looking for evidence of logical thinking, prior experience, and the ability to systematically work through technical challenges.

Audience Question 2: *How can educators balance providing students with meaningful exposure to artificial intelligence tools while also maintaining safe and secure learning environments, particularly when access to these tools may be restricted?*

Rashad Naime: Emphasized that students do not necessarily need unrestricted access to artificial intelligence tools to begin developing relevant skills. Instead, understanding how to interact with AI systems, particularly through prompt engineering, is a critical foundational skill. He noted that students should learn how to ask effective questions and use AI to support their thinking rather than relying on it to generate complete answers.

He also highlighted the importance of teaching ethical use of AI within CTE pathways. Incorporating lessons or projects focused on the responsible use of AI can help students understand both the benefits and potential risks of these tools. He suggested that structured classroom activities, such as analyzing prompts or presenting on ethical considerations, can reinforce this understanding. Additionally, schools may consider monitored or controlled access environments that allow students to safely engage with AI tools while maintaining appropriate oversight.

Erinea House: Emphasized that AI should be taught as a tool to support learning rather than replace it. She explained that students should first develop a foundational understanding of concepts before using AI to assist with more complex tasks. When used effectively, AI can help guide students through processes, provide step-by-step support, and reinforce learning without removing the need for critical thinking.

She also highlighted the importance of exposing students to a variety of AI platforms and tools, noting that there are multiple systems available beyond commonly used applications. Teaching students how to evaluate outputs, verify sources, and understand how AI generates responses helps them use these tools responsibly. She stressed that students should be able to explain what the AI is doing and why, rather than relying on it to complete tasks without understanding.

Jeffrey Huynh: Emphasized that AI should be embraced as an evolving tool that is now a permanent part of the technology landscape. He explained that, similar to how search engines became widely accepted, AI tools are now essential resources that students should learn to use effectively. Rather than discouraging use, educators should guide students in how to interact with AI in a way that supports learning.

He also highlighted the importance of teaching students how to ask better questions and use AI to deepen their understanding, rather than simply generating answers. Encouraging students to use AI for clarification, summaries, or guided explanations helps promote learning while avoiding over-reliance. He noted that developing these skills will better prepare students for how AI is used in professional environments.

Christopher Love: Emphasized the importance of integrating AI into instruction through structured and intentional use within the classroom. He explained that educators should collaborate with administration and other departments to create guided opportunities for students to use AI tools in alignment with instructional goals. This may include designated time during lessons where students can use approved devices or platforms under supervision.

He also highlighted the need to normalize AI use across multiple disciplines, ensuring that students gain consistent exposure rather than isolated experiences. By embedding AI into lesson design and aligning its use with academic standards, educators can provide meaningful exposure while maintaining appropriate safeguards and oversight.

Cross-Panel Key Takeaways

These are the themes that appeared consistently across the full four questions AND the audience Q&A.

1. **Artificial intelligence is transforming the ICT field, but must be used as a tool, not a replacement for foundational knowledge.** Panelists emphasized that while AI is rapidly expanding across all areas of technology, students must first develop strong foundational skills such as programming, networking, and systems design. AI should be leveraged to support learning and productivity, not replace critical thinking or technical understanding.

2. **Hands-on, real-world experience is essential for workforce readiness.** Across all discussions, panelists stressed that students must be able to demonstrate practical skills through projects, portfolios, simulations, or real-world applications. Employers are increasingly prioritizing what students can do over what they have studied.

3. **Exposure to industry tools and environments significantly increases employability.** Students who have experience working with platforms such as cloud environments, cybersecurity tools, development frameworks, and networking systems are better prepared to transition into the workforce. Familiarity with industry-standard tools helps bridge the gap between education and employment.

4. **Certifications support entry into the field, but experience and application determine long-term success.** Certifications such as CompTIA and Cisco credentials help students get past initial hiring requirements, but panelists consistently emphasized that hands-on experience, problem-solving ability, and demonstrated skills are what ultimately secure employment and advancement.

5. **Soft skills and communication are critical in modern ICT careers.** Panelists highlighted that roles in IT, cybersecurity, and development increasingly require direct interaction with users, clients, and teams. Skills such as communication, collaboration, customer service, and professionalism are essential for both entry-level and advanced roles.

6. **Early and continuous exposure to career pathways improves student outcomes.** Students benefit from early awareness of the wide range of ICT careers beyond traditional roles such as coding. Exposure to areas such as cybersecurity, networking, AI, robotics, and IT support helps students identify interests and pursue appropriate pathways.

7. **Clubs, competitions, and extracurricular experiences play a key role in skill development.** Participation in activities such as cybersecurity competitions, student organizations, and project-based clubs provides students with additional opportunities to develop technical skills, build confidence, and demonstrate initiative to employers.

8. **Career readiness requires both technical skills and an understanding of real-world application.** Panelists emphasized that students must understand how technology supports business operations. The ability to connect technical knowledge to real-world use cases increases student value in the workforce.

9. **Adaptability and continuous learning are essential due to the rapidly evolving nature of technology.** The ICT field is constantly changing, requiring students and professionals to continuously update their skills. Developing the ability to learn independently, adapt to new tools, and respond to emerging trends is critical for long-term success.

10. **Structured exposure to AI, including ethics and responsible use, is necessary in education.** Educators must intentionally incorporate AI into instruction while maintaining safeguards. Teaching students how to use AI responsibly, evaluate outputs, and understand ethical considerations is essential as these tools become more integrated into the workplace.

Cross-Panel Action Items

These action items synthesize the most actionable guidance from the full advisory. These are the steps teachers can embed into coursework, lesson plans, or pathway design.

1. Strengthen foundational technical skills alongside emerging technologies.

- Reinforce core concepts such as programming, networking, routing, and systems design within all courses.
- Ensure students understand how technology works before introducing advanced tools such as artificial intelligence.
- Design lessons that require students to explain processes, not just produce outcomes.

2. Integrate hands-on, project-based learning aligned to real-world applications.

- Develop assignments where students build, deploy, or troubleshoot systems such as websites, networks, or cloud environments.
- Incorporate performance-based tasks that mirror industry hiring practices such as timed builds or troubleshooting scenarios.
- Require students to complete projects that demonstrate increasing levels of complexity over time.

3. Provide students with access to industry-standard tools and platforms.

- Utilize free or education-tier access to platforms such as AWS, Microsoft Azure, GitHub, and cybersecurity tools.
- Design activities that allow students to interact with real systems rather than simulations only.
- Incorporate tool-based tasks into instruction so students gain familiarity with industry environments.

4. Embed portfolio development into pathway coursework.

- Require students to maintain a digital portfolio such as GitHub repositories, project folders, or documented builds.
- Include assignments that result in shareable artifacts such as websites, applications, or system configurations.
- Teach students how to explain and present their work for interviews and career opportunities.

5. Integrate employability and communication skills into daily instruction.

- Include structured opportunities for students to practice explaining technical processes verbally and in writing.
- Incorporate customer service scenarios, peer collaboration, and presentation-based tasks.
- Assess both technical performance and communication skills as part of grading criteria.

6. Expand student participation in clubs, competitions, and experiential learning.

- Support the development of cybersecurity, coding, or IT-related student clubs.
- Encourage participation in competitions such as CyberPatriot or other regional events.

- Provide opportunities for students to lead projects, teach peers, and collaborate outside of class time.

7. Create structured opportunities for real-world exposure and work-based learning.

- Partner with local industry, government agencies, or organizations to provide internships, job shadowing, or mentorship.
- Develop on-campus opportunities such as help desk support, student tech teams, or project-based service roles.
- Encourage volunteer or entry-level experiences that build technical and professional skills.

8. Incorporate career exploration and labor market awareness into instruction.

- Use tools such as CyberSeek or similar platforms to explore job demand, salaries, and required skills.
- Guide students in researching career pathways and aligning coursework to workforce needs.
- Facilitate discussions on emerging trends, funding streams, and future job opportunities in ICT.

9. **Integrate structured instruction on artificial intelligence and its ethical use.**

- Teach students how to use AI as a support tool for learning, problem-solving, and productivity.
- Include lessons on prompt engineering, evaluating outputs, and verifying sources.
- Incorporate discussions or projects focused on ethical considerations and responsible AI use.

10. **Build a classroom culture that promotes resilience, initiative, and continuous learning.**

- Encourage students to take risks, learn from failure, and persist through challenges.
- Provide opportunities for independent exploration and student-driven learning.
- Reinforce the importance of adaptability and lifelong learning in a rapidly evolving industry.

Key Takeaways and Action Items by Panelist

These key takeaways and action item lists highlight each respondent's insights, concerns, and suggested actions to address industry trends and to prepare students for the evolving landscape within their respective industries.

Adam Dotty, Technical Services Director, San Bernardino Superintendent of Schools

Key Takeaways:

- Foundational technical skills remain critical, as many students are attempting to enter specialized fields without understanding core concepts such as networking, programming, and systems design.
- Certifications help students get past initial hiring requirements, but hands-on experience and demonstrated skills are what lead to employment opportunities.
- A bachelor's degree is often required for long-term advancement, creating a barrier for individuals without one.
- Customer service and interpersonal skills can differentiate candidates in a competitive applicant pool.

Action Items:

- Ensure students develop strong foundational knowledge in networking, programming, and systems before specializing.
- Provide opportunities for students to earn entry-level certifications aligned to pathway goals.
- Incorporate hands-on projects using cloud platforms or real-world environments to build practical experience.
- Embed customer service and communication skill development into technical coursework.

Christopher Love, Owner, Sirius Omega Cybersolutions

Key Takeaways:

- Students benefit most from real-world, hands-on experiences that mirror industry expectations.
- Exposure to vendor-specific tools and platforms better prepares students for immediate workforce entry.
- Building a strong program requires collaboration with administration and integration into the broader school culture.
- Resilience, initiative, and the ability to communicate effectively are essential for long-term success.

Action Items:

- Design project-based learning experiences that simulate real-world IT and cybersecurity tasks.

- Incorporate industry-standard tools such as AWS, Azure, and cybersecurity platforms into instruction.
- Collaborate with school leadership to create opportunities for students to build and manage real systems on campus.
- Develop classroom and extracurricular structures that promote student engagement, communication, and leadership.

Erinea House, Outreach & Recruitment Coordinator, Center for Cyber & AI, California State University, San Bernardino
Key Takeaways:
- Students need broader exposure to the wide range of careers within technology beyond traditional roles such as coding.
- Hands-on experiences and real-world application help students understand and retain technical concepts.
- Certifications, competitions, and extracurricular involvement significantly improve student readiness and employability.
- Students who actively engage in programs and opportunities gain a competitive advantage in the workforce.

Action Items:
- Expose students to multiple ICT career pathways, including cybersecurity, networking, and emerging technologies.
- Incorporate hands-on experiences such as simulations, labs, or real-world applications into coursework.
- Encourage participation in competitions, clubs, and workforce programs to build experience and confidence.
- Utilize career exploration tools and labor market data to help students understand opportunities and requirements.

Rashad Naime, Software Engineer, Hounder
Key Takeaways:
- Practical experience and demonstrated skills are critical for employment, particularly in development roles.
- Building a portfolio of work is often more impactful than certifications alone.
- Communication skills are essential for collaborating with teams and clients in technical environments.
- AI tools are becoming integrated into development workflows and should be used to support learning and productivity.

Action Items:
- Require students to build and maintain a portfolio of projects such as websites or applications.

- Incorporate assignments that require students to explain their development process and technical decisions.
- Provide opportunities for students to practice both front-end and back-end development skills.
- Integrate AI tools into instruction as support tools while reinforcing foundational understanding.

Ryan Ritualo, IT Manager, East Valley Water District
Key Takeaways:
- Soft skills are increasingly important as IT roles require more direct interaction with users and teams.
- Certifications and experience often carry more weight than degrees alone in hiring decisions.
- Exposure to real-world systems and environments is critical for preparing students for the workforce.
- Adaptability is essential as technology continues to evolve across industries.

Action Items:
- Integrate communication, customer service, and interpersonal skill development into coursework.
- Encourage students to pursue certifications that align with industry needs.
- Provide exposure to real-world scenarios such as troubleshooting, help desk support, and system management.
- Prepare students to be adaptable by exposing them to a variety of tools, systems, and environments.

Jeffrey Huynh, Technology Support Specialist II, San Bernardino Valley College
Key Takeaways:
- Students need access to hands-on experiences, even when traditional internships are not available.
- Experiential learning through clubs, events, and campus-based opportunities builds both technical and soft skills.
- Emerging areas such as esports provide new pathways for student engagement in technology.
- Students benefit from opportunities to work in collaborative, real-world environments.

Action Items:
- Create accessible opportunities such as campus help desk support or volunteer-based technical roles.
- Incorporate project-based and event-based learning experiences into programs.
- Leverage student organizations and clubs to build leadership, teamwork, and technical skills.

- Explore emerging areas such as esports to increase student engagement and exposure to ICT careers.

Nathan Vincent, CEO / Managing Consultant, EQL Consulting LLC
Key Takeaways:

- Entry-level IT roles are becoming less available due to the impact of artificial intelligence and automation.
- Gaining experience within an organization, even in a non-technical role, can provide a pathway into IT positions.
- Understanding how technology supports business operations increases an individual's value in the workforce.

Action Items:

- Encourage students to seek employment in organizations where they can gain exposure to IT functions.
- Help students understand how technical skills connect to business needs and operations.
- Promote initiative by encouraging students to volunteer, apply for internal opportunities, and build experience over time.

Labor Market Information

The following labor market information was sourced from https://www.onetonline.org/ on March 31, 2026.

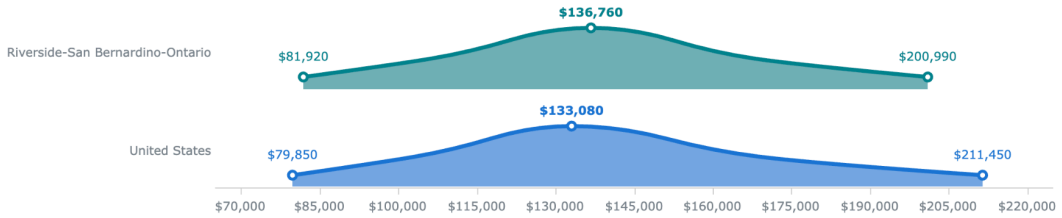
Local Wages

15-1252.00 - Software Developers Bright Outlook

Wages for state: California Go

Wages near ZIP Code: 92408 Go

Annual Wages | Hourly Wages



In Riverside-San Bernardino-Ontario, CA:

- Workers on average earn **$136,760**.
- 10% of workers earn **$81,920 or less**.
- 10% of workers earn **$200,990 or more**.

In California:

- Workers on average earn **$170,910**.
- 10% of workers earn **$103,950 or less**.
- 10% of workers earn **$239,200+ or more**.

In the United States:

- Workers on average earn **$133,080**.
- 10% of workers earn **$79,850 or less**.
- 10% of workers earn **$211,450 or more**.

Source: Bureau of Labor Statistics 2024 wage data.

California Employment Trends

15-1252.00 - Software Developers Bright Outlook

View trends for state: California Go

In California:

Employment (2022)	313,700 employees
Projected employment (2032)	388,000 employees
Projected growth (2022-2032)	24%
Projected annual job openings (2022-2032)	26,000

In the United States:

Employment (2024)	1,693,800 employees
Projected employment (2034)	1,961,400 employees
Projected growth (2024-2034)	16% Much faster than average
Projected annual job openings (2024-2034)	115,200

California source: Projections Central 2022-2032 long-term projections. United States source: Bureau of Labor Statistics 2024-2034 employment projections. "Projected growth" represents the estimated change in total employment over the projections period. "Projected annual job openings" represent openings due to growth and replacement.

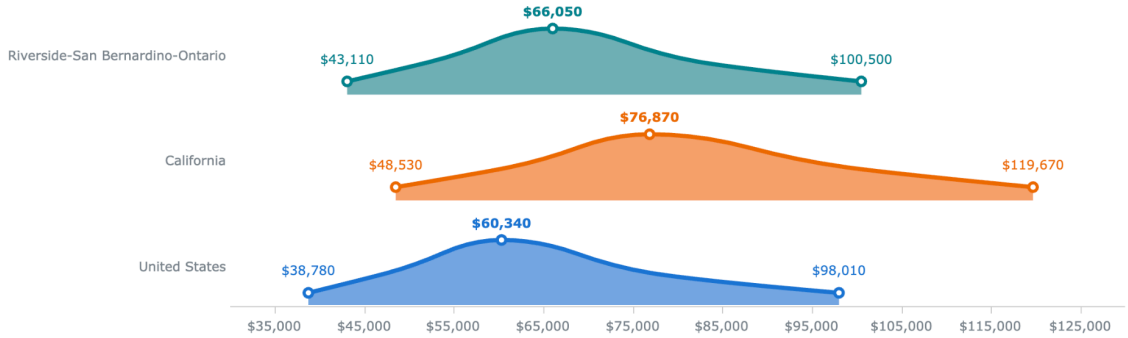
Local Wages

15-1232.00 - Computer User Support Specialists

Wages for state: California Go

Wages near ZIP Code: 92408 Go

Annual Wages | Hourly Wages



In Riverside-San Bernardino-Ontario, CA:

- Workers on average earn **$66,050**.
- 10% of workers earn **$43,110 or less**.
- 10% of workers earn **$100,500 or more**.

In California:

- Workers on average earn **$76,870**.
- 10% of workers earn **$48,530 or less**.
- 10% of workers earn **$119,670 or more**.

In the United States:

- Workers on average earn **$60,340**.
- 10% of workers earn **$38,780 or less**.
- 10% of workers earn **$98,010 or more**.

Source: Bureau of Labor Statistics 2024 wage data.

California Employment Trends

15-1232.00 - Computer User Support Specialists

View trends for state: California Go

In California:

Employment (2022)	69,600 employees
Projected employment (2032)	72,900 employees
Projected growth (2022-2032)	5%
Projected annual job openings (2022-2032)	5,000

In the United States:

Employment (2024)	729,500 employees
Projected employment (2034)	702,500 employees
Projected growth (2024-2034)	-4% Decline
Projected annual job openings (2024-2034)	40,800

California source: Projections Central 2022-2032 long-term projections. United States source: Bureau of Labor Statistics 2024-2034 employment projections. "Projected growth" represents the estimated change in total employment over the projections period. "Projected annual job openings" represent openings due to growth and replacement.

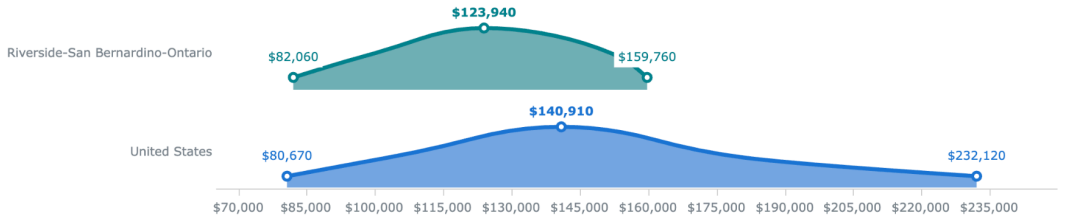
Local Wages

15-1221.00 - Computer and Information Research Scientists Bright Outlook

Wages for state: California Go

Wages near ZIP Code: 92408 Go

Annual Wages | Hourly Wages



In Riverside-San Bernardino-Ontario, CA:

- Workers on average earn **$123,940**.
- 10% of workers earn **$82,060 or less**.
- 10% of workers earn **$159,760 or more**.

In California:

- Workers on average earn **$156,290**.
- 10% of workers earn **$83,100 or less**.
- 10% of workers earn **$239,200+ or more**.

In the United States:

- Workers on average earn **$140,910**.
- 10% of workers earn **$80,670 or less**.
- 10% of workers earn **$232,120 or more**.

Source: Bureau of Labor Statistics 2024 wage data.

California Employment Trends

15-1221.00 - Computer and Information Research Scientists Bright Outlook

View trends for state: California Go

In California:

Employment (2022)	7,800 employees
Projected employment (2032)	9,600 employees
Projected growth (2022-2032)	23%
Projected annual job openings (2022-2032)	720

In the United States:

Employment (2024)	40,300 employees
Projected employment (2034)	48,300 employees
Projected growth (2024-2034)	20% Much faster than average
Projected annual job openings (2024-2034)	3,200

California source: Projections Central 2022-2032 long-term projections. United States source: Bureau of Labor Statistics 2024-2034 employment projections. "Projected growth" represents the estimated change in total employment over the projections period. "Projected annual job openings" represent openings due to growth and replacement.

Local Wages

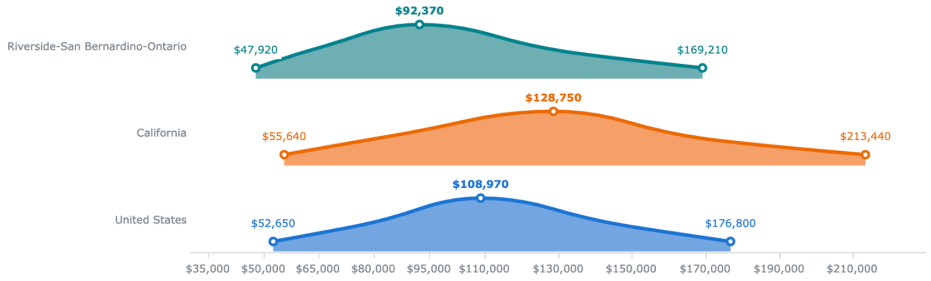
15-1299.08 - Computer Systems Engineers/Architects Bright Outlook

Wage data collected from **Computer Occupations, All Other**.

Wages for state: California Go

Wages near ZIP Code: 92408 Go

Annual Wages | Hourly Wages



In Riverside-San Bernardino-Ontario, CA:

Wage data for **Computer Occupations, All Other**.

- Workers on average earn **$92,370**.
- 10% of workers earn **$47,920 or less**.
- 10% of workers earn **$169,210 or more**.

In California:

Wage data for **Computer Occupations, All Other**.

- Workers on average earn **$128,750**.
- 10% of workers earn **$55,640 or less**.
- 10% of workers earn **$213,440 or more**.

In the United States:

Wage data for **Computer Occupations, All Other**.

- Workers on average earn **$108,970**.
- 10% of workers earn **$52,650 or less**.
- 10% of workers earn **$176,800 or more**.

Source: Bureau of Labor Statistics 2024 wage data.

California Employment Trends

15-1299.08 - Computer Systems Engineers/Architects Bright Outlook

View trends for state: California Go

In California:

Employment data for **Computer Occupations, All Other**.

Employment (2022)	96,300 employees
Projected employment (2032)	105,300 employees
Projected growth (2022-2032)	9%
Projected annual job openings (2022-2032)	7,130

In the United States:

Employment data for **Computer Occupations, All Other**.

Employment (2024)	472,000 employees
Projected employment (2034)	510,500 employees
Projected growth (2024-2034)	8% Much faster than average
Projected annual job openings (2024-2034)	31,300

California source: Projections Central 2022-2032 long-term projections. United States source: Bureau of Labor Statistics 2024-2034 employment projections. "Projected growth" represents the estimated change in total employment over the projections period. "Projected annual job openings" represent openings due to growth and replacement.

Local Wages

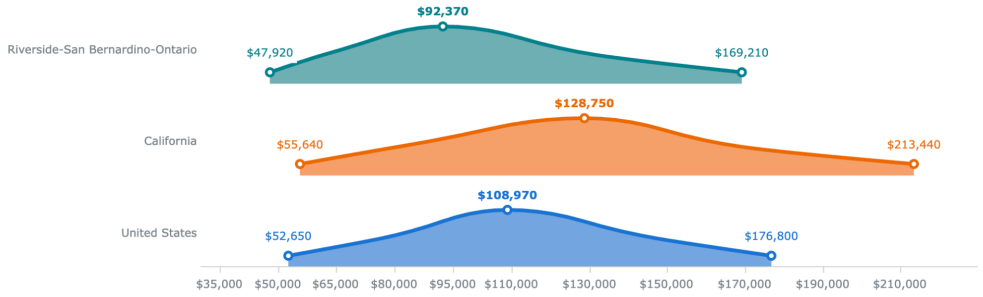
15-1299.05 - Information Security Engineers Bright Outlook

Wage data collected from **Computer Occupations, All Other**.

Wages for state: California Go

Wages near ZIP Code: 92408 Go

Annual Wages | Hourly Wages



In Riverside-San Bernardino-Ontario, CA:

Wage data for **Computer Occupations, All Other**.

- Workers on average earn **$92,370**.
- 10% of workers earn **$47,920 or less**.
- 10% of workers earn **$169,210 or more**.

In California:

Wage data for **Computer Occupations, All Other**.

- Workers on average earn **$128,750**.
- 10% of workers earn **$55,640 or less**.
- 10% of workers earn **$213,440 or more**.

In the United States:

Wage data for **Computer Occupations, All Other**.

- Workers on average earn **$108,970**.
- 10% of workers earn **$52,650 or less**.
- 10% of workers earn **$176,800 or more**.

Source: Bureau of Labor Statistics 2024 wage data.

California Employment Trends

15-1299.05 - Information Security Engineers Bright Outlook

View trends for state: California Go

In California:

Employment data for **Computer Occupations, All Other**.

Employment (2022)	96,300 employees
Projected employment (2032)	105,300 employees
Projected growth (2022-2032)	9%
Projected annual job openings (2022-2032)	7,130

In the United States:

Employment data for **Computer Occupations, All Other**.

Employment (2024)	472,000 employees
Projected employment (2034)	510,500 employees
Projected growth (2024-2034)	8% Much faster than average
Projected annual job openings (2024-2034)	31,300

California source: Projections Central 2022-2032 long-term projections. United States source: Bureau of Labor Statistics 2024-2034 employment projections. "Projected growth" represents the estimated change in total employment over the projections period. "Projected annual job openings" represent openings due to growth and replacement.

Local Wages

11-3021.00 - Computer and Information Systems Managers Bright Outlook

Wages for state: California Go

Wages near ZIP Code: 92408 Go

Annual Wages | Hourly Wages

In Riverside-San Bernardino-Ontario, CA:

- Workers on average earn **$165,760**.
- 10% of workers earn **$102,870 or less**.
- 10% of workers earn **$239,200+ or more**.

In California:

- Workers on average earn **$211,340**.
- 10% of workers earn **$127,220 or less**.
- 10% of workers earn **$239,200+ or more**.

In the United States:

- Workers on average earn **$171,200**.
- 10% of workers earn **$104,450 or less**.
- 10% of workers earn **$239,200+ or more**.

Source: Bureau of Labor Statistics 2024 wage data.

California Employment Trends

11-3021.00 - Computer and Information Systems Managers Bright Outlook

View trends for state: California Go

In California:

Employment (2022)	100,500 employees
Projected employment (2032)	116,300 employees
Projected growth (2022-2032)	16%
Projected annual job openings (2022-2032)	8,500

In the United States:

Employment (2024)	667,100 employees
Projected employment (2034)	768,700 employees
Projected growth (2024-2034)	15% Much faster than average
Projected annual job openings (2024-2034)	55,600

California source: Projections Central 2022-2032 long-term projections. United States source: Bureau of Labor Statistics 2024-2034 employment projections. "Projected growth" represents the estimated change in total employment over the projections period. "Projected annual job openings" represent openings due to growth and replacement.

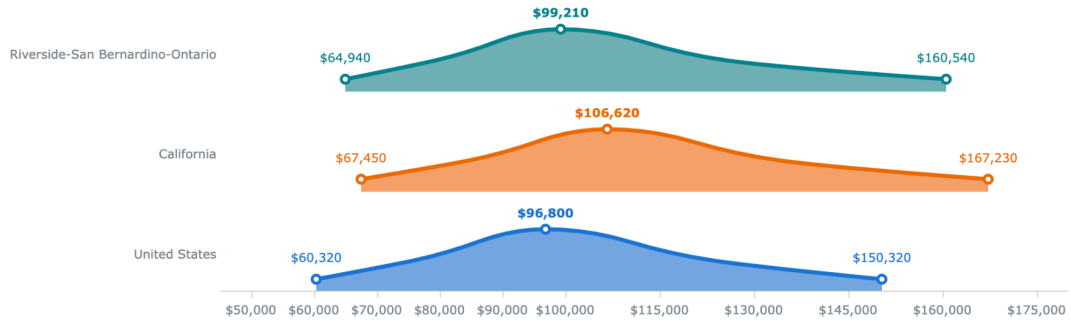
Local Wages

15-1244.00 - Network and Computer Systems Administrators

Wages for state: California Go

Wages near ZIP Code: 92408 Go

Annual Wages | Hourly Wages



In Riverside-San Bernardino-Ontario, CA:

- Workers on average earn **$99,210**.
- 10% of workers earn **$64,940 or less**.
- 10% of workers earn **$160,540 or more**.

In California:

- Workers on average earn **$106,620**.
- 10% of workers earn **$67,450 or less**.
- 10% of workers earn **$167,230 or more**.

In the United States:

- Workers on average earn **$96,800**.
- 10% of workers earn **$60,320 or less**.
- 10% of workers earn **$150,320 or more**.

Source: Bureau of Labor Statistics 2024 wage data.

California Employment Trends

15-1244.00 - Network and Computer Systems Administrators

View trends for state: California Go

In California:

Employment (2022)	29,500 employees
Projected employment (2032)	30,800 employees
Projected growth (2022-2032)	4%
Projected annual job openings (2022-2032)	1,800

In the United States:

Employment (2024)	331,500 employees
Projected employment (2034)	317,700 employees
Projected growth (2024-2034)	-4% Decline
Projected annual job openings (2024-2034)	14,300

California source: Projections Central 2022-2032 long-term projections. United States source: Bureau of Labor Statistics 2024-2034 employment projections. "Projected growth" represents the estimated change in total employment over the projections period. "Projected annual job openings" represent openings due to growth and replacement.