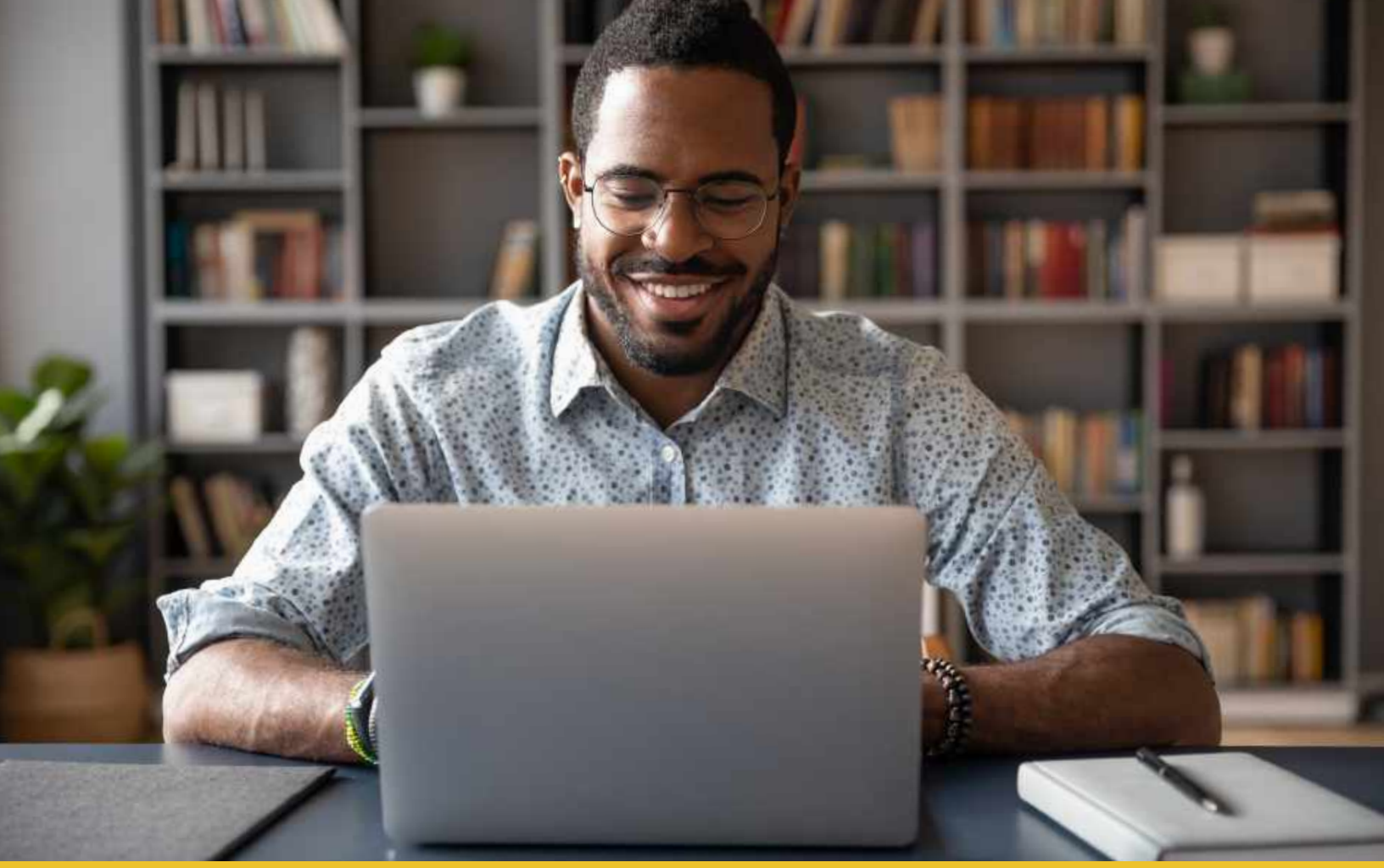

February 2021

Building Careers in the Cloud: An Industry-engaged Pathway

By Career Ladders Project

CLP | Career Ladders Project

Acknowledgments

This publication is based on the work of the 19 colleges in the California Cloud Computing Workforce Project led by Santa Monica College in partnership with colleagues from Cerritos College, Citrus College, Compton College, El Camino College, East Los Angeles College, Glendale Community College, Long Beach City College, Los Angeles City College, Los Angeles Harbor College, Los Angeles Mission College, Los Angeles Pierce College, Los Angeles Southwest College, Los Angeles Trade-Technical College, Los Angeles Valley College, Mt. San Antonio College, Pasadena City College, Rio Hondo College, and West Los Angeles College.

We would like to thank the California Cloud Computing Workforce Project team of Charlotte Augenstein, Nancy Cardenas, Salomón Dávila, Koda Kol, Dorothy Phillips, Dr. Patricia Ramos, Munir Samplewala, Howard Stahl, and Vicky Seno. We also extend our thanks to the many employers and industry partners that supported this project and provided learning opportunities for the cloud computing faculty and students. On the Career Ladders Project team, we would like to acknowledge the work of Naomi Castro, Luis Chavez, Eder Flores, and Sherry Shojaei. Special thanks to CLP consultant Kathleen Schaefer for her support in writing and developing this brief.

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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.

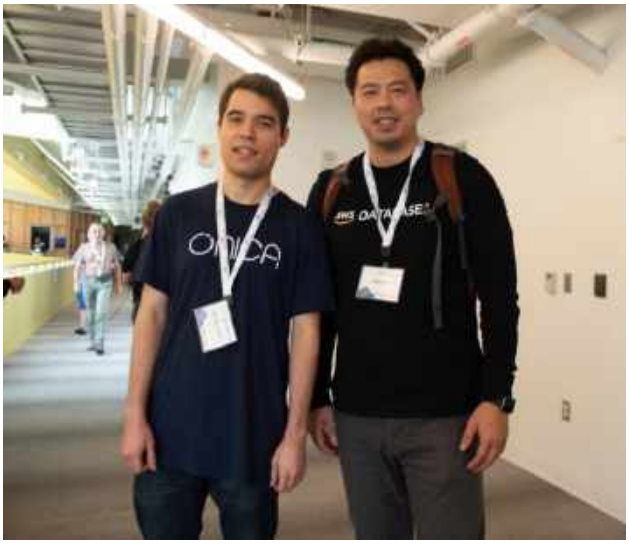
CAREER LADDERS PROJECT (CLP) collaborates with community colleges and their partners to build capacity for equity-minded redesign. CLP supports reflection, documentation, and publication of practitioner tools and policy briefs to support the field and lift up effective and systemic reforms. In support 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 • 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 • 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

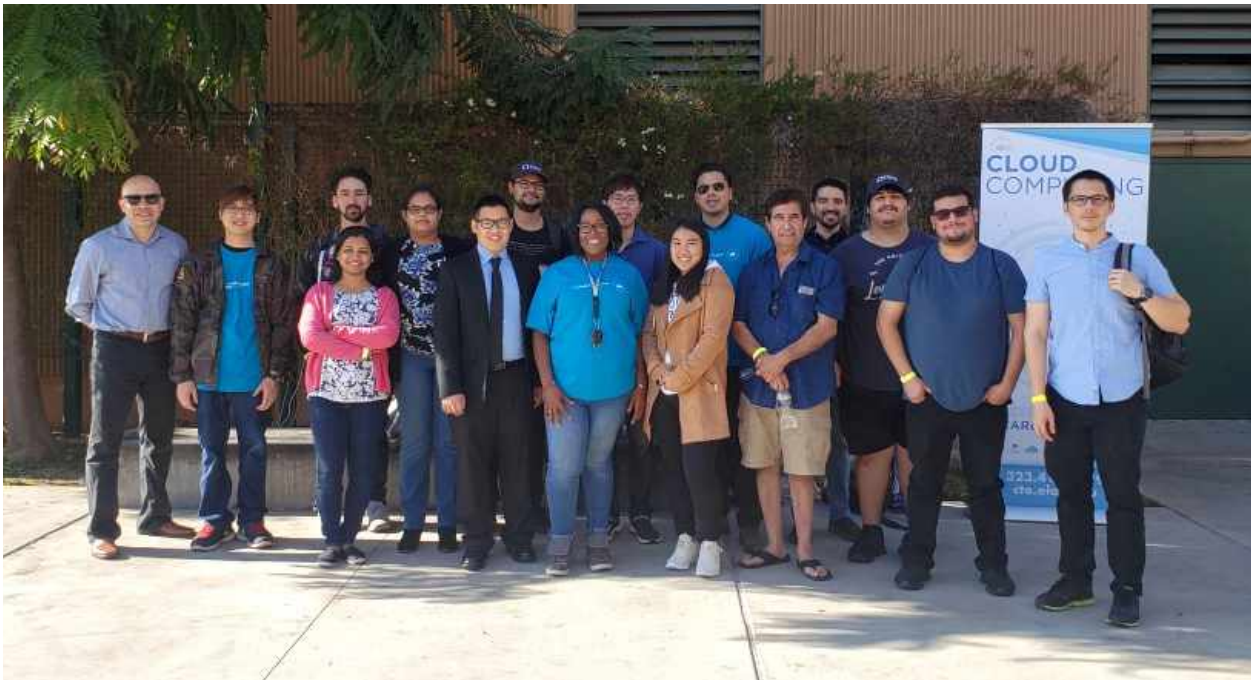
The team internship idea is a highly scalable model that can be incorporated into the existing cloud courses across the region. It empowers faculty by giving them something tangible to offer employers that is value added. Students with a range of skill levels can gain a real-world learning experience 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

CLP | Career Ladders Project

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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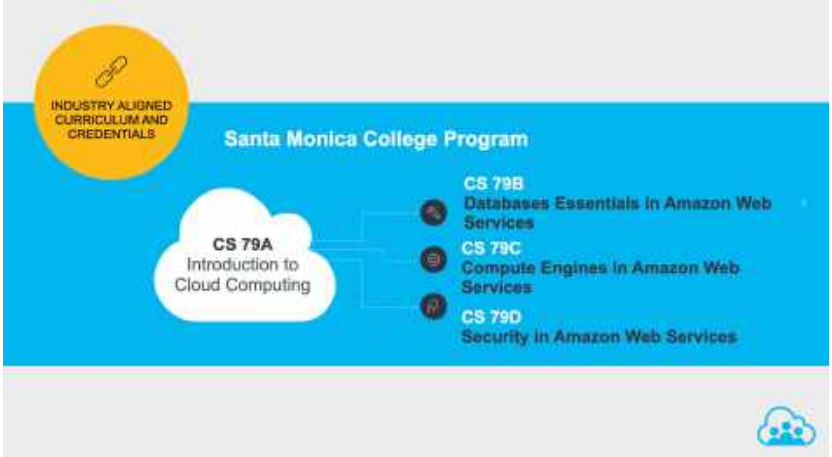
Section One: What the Project Accomplished

A. THE CALIFORNIA CLOUD WORKFORCE PROJECT

Cloud computing is the delivery of computing services—from applications to storage and processing power—over the internet.[1] It is widely considered the hottest growth area in technology today. Experts say that 90% of companies are on the cloud with the U.S. public cloud market accounting for $124.6 billion in 2019.[2] With the advent of COVID-19, large sections of the workforce are working from home, increasing the demand for cloud computing services. Cloud computing offers students a prime opportunity to enter a high-wage growth sector.[3]



In Los Angeles and Orange Counties in 2018, there were 83,010 job openings requiring knowledge of cloud computing, while the region's community colleges conferred 974 degrees or certificates in information and computing technology that year.[4] To address this gap, Santa Monica College partnered with Amazon Web Services (AWS) and AWS Educate to develop college credit courses in cloud computing that begin in high school, continue in college, and lead to college certificates, degrees, and industry certifications. The partners created an entry-level, 18-unit Cloud Computing Certificate program that introduces students to AWS and other cloud technologies as well as to career pathways in the cloud. The four core courses teach architecting, database management, security, and other cloud essentials and are carefully aligned with industry competencies and certifications. During its initial pilot (2017-2018), Santa Monica College also partnered with Roosevelt High School to offer dual enrollment opportunities in cloud computing during the school year.

What distinguishes this work is that Santa Monica College and AWS Educate did not stop there. The partners had a vision for a regional cloud computing pathway with the core curriculum expanded into high schools and colleges across the greater Los Angeles area. With funding from the California Community Colleges Chancellor's Office under the Strong Workforce Program, Santa Monica College established a regional sector-based partnership of multiple cloud employers with 19 Los Angeles community colleges and their partner high schools, the Los Angeles County Office of Education, the Career Ladders Project, and many other involved stakeholders. The California Cloud Workforce Project (Cloud Project) provides coordination to promote regional employer involvement and the sharing of open source curriculum. It is the largest consortium in Amazon's portfolio of AWS Educate projects around the globe. After three years, the Cloud Computing Certificate is now offered at all the participating colleges and is approved by the state as a regional certificate program with course credit portable across the 19 colleges. To date, 3,555 students in the Los Angeles region have enrolled in the cloud computing courses (Fall 2017-Fall 2020).

> *"I have never seen any other program at my college have such a dramatic, life-altering effect on students' lives. This program helps students build careers in tech. Coupled with industry-recognized certifications, students are getting employed in great jobs with fantastic companies all over the tech field. It is so absolutely wonderful to see."*
>
> *— Howard Stahl, department chair, Computer Science and Information Systems, Santa Monica College*

CLP

The Cloud Project builds on Santa Monica College's initial pilot, including collaboration with area high schools. The introductory courses are offered as dual enrollment options at partner high schools, reaching diverse students who do not have access to technology programs at their school. The initiative sponsors work-based learning events, such as Cloud Days, where faculty and counselors invite industry speakers to talk with students about occupations in cloud computing. With the advent of COVID-19, the project organized a virtual Cloud Day and a virtual Welcome Day for students. The regional Welcome Day provided an orientation to the program for new students and featured alumni stories to inspire new and continuing students in the cloud pathway. The Cloud Project also developed its own specialized AWS certification bootcamp training to prepare students for the AWS Cloud Practitioner certification exam or the AWS Solutions Architect-Associate certification exam. All these types of student supports foster a sense of community among the cloud students and enable partners to regularly communicate with students and capture feedback to enhance program effectiveness.

The Cloud Project required a significant investment of energy, vision, and leadership to launch. At Santa Monica College, multiple levels of campus leadership supported the initiative and were committed to a regional scope from the beginning, including the Santa Monica College Board of Trustees, the district superintendent/president, the vice presidents of academic affairs, the CTE dean, project managers, and the 19 college deans that facilitated the funding needed to ensure multi-year success of this project. The Cloud Project draws upon the earlier work of the Los Angeles High Impact Information Technology, Entertainment and Entrepreneurship, and Communications Hubs (LA HI-TECH) Regional Consortium.[5] That effort sought to connect regional community colleges with area high schools and industry to build career pathways in information and communications technology. Santa Monica College's relationship with AWS grew out of this body of work, with both partners recognizing the potential to share cloud computing curriculum across colleges and high schools in the region.

Supporting Partners

AWS EDUCATE is Amazon's global initiative to provide students comprehensive resources for building skills in the cloud. It is a no-cost curriculum providing access to content, training, pathways, AWS services, and the AWS Educate Job Board with employment opportunities. Educators can access AWS services, launch virtual classrooms, and use tools to help students learn the cloud.

CAREER LADDERS PROJECT (CLP) promotes equity-minded community college redesign. CLP collaborates with colleges and their partners to discover, develop, and disseminate effective practices. CLP's policy work, research, and direct efforts with colleges lead to system change—and enable more students to attain certificates, degrees, transfers, and career advancement. CLP publishes practitioner tools and policy briefs to support the field, advance reform, and inform policymakers.

LOS ANGELES COUNTY OFFICE OF EDUCATION (LACOE) is the nation's largest regional education agency. LACOE provides a range of programs and services to support the county's 80 school districts and 1.4 million students in the region.

LOS ANGELES ECONOMIC DEVELOPMENT CORPORATION (LAEDC) drives action in support of a reimagined Los Angeles regional economy that is growing, equitable, sustainable, and resilient—and provides a healthy and high standard of living for all. LAEDC collaborates with all stakeholders in the region including education, business, and government to foster the growth of well-paying jobs in key industries.

CENTER FOR A COMPETITIVE WORKFORCE (CCW) is a Strong Workforce Program regional project focused on engaging and institutionalizing partnerships between the 19 community colleges in the Los Angeles region and employers from high-growth industry sectors. CCW leads and supports regional workforce development and employer engagement efforts on behalf of the 19 colleges in the Los Angeles region to better understand industry trends and the demands for talent.

LOS ANGELES TECHNOLOGY EMPLOYERS in addition to Amazon Web Services and AWS Educate, technology employers such as Apple, Mission Cloud Services, Onica, Kokomo Solutions, CDW Integrated Technology Solutions, Slalom Consulting, Think AI Corporation, and Los Angeles Metro support the Cloud Project, helping to convey industry competencies and in-demand skills, inform cloud courses, and offer work-based learning opportunities for cloud students.

Santa Monica College and its partners have built robust connections among regional colleges, high schools, and industry to align curriculum, engage in pathway design, incorporate work-based learning, and support students as they progress along a pathway.

It should be noted that the Cloud Project is still in development. Years one through three (2018-2020) focused on certificate development, partnership building, and program implementation. Now in year four, the project is sharply focused on supporting student completion of AWS industry certifications and preparation for employment and will report further on outcomes as the initiative matures. While it is early in the project to see longitudinal student outcome data, the project is committed to the routine review of data on student success to inform continuous program improvement. This brief is the first of two publications highlighting lessons from this locally-grown, sector-based partnership. This brief features insights from the faculty community of practice while the companion brief, *Building Careers in the Cloud: An Industry-engaged Pathway*, explores the project's engagement with industry in greater depth.

By the Numbers

The Los Angeles Region

- **19** community colleges in Southern California implementing
- Over **50** faculty involved in professional development
- Student Enrollments in the Region
  - **2,155** cloud students, Fall 2017-Fall 2019
  - **1,400** cloud students, Fall 2020 (Projected)
  - Approximately **3,000** cloud students per year
  - Over **$2M** in funds to scale and support

The Multiplier Effect

- **28** community colleges in Northern California planning to replicate the Cloud Project in the Bay Area region
- Several community colleges outside of the Los Angeles region are already participating in—and contributing to—the cloud community of practice

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 • 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 • 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.

Colleges in the Community of Practice

Cerritos College
Citrus College
Compton College
El Camino College
East Los Angeles College
Glendale Community College
Long Beach City College
Los Angeles City College
Los Angeles Harbor College
Los Angeles Mission College
Los Angeles Pierce College
Los Angeles Southwest College
Los Angeles Trade Technical College
Los Angeles Valley College
Mt. San Antonio College
Pasadena City College
Rio Hondo College
Santa Monica College
West Los Angeles College

Colleges Outside the Region
Cuesta College
Foothill College
Las Positas College
Moorpark College
Riverside City College

Lead College
Santa Monica College

Project Leadership Team Members

Dr. Tricia Ramos, Dean of Academic Affairs, Santa Monica College

Salomón Dávila, Project Manager, California Cloud Workforce Project

Nancy Cardenas, Counseling Faculty and Project Manager, Santa Monica College

Koda Kol, Faculty, Computer Information Systems, El Camino College

Howard Stahl, Department Chair, Computer Science and Information Systems, Santa Monica College

Vicky Seno, Faculty, Computer Science, Santa Monica College

Dorothy Phillips, Faculty, Computer Information Systems, Los Angeles Harbor College

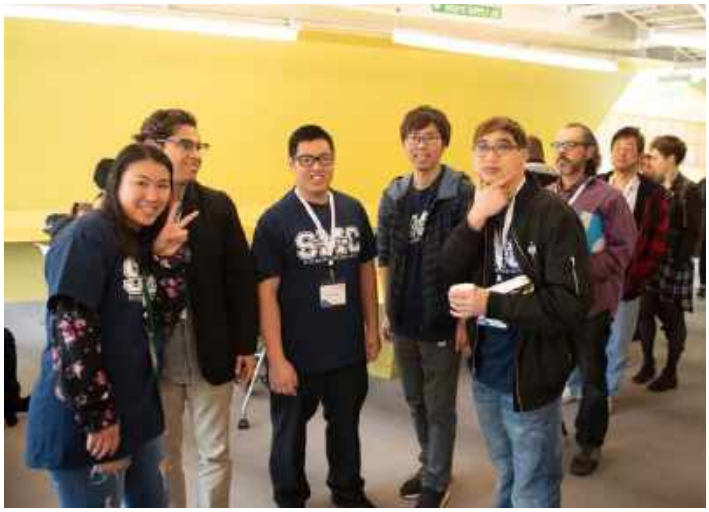
Munir Samplewala, Faculty, Computer Information Systems, Los Angeles City College

Charlotte Augenstein, Regional Director of Employer Engagement, Los Angeles Region, ICT/ Digital Media

B. THE FACULTY COMMUNITY OF PRACTICE

The regionalization of curriculum is nuanced work. The Cloud Project found that relationship building through a community of practice is a critical element in taking a pathway to scale. For the past three years, an active community of practice brought consistency and structure to project implementation and fostered genuine collegiality among faculty. It is important to note that this was not a top-down endeavor, but rather faculty driven at every step of the way. At any given time, 15-20 instructional faculty across institutions were engaged in project team meetings, professional development, and webinars on key topics—both participating in these activities and driving content to support their peers. Moreover, 50 faculty have attended professional development training to date. This level of peer exchange has made a tremendous difference in widespread uptake of the core curriculum across the 19 colleges and their high school partners.

A project leadership team—composed of instructional faculty, college and high school dual enrollment faculty, counseling faculty, a project manager for the Cloud Project, a CLP project lead, and other members of the larger community of practice—kept the project moving along. This cross-functional, cross-institutional team met on a weekly basis to share updates, evaluate progress, iterate best practices, and design professional development. The project team served as a hub of expertise for the region. Team members provided knowledge and support to the colleges, helping practitioners to facilitate conversations, enlist partners, and cultivate champions for the work at individual campuses.



> *"Knowing that we had a new program in great demand for our students excited me."*
>
> *— Dorothy Phillips, faculty, Computer Technology, Los Angeles Harbor College*

From the beginning, the work of the leadership team was informed by industry-required competencies with input from Los Angeles technology employers using a range of cloud solutions. A regional advisory board for the Cloud Project also informs project curriculum and work-based learning activities with representation from Amazon Web Services and AWS Educate, CDW Integrated Technology Solutions, Slalom Consulting, Think AI Corporation, Los Angeles Metro, the Los Angeles Economic Development Corporation, and the Center for a Competitive Workforce.

With leadership from CLP, the project team was intentional about professional development. The team worked with college partners to identify and design relevant professional development to support implementation at the colleges. In years one and two, faculty professional development focused on cloud computing technical training and practices to build a robust career pathway. In year three, in-person training addressed outreach to area high schools and included intersegmental professional development with feeder high schools to foster dual enrollment relationships with the colleges. Monthly webinars augmented professional development, addressing a range of topics such as project data, high school and community college partnerships, outreach to students, and incorporating work-based learning into the pathway. Outside of formal training, the project used a channel (chat room) in the Slack communication platform to further connect faculty together. All these structured efforts helped to cement relationships and create a forum for ongoing resource sharing across the region.

This community of practice created a spirit of collaboration and community among faculty, not competition. A structured, intentional, and consistent approach to bringing practitioners together enabled collaboration to flourish.

The Role of the Career Ladders Project

CAREER LADDERS PROJECT (CLP) utilized its expertise in equity-minded redesign and knowledge of K-12 and community college systems to support the faculty community of practice. In addition to ongoing support for project meetings, CLP facilitated collaboration between high school and community college partners, supported communications outreach by providing information to counselors on the cloud computing sector, and designed faculty professional development to meet the needs of regional partners. CLP worked one-on-one with the colleges to assist with planning, address issues, and help keep the work on track. Additionally, CLP worked with Santa Monica College on its initial pilot and advised the college regarding the original design, especially helping to broaden the focus beyond AWS to include other cloud platforms and technology employers. With support from CLP, the California cloud community of practice has fostered innovation in the region and much has been learned from this work. CLP, along with project partners, will continue to share lessons learned with the broader field.

Section Two: What The Project Team Learned

A. FACULTY REFLECTIONS ON THE WORK

CLP asked cloud faculty to reflect on their experience with this community of practice, including key factors that led to success. Across the board, the faculty shared that networking with peers, sharing effective practices and challenges, and the willingness of their counterparts to provide support was essential to an impactful program launch. They noted the benefit of starting with the model developed by Santa Monica College, which made curriculum development easier at the colleges. They shared that the monthly professional development training was instrumental to implementation and many also pointed to the importance of having a central point of contact, the project manager, providing support. All agreed that there is strength in numbers. The regional structure helped to demystify processes and practices, while creating a rich sense of connection that is often missing for faculty, especially those teaching in small departments.

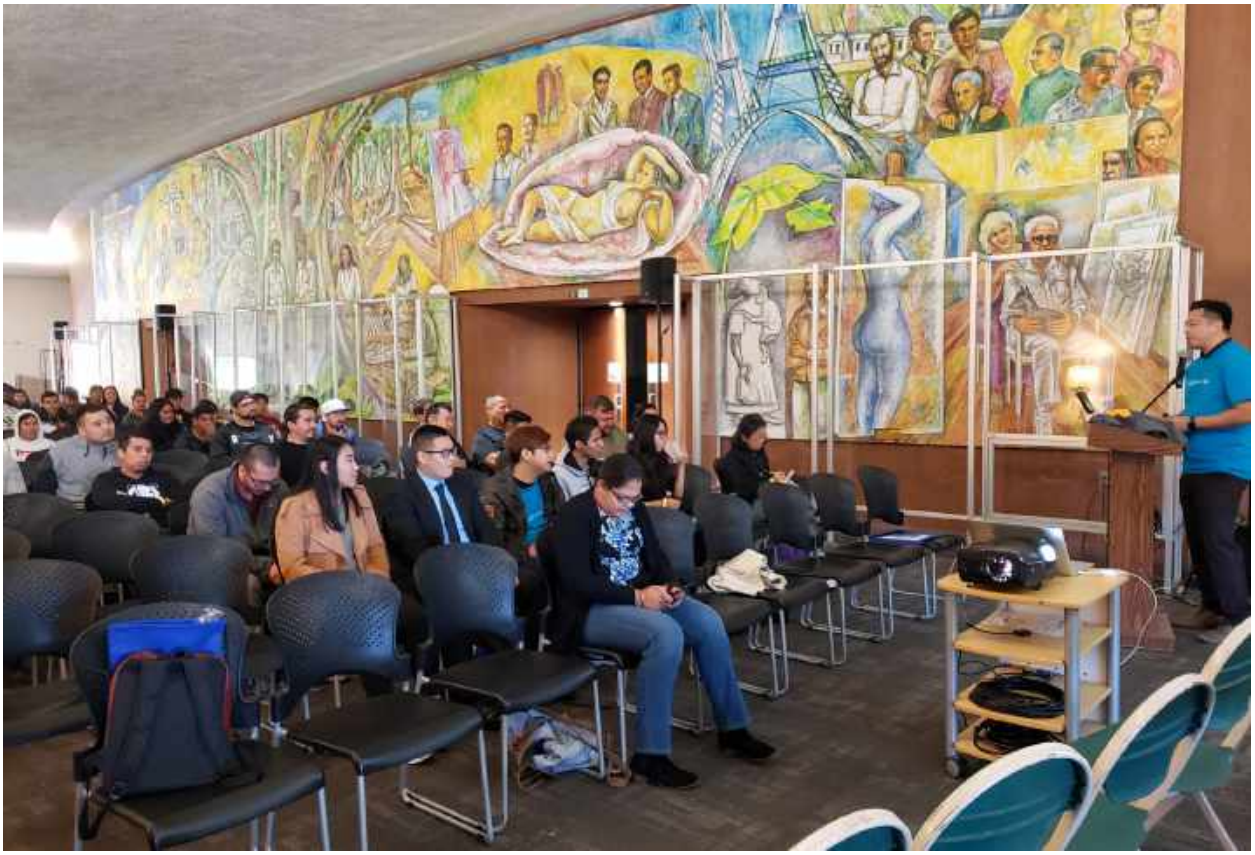
> *"Sharing with the other instructors and hearing about their college's successes and how they were putting it together was great...Sharing a very successful model (Santa Monica College) that was working helped us to build a successful program."*
> *— John Bowman, Jr., faculty, Computer Science, Los Angeles Southwest College*

> *"I was an outsider when I first learned about the Cloud Project.... I was made to feel very welcome. And then right off the bat...I was invited to training at Glendale College and I was able to meet other faculty. I think it was really that training on a Saturday that helped me get a better understanding of what I needed to do... to get the course approved through curriculum and go through my own training.... I was so appreciative to be part of a larger group that had the same focus."*
> *— Edmond Garcia, faculty, Computer Network Systems Engineering, Moorpark College*

> *"It can be isolating to work as an instructor in a community college, especially if you're one of very few instructors in your discipline, as many cloud faculty are. Unfortunately, part of the job is that you work in isolation and we kind of get used to it. It's working on a regional project like this—which is not common, I think, across our institutions—that brings a new level of engagement that when I was teaching wasn't present for me. And so I'm glad to provide that as an option, because I know how lonely it was for myself to be in my class, trying to figure out my classes."*
> *— Salomón Dávila, project manager, California Cloud Workforce Project*

The faculty were enthusiastic about "Regional Cloud Day" events, where high school and college students across the region attended industry panels and breakout sessions to learn more about cloud computing careers from cloud professionals. Seeing students (current, potential, and alumni) excited about the cloud industry sector and inspired by one another at these events was a genuine highpoint for many faculty.

Faculty were willing to invest their time and talents developing the program because it addressed an in-demand sector that promised high-paying, quality jobs for students. Faculty appreciated that the curriculum was based on industry-desired competencies and were confident that students would gain skills in a range of cloud computing platforms and technologies including AWS and Microsoft Azure. They noted that many traditional computer science programs do not cover cloud computing and it is difficult to find cloud programs even at four-year institutions. The Cloud Project is serving a broad range of students seeking entry



into cloud occupations, including career changers (7%) and those without any background in information technology (62%). Offering a cutting-edge curriculum that could change students' career trajectories, while meeting industry demand for talent, was a point of pride for faculty in the community of practice.

> *"Knowing that we had a new program in great demand for our students excited me."*
> *— Dorothy Phillips, faculty, Computer Technology, Los Angeles Harbor College*

With that said, high student demand creates challenges. Several faculty reflected that it is difficult to find enough instructors with cloud expertise to teach these courses. Finding good instructors, ideally with industry expertise, who have time to teach represents an ongoing struggle for the colleges.

The ultimate indicator of the initiative's success is the impact on students. As one faculty member shared, students are demonstrating significant career gains as a result of their experience in cloud courses and project activities:

> *"Recently one of our students with no technical background was offered an internship that led to a full-time opportunity. Over the span of 1.5 years, he has been promoted twice. We also had a high school student who completed the cloud certificate program and landed a summer internship upon graduation. The CEO was so impressed with her skills that he extended the internship through fall. These are a few of the success stories that show the immediate impact experienced by students in our program."*
> *— Koda Kol, faculty, Computer Information Systems, El Camino College*

B. INSIGHTS FOR THE FIELD

The experience of the Cloud Project suggests important lessons for colleges seeking to build robust communities and pathways. While there is no one formula for success, several core principles have served this project well and may be of interest to the broader field. Chief among these:

Be intentional about the design of the community of practice. A strong community is one where participants genuinely care about each other and root for the success of their colleagues. Such a community is not just a "happy accident"—it is purposefully cultivated.[6] The community of practice was carefully designed with faculty at the center. The project team, as the hub of the community, drew faculty into the conversation and empowered them to deepen their involvement when they felt comfortable. The team did not push out content for colleges to implement; rather, they provided structure and resources for faculty and encouraged codesign of curriculum and project activities.

Regionalize core structures and practices. The project team crafted core structures at a regional level in order to simplify implementation at the local level. The team figured out the complexities of building the pathway so that individual colleges didn't have to, making it easier and faster to get a cloud program off the ground at the colleges. These structures included:

- *Professional development* that was timely, relevant, and consistent.
- *A curriculum approval process* with course outlines and documentation available through the online Canvas learning management system and the adoption of a regional cloud certificate approved by the state Chancellor's Office—making it simple for college and high school teams to adapt and adopt.
- *Regional labor market data* to share with partners, counselors, instructors, and students, including labor market data from the Centers of Excellence and an online scan of job openings requiring knowledge of cloud computing technologies.
- *Regional Advisory Committee minutes* to share with college partners for local curriculum committee program approvals and state submission.

Use a "hub of experts" to empower faculty. The consortium found that having a project leadership team to support practitioners helped to legitimize the work. Individual faculty could achieve big goals because they had a team of experts behind them. For example, faculty often brought project team members to meetings with high school principals to explain the value of the cloud computing courses and program. At El Camino College, the cloud instructor was a first-year hire. It can take years for faculty to cultivate relationships with senior colleagues and successfully navigate power structures at their respective campuses—all necessary to develop a new certificate program. The El Camino faculty member was successful, in part, because he had a regional team supporting him, helping to mobilize buy-in at the college and with external partners.

Incentivize faculty. The Cloud Project encouraged faculty participation in the regional endeavor in several ways. The project provided specialized training to high school and college faculty around the AWS platform and cloud technologies as well as professional development on key topics such as outreach to high schools and work-based learning. Faculty appreciated the opportunity to gain knowledge and skills that could advance their careers. The initiative demonstrated strong labor market demand for cloud computing programs and brought industry leaders to the table—all important motivators 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.

> ***"We worked with individual colleges at their own pace while consistently hosting meetings and events to maintain engagement in the community of practice. This model engendered trust in each other and created space for collegiality to develop."***
>
> *— Salomón Dávila, project manager, California Cloud Workforce Project*

> *"The work done at the regional level improved buy-in of the program at the local level."*
>
> *— Khai Lu, faculty, Computer Information Systems, El Camino College*

Consider including outside facilitators in the conversation. Both CLP and the regional project manager for the Cloud Project were not affiliated with any one college (Santa Monica College did house the grant) and were seen as objective and trusted allies for faculty and counselors. As outsiders, the CLP project lead and the regional project manager could often bring expertise and a regional perspective to the work, helping colleges to cut through "stuck points" that might otherwise stall innovation.

Be transparent about results. The project team established mechanisms with faculty and students to collect individual college project data. As a neutral third party, the team made these results visible to the community of practice, always there to lend a helping hand as course corrections were needed. The project team emphasized that the colleges were all in this together. The team regularly used data during webinars and project meetings to inform conversations about next steps. The team reviewed student enrollment by college as well as survey data on student educational backgrounds, work experience history, purpose for enrolling in the program, and educational goals. Individual faculty members reviewed student success and progress data. As the project has matured, the partners are developing strategies to better track job placement.

This transparency allowed the community of practice to honestly evaluate progress and draw lessons for improvement. For example, in a review of aggregate data, the project team discovered that 42.5% of the regional cloud students already held a bachelor's degree or higher (about half of these students held non-technical degrees). Many on the project team were surprised by these findings. 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—all of which was explored in the larger community of practice. It might have been daunting for individual faculty to address the findings on their own; but, in collaboration with their peers, the colleges easily prioritized relationship-building with the high schools.

Conclusion

The California Cloud Workforce Project has crafted a strong community that is helping faculty to support one another, share practices, and diffuse learning across the Los Angeles region and beyond. The endeavor is inspiring to students, partners, and faculty alike. Working together across the region, the partnership has scaled implementation at the colleges further and faster than an individual college might accomplish on its own. A welcoming community of practice—with a thoughtfully designed regional infrastructure at the center—was essential to achieving project goals. As a result, students across the region have access to cloud computing programs that lead to high-paying jobs in a growth industry sector with opportunities to advance in college and careers—and early evidence suggests that students are completing the program and getting hired.

Endnotes

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2 Galov, N. (2020, December 4). *25 Must-know cloud computing statistics in 2020*. Hosting Tribunal. https://hostingtribunal.com/blog/cloud-computing-statistics/

3 According to ZipRecruiter, the majority of cloud computing salaries in California range between $91,920 to $139,600, with top earners making $173,026 annually. *Cloud computing annual salary in California ($107,108 Avg: Dec 2020). ZipRecruiter (2020, December 4)*. https://www.ziprecruiter.com/Salaries/Cloud-Computing-Salary--in-California

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

5 Funded in 2014 by the California Career Pathways Trust (CCPT), a state grant, the Los Angeles High Impact Information Technology, Entertainment and Entrepreneurship, and Communications Hubs (LA HI-TECH) Regional Consortium brought together eight community colleges and sixteen high schools with business and community partners to create career pathways in information and communications technology (ICT) across the Los Angeles region. LA HI-TECH represented approximately 3,600 high school and community college students and over half of ICT majors in the region's community colleges. Pasadena City College served as the fiscal agent and Santa Monica College served as one of four regional hubs in the consortium.

6 Vogl, C. H. (2016). *The Art of Community: Seven principles for belonging*. Berrett-Koehler Publishers, Inc.

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