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Building Careers in the Cloud: An Industry-engaged Pathway

By Career Ladders Project

Acknowledgments

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Introduction

The California Cloud Workforce Project (Cloud Project), a regionally-grown consortium of 19 Los Angeles community colleges and their partner high schools, launched a new cloud computing program that extends into high school dual enrollment and culminates in industry certifications and employment preparation. The program offers an 18-unit Cloud Computing Certificate that is approved as a state program certificate template with credit portable across the 19 colleges. As part of the initiative, each community college is partnering with at least one high school in the greater Los Angeles area to provide dual enrollment in the cloud courses. Additionally, the project prepares students to attain Amazon Web Services (AWS) certifications. This regional endeavor is funded by California Community College Strong Workforce Program, a \$248 million annual investment statewide to develop a modern workforce.

The cloud curriculum was initially designed by faculty at Santa Monica College in partnership with AWS Educate, a global Amazon initiative to help students learn the cloud. The project has broad industry support, leveraging connections with the Los Angeles Economic Development Corporation, the Center for a Competitive Workforce, Amazon Web Services and AWS Educate, as well as Apple, Mission Cloud Services, Onica, Kokomo Solutions, and other tech employers to develop “feedback loops” with industry that inform cloud courses and work-based learning opportunities.

The Cloud Project was developed with the goal of building a high-quality regional pathway in cloud computing that is responsive to industry needs, while providing high school and college students real-world experiences through work-based learning. It is a prime example of industry-education

alignment that is helping businesses to develop local talent and students to access in-demand jobs. Regional labor market data indicates a need to fill over 4,000 jobs requiring knowledge of AWS annually, which led the Cloud Project to formulate initial goals of 3,000 annual enrollments with 600 students reaching employability status upon program completion.¹

This brief explores how the Cloud Project has engaged with industry at scale to prepare students for careers in cloud computing. The brief addresses challenges and insights gleaned along the way in the hope that it will inform other regional partnerships as they design industry-engaged pathways. This brief is a companion piece to *Building Careers in the Cloud: An Effective and Connected Community of Practice*, which features insights from the Cloud Project’s faculty community of practice. Together, these two publications highlight lessons learned from this locally-grown, sector-based partnership.

CAREER LADDERS PROJECT (CLP) collaborates with community colleges and their partners to build capacity for equity-minded redesign. CLP supports reflection, documentation, and publication of practitioner tools and policy briefs to support the field and lift up effective and systemic reforms. In support of the Cloud Project, CLP designed professional development in response to the needs of the consortium and helped to build partnerships among community colleges, high schools, industry, and others—all with the vision of establishing a high-quality, student-centered, and industry-engaged pathway.

“Given the wide adoption of cloud technology and high demand for talent in this area, employers have been so willing to work with us. They see the value in our producing a pipeline of diverse and vibrant talent that is learning the tools and skills they use in industry today. Employer engagement has helped keep our program current and advised us in the new and emerging things that are developing.”

— Howard Stahl, department chair, Computer Science and Information Systems, Santa Monica College

Section One: Meaningful Connections with Industry

A. INDUSTRY AND WORKFORCE PARTNERS

The partnership with Amazon and AWS Educate has been instrumental to this endeavor. From the beginning, AWS shared cloud expertise to help shape project curriculum and convey technical skills requirements leading to the AWS certifications. They provided specialized training around the AWS platform through faculty workshops, especially in the early days of the project launch. AWS subject matter experts continue to serve as a resource to faculty as questions emerge. AWS provides access to the AWS Educate platform,² offering Amazon credits for faculty and students at the 19 colleges to use AWS services and tools and build in the cloud (a value of \$200 per faculty member and \$100 for students per year). Faculty at the colleges have incorporated AWS content and hands-on learning into their cloud classes according to their own needs and preferences.

Both AWS and the Center for a Competitive Workforce support the consortium by hosting resume and interview workshops and mock interviews for students tailored to technology occupations. Amazon and other industry professionals prepare

cloud students for the kinds of questions they will face in interviews for internships or jobs and help students to update their resumes. Additionally, AWS Educate hosts an online learning library that the cloud students can access for free to develop short-term and long-term career plans and learn interviewing tips for cloud jobs. Students also have access to virtual AWS job fairs and the AWS Educate Job Board to find internships and employment in technology.

To support industry-education alignment across the colleges, the project forged connections with the Los Angeles Economic Development Corporation (LAEDC), the Center for a Competitive Workforce, and the Los Angeles Regional Directors of Employer Engagement under the Strong Workforce Program. The Cloud Project subcontracted with

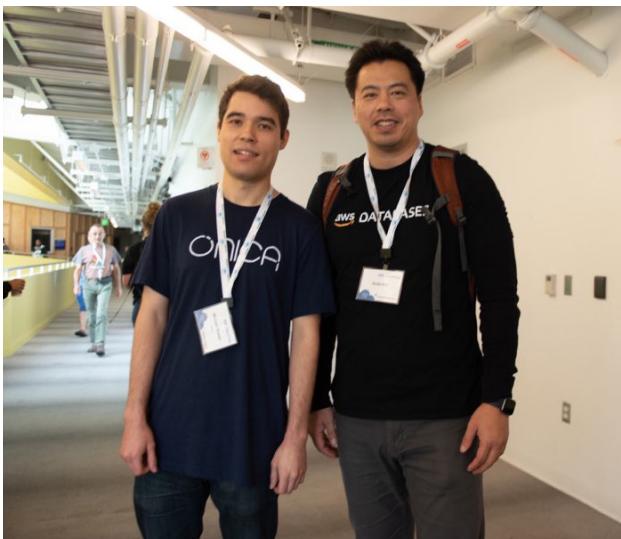
the LAEDC to convene a regional advisory board for the 19 colleges. The LAEDC, through its work in the Center for a Competitive Workforce, recruited industry participants to serve on the board and facilitated advisory meetings on behalf of this locally-grown, regional initiative.

The project leadership team built a robust partnership with Charlotte Augenstein, the Los Angeles Regional Director for Employer Engagement in ICT and Digital Media (California Community College Strong Workforce Program). As a former Microsoft employee, she connected the work with

the Microsoft Azure platform, enriching curriculum content and project activities with exposure to Azure cloud solutions. She brought industry representatives to regional Cloud Days (industry guest speakers) and allocated funding to help offset the costs of these events. Innovatively, the Regional Director shared the AWS DeepRacer app with the project. The app enables students to code a racing car using their phones in the cloud. The consortium was able to use the app as an outreach tool with

regional high school students, engaging their interest in cloud computing through a tangible, hands-on activity. Several colleges have also integrated the app into their courses.

Utilizing these connections, the project has engaged with industry at a regional scale. Individual college faculty also bring industry relationships—cultivated throughout their careers—to the regional effort. For example, cloud faculty invited representatives from Apple, Mission Cloud Services, Onica, and Kokomo Solutions to speak with students on industry panels during Cloud Days and have leveraged connections with these employers and others to offer internships to students. In this way, the regional cloud community of practice is characterized by an organic process of give and take—with the project leadership team aligning with industry at a regional scale to bring resources to the colleges and the colleges sharing their connections also with their peers across the consortium.



B. EQUITABLE ACCESS TO AWS INDUSTRY CERTIFICATIONS

Innovating the AWS Certification Process

In addition to offering students a college certificate in cloud computing, the Cloud Project prepares students for industry-recognized certifications. AWS certifications validate cloud expertise, giving employers a more precise screening tool to identify qualified talent. Helping students to earn the AWS Cloud Practitioner certification and the AWS Solutions Architect-Associate certification is a key goal of the Cloud Project.

Organizing and systematizing the certification process across the Los Angeles region was a complex undertaking. The project manager for the Cloud Project collaborated with regional cloud faculty to design a free and accessible short-term, intensive training program or “bootcamp” to prepare students for the Cloud Practitioner (designed for generalists) or the Solutions Architect-Associate (designed for technical professionals) AWS certification exams. They then designed an outreach process that identified students who were ready to pursue AWS certifications. Faculty reached out to students who were in the final course of the 18-unit cloud certificate and shared with them the benefits of the project’s specialized AWS certification bootcamp training. The first Cloud Practitioner bootcamp was delivered virtually to regional students in June 2020, hosted over a three-day period. The first AWS Solutions Architect bootcamp was delivered virtually in June 2020 and a second Cloud Practitioner bootcamp was offered in December 2020. To date, 116 community college students have attended the certification training and an additional 30 regional cloud students have participated in certification preparation at the colleges. Student feedback on the bootcamp experience has been very positive.

The certification training was developed by the Cloud Project faculty and is taught by the project manager who holds multiple advanced AWS certifications. To develop and design content for the bootcamps, the project manager collaborated with cloud faculty who have taken and passed the AWS certifications themselves. Together, they pinpointed the most critical technical topics to cover in each training and also identified test-taking strategies that would help students to successfully complete test questions in the allotted exam time. Faculty are encouraged to offer extra credit to students who participate in the training and some faculty allow students to attend one of the bootcamps and sit for the certification exam in lieu of a final class project. This innovation represents a significant benefit and cost-savings for students. In the open market, AWS certification prep courses can cost upwards of \$600 which is prohibitive for many students.

Addressing Challenges Together

AWS certifications are costly which can become a barrier for students.³ The California Education code prohibits use of public funds for stipends to students, which did not allow the project to directly help students to pay for these certifications. While the Cloud Project could not distribute stipends directly to students, taking and passing AWS certifications was a deliverable of the California Strong Workforce Program grant funding, creating a hurdle for project leadership. The team came up with a workaround; the Cloud Project established a service agreement with Xvoucher, a third-party platform that helps customers to purchase industry certifications in bulk for employees or students and manage the distribution process. The Cloud Project contracted with Xvoucher to issue discount test vouchers (50% off) to students and capture data for the project on how many students take and pass the AWS certifications. Project leadership recently finalized this contract which will ease the financial burden on students. So far, the project has issued 100 vouchers through Xvoucher with a 90% pass rate on the certification examinations. The regional partnership will scale the strategy to serve more students over the coming year. The recent implementation of 2020 CTEA Perkins federal funding, which includes costs associated with industry-recognized certification examinations as an acceptable use of funds, provides another resource to defray these costs for students.

“The cost of industry certifications is a barrier for students. This is an equity issue.”

— Koda Kol, faculty, Computer Information Systems, El Camino College

This workaround was months in the making and required a tremendous amount of effort to complete. Other workforce initiatives may bump up against these restrictions as they encourage students to pass certifications validated by industry. One lesson of the Cloud Project is that there needs to be a more systemic approach to addressing issues of equitable access to industry certification where costs are prohibitive for the student and the college alike. A state-level solution would free colleges and training providers from having to develop local workarounds and allow colleges to more routinely build certifications into their programs. This could be accomplished in a number of ways—by reconsidering funding restrictions, creating a new funding source for this purpose, or providing incentives to industry and third-party certification groups to offer the certifications for free or at reduced cost to low-income community college students.

Section Two: Work-Based Learning Opportunities

Work-based learning is an educational approach that connects the classroom to the world of work. Work-based learning encompasses a range of real-world experiences, including industry guest speakers, career fairs, career-related competitions, job shadowing, mentoring, and internships among others. It provides a way for students to “test drive” a career. The Cloud Project is embedding work-based learning into the cloud pathway along a continuum, beginning with career exploration and culminating in internships with industry. As described below, the project has implemented

regional career exploration events with industry and is ramping up the connection to internships and employment over the next several years. Many students already use the AWS Educate job board as well as internship programs available at their college to pursue employment. All these opportunities are meant to engage and motivate students, increasing student persistence and completion by making clear the connection to the end goal—careers in technology and cloud computing.

A. CLOUD DAYS AND WELCOME DAY

Santa Monica College hosted the first “Regional Cloud Day” event in November 2018 for students from the 19 community colleges to learn more about cloud computing careers from industry professionals. The event featured industry panel discussions, breakout sessions led by industry and faculty leaders, and opportunities for students to network with industry. The 160 students who attended the Regional Cloud Day learned how to prepare for upcoming certifications, interviews, and job applications, in addition to hearing about different career paths within the cloud computing sector. The individual breakout sessions focused on specific cloud computing platforms and technologies such as Amazon Web Services, Alexa Skills, AWS Deep Racer, Big Data Technologies, and Machine Learning and included mini-hackathons and career preparation. Sessions were taught by regional faculty and employers, allowing for the presentation of topics typically not covered in college courses and motivating student collaboration across institutions.

Project leadership encouraged other colleges to host similar Cloud Day events locally with support from the consortium. East Los Angeles College, El Camino College, and Los Angeles Mission College have all sponsored their own local Cloud Days. After COVID-19 struck, the consortium presented a virtual “Regional Cloud Day” in June 2020 as well. The

Cloud Days are popular, with many students attending numerous events. Some students report attending every single Cloud Day, as the event itself has transformed with technology changes and project growth over the course of implementation.

The Cloud Project also hosted a virtual “Welcome Day” in August 2020 for students with representation from the 19 colleges and partner high schools. This virtual orientation and enrollment day included alumni from colleges across the region who shared their experiences in the program and talked about career outcomes resulting from their participation. College faculty facilitated zoom breakout sessions to introduce new students to the core curriculum. Over 100 community college and high school students attended this outreach event.



The camaraderie that emerged at these gatherings is a testament to the strength of this community of practice. New and returning students alike found it inspiring to see and support each other at the Welcome Day. They discovered that a regional community was behind the project, building partnerships in support of their success. The Cloud Days and Welcome Day provided students with a sense of belonging to a larger community. Moreover, at the Welcome Day, there was never the impression that colleges were in competition with one another to attract students; rather, there was a feeling of camaraderie and support for one another among the colleges. The California Cloud Workforce Project has built a robust community endowed with a rich feeling of connection.

Timeline

2017	2018	2019	2020	2021
Pilot Santa Monica College, AWS Educate, and Roosevelt High School	Program Launch California Cloud Workforce Project, 19 Los Angeles Community Colleges and High School Partners Regional Cloud Day at Santa Monica College	Implementation Developing the Community of Practice Collaborating on Open-Source Curriculum Faculty Professional Development Engaging Additional Tech Employers	Implementation Outreach to High Schools Work-Based Learning Events with Industry Faculty Professional Development <ul style="list-style-type: none"> • Regional Industry Advisory Board • Intersegmental Professional Development with Los Angeles Unified School District • Virtual Cloud Day • Virtual Welcome Day • Cloud Practitioner and Solutions Architect Bootcamps 	Program Improvement Scaling Bootcamps, Certification Preparation, and Career Readiness Activities Piloting Team Internship Model <ul style="list-style-type: none"> • Regional Industry Advisory Board • Virtual Cloud Days • Virtual Welcome Day • Cloud Practitioner and Solutions Architect Bootcamps

This timeline represents key events and the focus of each year of implementation. The Cloud Project works with the colleges and partners at their own pace. The initiative reflects a mix of early and late adopters. The project leadership adapts to the needs of the locally-grown partnership with implementation at different stages at different colleges.

Student Profiles



Isabelle Wagenvoord, rising senior at Santa Monica High School

Isabelle was interested in programming and saw an announcement from her high school counselor about the cloud computing program at Santa Monica College. Isabelle took her first college cloud computing class as a high school sophomore through a dual enrollment partnership between her high school and Santa Monica College. After the introductory course, she was motivated to complete the rest of the cloud computing certificate courses. Isabelle is now an intern at Kokomo Solutions, an innovative start-up that helps companies and organizations to manage unexpected events through cloud technologies. Isabelle is excited about her career prospects given her early success obtaining employment as a result of the cloud courses. Ultimately, she hopes to earn a four-year degree in computer science or a related field.



Jonathan Aguirre, graduate of Los Angeles Mission College

Jonathan was pursuing a degree in cybersecurity at Los Angeles Mission College when he saw a flyer for the cloud computing program. He decided to take the AWS courses to complement the skills he was learning in his cybersecurity classes. Jonathan fell in love with cloud system infrastructure and ended up completing the 18-unit cloud certificate, in addition to earning an associate degree in cybersecurity. He believes both programs in tandem strengthened his knowledge of computing fields. Near the end of his coursework, Jonathan also completed the program's certification bootcamp to prepare for the AWS Cloud Practitioner exam which he successfully passed. Jonathan utilized the partnership with AWS Educate to prepare for and line up interviews in his field. With the cloud certificate, an associate degree, and the AWS Cloud Practitioner certification under his belt, Jonathan is ready to launch a career in cloud computing.

B. A PURPOSEFUL WORK-BASED LEARNING INFRASTRUCTURE

The regional partnership has designed a supportive infrastructure for student onboarding across the region, including access to work-based learning experiences. The project utilizes an employment background survey that students fill out as they enroll in the cloud classes. The survey provides entry into a regional listserv that is used to blast out information regarding AWS certifications, virtual job fairs, and employment opportunities. Faculty are encouraged to incorporate the survey into their classes as an assignment or for extra credit. The survey is also a tool for the program to capture information on student backgrounds as they enter the program and to assess student interest in internships and jobs. Project leadership uses this data to inform regional planning, continually evaluating how the Cloud Project can best support students as they pursue employment opportunities. This regional data system is used for project dashboards for stakeholder communication, tracking practitioner relevant metrics. This was achieved outside the local college institutional research offices.

As noted, AWS and industry professionals volunteer their time to conduct mock interviews and resume critiques for the cloud students. To qualify for the Amazon mock interviews, students must first attend two AWS webinars addressing how to write a resume for the tech sector and interview tips for cloud jobs. To date, 100 regional students have attended the webinars and 35 have chosen to participate in the one-on-one interviews. The project will increase student participation in these activities over the next several years using a team internship design modeled after the California Community College (CCC) Maker Initiative.⁴

With feedback from employer partners, project leadership discovered that many students are not adequately prepared for the one-on-one interviews. The numbers also reveal that many students self-select out of the interview process entirely, likely because students need more support to feel confident about approaching a professional interview. To address this gap, the Cloud Project plans to redesign this component of the regional project to further validate and support student readiness for employment. Over the next year, the project manager will reach out to career specialists at each campus to engage them in the process. The plan is to have career center professionals on each campus facilitate participation in the AWS webinars, work with students on their resumes, and conduct their own mock interviews—all before students interview with industry representatives. This will help the colleges to validate student

job readiness, while also accelerating involvement from other campus departments in the cloud endeavor. The program will roll out this added career readiness infrastructure next year.

The Cloud Project is similarly ramping up connections to internships, keeping in mind some of the challenges associated with scaling internship models. Student internships can be time consuming for employers to manage. Some faculty are hesitant to approach industry as student internships seem like a big ask. Many of the cloud students are obtaining internships already, but these do tend to be students who are already highly prepared and ready for employment. To scale access to real-world experiences for all students, the Cloud Project has proposed a regional “team internship” model. This component is designed as an experiential learning activity that can be incorporated into the cloud certificate program as a class project or capstone course. The Cloud Project plans to recruit employers who have a specific business challenge and offer the opportunity for a team of cloud students, mentored by faculty, to develop solutions to the business challenge. Cloud faculty will manage the business relationship and negotiate the right scope for the project given student abilities and semester timelines. It is a value-added proposition for employers and provides a realistic learning opportunity for students that can enhance their employability. The concept will be piloted over the next two years.

Cloud Project Career Readiness Innovation

- Online student onboarding to connect students to regional resources and employment information
- Continual feedback from students to inform planning via embedded student surveys
- Mock interviews with industry professionals preceded by interview and resume preparation activities
- A “team internship” model built into capstone courses that engages students in addressing specific business challenges faced by local employers

The team internship idea is a highly scalable model that can be incorporated into the existing cloud courses across the region. It empowers faculty by giving them something tangible to offer employers that is value added. Students with a range of skill levels can gain a real-world learning experience that includes meaningful collaboration with their peers. Embedding the team internship in a capstone project will enable faculty to observe student work behaviors in a sheltered environment where students can be mentored both technically and for work readiness. The Cloud Project is developing a thoughtfully designed infrastructure for bringing industry and students together using this scalable model inspired by CCC Maker.

Section Three: Lessons Learned

A. INSIGHTS

As project leadership reflects on this growing body of work, several early lessons emerge. These insights include:

- **Engage with industry at scale.** Implementing project activities at regional scale was critical to the cloud partnership. The project found that tech employers were more likely to participate in an event, like Cloud Day, where they could reach students from 19 colleges versus an event with a single institution. Employers are busy and it is more feasible for industry partners to engage when multiple colleges are in attendance. Similarly, hosting multiple employers at regional events maximizes exposure to potential job opportunities for students.
- **Build trust with employers over time.** Employers need time to get to know the community college student population and see for themselves what community college students (including dual enrollment students) can do. The Cloud Project sees the benefit of starting with low-engagement activities like career fairs or guest speakers (Cloud Days) to introduce employers to community college students. Then over time, colleges can ramp up relationships with industry to include high-engagement activities, such as experiential learning or internship models.

- **Incentivize faculty.** The Cloud Project provided specialized training to high school and college faculty around the AWS platform and cloud technologies. Many faculty pursued their own AWS certifications following the regional training. The access to cloud professionals as well as the AWS platform was invaluable for faculty. These opportunities enriched course content, while providing a highly sought-after opportunity for faculty to advance their knowledge of in-demand technologies. As a result, faculty were extremely motivated to participate in the project. Likewise, the initiative demonstrated a strong student and labor market demand for cloud computing education which was another motivator for faculty. Colleges and consortiums pursuing similar efforts can consider a range of strategies to incentivize faculty such as: access to industry expertise, training, and certifications; additional professional development resources; compensation for additional responsibilities; or demonstrating high student and industry demand for programming from the onset.



- **Use customized project branding to attract students and employers.**

Working as a regional partnership, the leadership team defined a regional “brand” or identity for the locally-grown initiative. The team promoted all of the colleges in the region participating in the cloud computing endeavor. This strategy helped to attract employers as well as students to the project. Students appreciated being a part of a regional program deeply engaged with industry.

Cloud technology is such an attractive industry sector that students from varied backgrounds are coming to the colleges for access to cloud careers, including career changers (7%) and those without any background in information technology (62%). The project found that over forty percent (42.5%) of students came to the program with bachelor’s and master’s degrees looking to upskill or change careers. About half of the students with college credentials held degrees from non-technical fields. Further, to ensure that students without college credentials had access to the cloud computing pathway, the project team focused more on building relationships with partner high schools with the explicit intention of reaching out to students who might not otherwise be included in STEM fields. The regional nature of the initiative—and the involvement of an industry leader like AWS—legitimized the project and helped to reach a broad population of students with varied experiences and backgrounds.

- **Invest in a project team for planning and empower a project manager.**

The implementation of new college programs and methods requires a change management approach to build trust across colleges. Developing stakeholder engagement and establishing methods to communicate across colleges was necessary to build capacity. This required careful planning and execution coordinated by a designated project manager using practices familiar to industry.⁵

- **Expect the collaborative approach to unleash creative solutions.**

The purposeful collaboration between college and industry partners that characterized this project led to several innovations that may not have emerged otherwise. The partners addressed challenges together and crafted student-centered solutions that hold promise for building a diverse cloud workforce. These include: a supportive process to onboard students and set them up for success in cloud careers; addressing challenges to help students attain industry certifications; and a thoughtful work-based learning infrastructure including an innovative “team internship” model designed to expand access to experiential learning. These innovations were made possible because of regional collaboration. One early lesson from the Cloud Project is that creative solutions happen when colleges and industry partners think at scale and work together as a region.

Conclusion

The California Cloud Workforce Project has developed an industry-engaged pathway that benefits both cloud employers and students interested in learning the cloud. The Los Angeles endeavor is building a regional pipeline of students with cloud knowledge to fill jobs in a growing sector that currently has a limited supply of qualified candidates. Employers, students, and faculty are all motivated to participate in the project because it offers rich, real-world learning experiences that prepare students for high-paying, quality jobs that need to be filled right now and that promise growth opportunities in the future.

The project is a testament to the old adage that there is strength in numbers. The regional scale of the initiative has enabled the colleges to engage industry leaders in the cloud space, attract students with diverse experiences and backgrounds, craft innovative workforce solutions, and build a large, yet connected community of learners with shared interests and goals. Collaborative models like the California Cloud Workforce Project signal a new approach to career-focused education. By scaling regional planning and work-based learning resources, the project is building a comprehensive regional cloud computing pathway, deeply informed by employers and clearly focused on student success.

Endnotes

1 Centers of Excellence. (2018, September). Cloud computing-Amazon Web Services (AWS), Los Angeles and Orange Counties. <http://www.coeccc.net>

2 The AWS Educate platform includes access to AWS content, training, pathways, AWS services, and the AWS Educate Job Board with employment opportunities for students. Educators can access AWS services, launch virtual classrooms, and use tools to help students learn the cloud.

3 The AWS Cloud Practitioner certification exam costs \$100 to take and the AWS Solutions Architect-Associate exam costs \$150. Professional-level and specialty exams are \$300.

4 The CCC Maker Initiative is a California Community College statewide endeavor funded under the Doing What Matters for Jobs and the Economy framework. The project is building a community of college makerspaces that welcome non-traditional students, support faculty to embed “making” into instruction, and partner with businesses to prepare students for STEM/STEAM careers. CCC Maker is piloting a new cohort-based internship model at several CCC Maker colleges. The college makerspace partners with business leaders to pose business challenges to students that they explore as a cohort and potentially solve in group learning sessions. California Community Colleges CCC Maker. <https://cccmaker.com>

5 Such as methods endorsed by the Project Management Institute. <https://www.pmi.org>



Career Ladders Project promotes equity-minded community college redesign. We collaborate with colleges and their partners to discover, develop, and disseminate effective practices. Our policy work, research, and direct efforts with colleges lead to system change—and enable more students to attain certificates, degrees, transfers, and career advancement.

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