Virtual Labs Service Brings Access and Flexibility to Community College Students and Faculty While Providing Cost Savings and Educational Expansion to Colleges

Summary

A proof of concept is underway in the South Central Coast Region (SCCRC) to embrace and actuate the California Community College Chancellor's Strong Workforce Program objectives to increase enrollment and facilitate more completions. Stakeholders throughout the region are working together to bring cloud-based labs to eight community colleges through design by the regional director of Information and Communication Technologies and Digital Media (ICT-DM) in collaboration with SynED and Cal Poly San Luis Obispo's new Digital Transformation Hub. The region spans Northern Los Angeles, Ventura, Santa Barbara, and San Luis Obispo counties.

This effort allows students to access labs for a variety of Information Technology (IT) and cybersecurity classes at any time and from anywhere. It also significantly reduces faculty workload by implementing the Learning Tools Interoperability (LTI) integration with Instructure's Canvas learning management system, used by all eight colleges, and making labs available for collective use. This, in turn, allows faculty to serve more students and increase the number of trained professionals in the workforce to fill the thousands of open IT positions in California and across the United States.

Embarking on projects like this represents an opportunity for community colleges to combine financial and intellectual capital to solve shared problems in a cohesive and mutually-beneficial way. Further, according to Herbert and Wigley (2015), the development of a student's experience (related to computer networking skills, including networking security) must address both problem-solving and soft skills (such as teamwork). Virtual labs integration within coursework achieves this goal.

Background

After considering extensive research, Kam, Gogolin & Emerick in 2014 determined that "Cybersecurity education requires learners to acquire knowledge through hands-on activities and authentic learning, whereby real-life scenarios are investigated and acted upon."

Traditionally, students have practiced computer networking and security skills at a centralized physical lab (and equipment) or a limited virtual lab appliance at their educational institution. Physical labs and college-based data centers have high costs associated with the maintenance

and repair of the hardware and software. Further, researchers noted that the cost limitations for a physical lab and college-based data center should include personnel, electricity, and other physical environmental costs.

An external service providing a turn-key virtualized environment that is identical to the corresponding physical environment will decrease the need for high-cost physical labs, yet provide open virtualized environments that let students experience the real-life scenarios that so critical in educating for technical careers. Virtual lab platforms must serve students with on demand, 24x7x365, access to a virtual lab environment from anywhere there is an internet connection. Virtual labs must also represent the full functionality of a real-world setting.

Cini and Krause (2014) suggested that higher education (including community colleges) will discard the “assembly model of one-size-fits-all” used over the past 150 years, due to online educational environments, which include virtualized environments.

The re-set of discarding the ‘sage on the stage’ to the educator as collaborator discards the typical silos of higher-education learning, and will further redefine higher education in coming years because of the following significant aspects (Cini & Krause, 2014):

- **Demographic trends**: Enrollments will soften until at least 2020, necessitating institutions to seek creative ways to ensure that courses survive at institutions by using online and virtualized environments.
- **Tuition cost:** Students cannot afford higher tuition and will become more resistant to increased costs. As a result, they will become smarter shoppers for relevant education, which will have an impact on how colleges offer courses to students, including online and virtualized courses.
- **Continued proliferation of Internet-technologies**: Accelerating and converging technology trends will provide new student training opportunities that students will progressively be required by employers, especially in the IT field.
- **Trend towards competency-based education:** Competency-based education will allow students to leverage their prior experiences to attain their desired certificate and degree goals in an adaptive manner, suggesting that courses must offer real-life case scenarios.

Project History

The groundwork for the SCCRC virtual labs project began from observing other regional implementations of shared labs that were hosted on a designated college campus. Although a valid solution, campus-hosted labs are constrained by campus hardware investment, in-house technical support, third-party software licensing at individual colleges, limited support hours and campus security burden.

The SCCRC region desired to approach Labs as a Service (LaaS) where there is no college physical location overhead, 24x7 support for faculty and students, third-party licensing bundled within the lab course, and a service level agreement (SLA) in place for availability and security.

Paula Hodge, Regional Director and Deputy Sector Navigator for ICT-DM in the South Central Coast Region, came to that role after a successful career as an IT director in the corporate world. She saw an opportunity to use cloud technology to overcome the "build it over buy it" preference that tends to be prevalent across higher education.

Hodge learned about Cal Poly's Digital Transformation Hub (DX-Hub), a new collaboration with Amazon Web Services (AWS) designed to help nonprofit organizations solve technical challenges through innovation. The virtual lab project proved to be a perfect initial project for the group to take on.

The project is being coordinated by SynED, a non-profit organization dedicated to promoting innovation in education at all levels, through research and providing higher education professional services to facilitate the development of new models of curriculum, industry alliance, service, and delivery.

Jerry Buckley, Chief Instructional Officer at College of the Canyons, sees the conversations happening around this project as reminiscent of the discussions that took place as the first computer labs were being built in the 1990s. Virtual labs provide a great opportunity to completely reimagine how students engage with technology on and off campus.

"This opens up educational resources to students and to faculty, who now have access 24/7. You couldn't say that five years ago," Buckley said. "There will still be computer labs, but they will become more specialized and represent a different set resource to a different group of students."

Process

The DX-Hub's implementation process is modeled after Amazon's Customer Obsession, Design Thinking, and The Working Backwards Process. This called for the formation of a "two-pizza team," having no more than 10 members that work with relative autonomy that could be nimble and make decisions quickly to rapidly innovate.

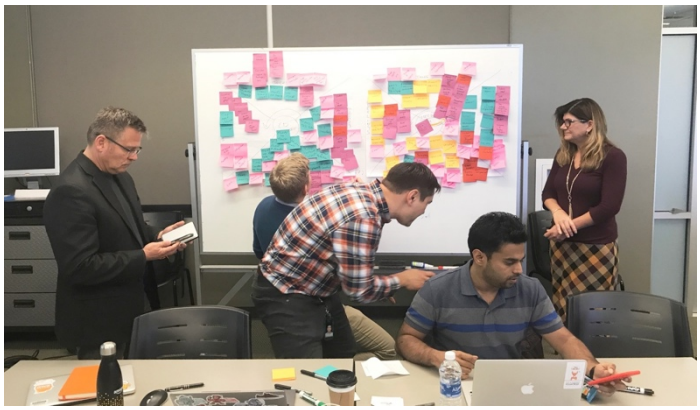

Figure 1 Paula Hodge (right), regional Deputy Sector Navigator for Information and Communication Technologies and Digital Media overseeing the solution design process for the South Central Coast Regional Consortium Virtual Lab project

The core group met for an initial half day "customer empathy" session

followed by an all-day intensive planning session in February 2018 to define what the final solution would look like. This, in turn, defined the project's goals and worked as a guide to develop a plan for evaluating and selecting a virtual lab vendor.

Focusing on the finished solution allowed the team to delve into the heart of the problem they were trying to solve by selecting appropriate technology, rather than choosing a technology first then finding a problem for it to solve. Free from bureaucratic constraints, the team was able to create a vision for better serving students, enabling faculty while still being institutionally and financially sound.

The two-pizza project team included:

- Paula Hodge, ICT-DM Deputy Sector Navigator, South Central Coast Region
- Ed Garcia, IT faculty, Moorpark College
- Mike Rose, Chief Technology Officer, Ventura Community College District
- Jim Bowen, IT faculty, Antelope Valley College
- Rick Shaw, Chief Technology Officer, Antelope Valley College
- Angel Cardenas, IT Faculty, Santa Barbara City College
- Scott Young, Director/CFO, SynED

Following the DX-Hub process, SynED provided research to locate vendors that most closely aligned with the team's design. Three top vendors were identified through a request for proposal (RFP) process. In addition to a demonstration, each vendor provided evaluation access to the team for unscripted testing and evaluation of the service. This process took place over the course of two months — lightning speed in higher education.

Practice Labs was selected as the winning vendor in May 2018. Practice Labs stood apart from its competitors because of its integrations with Canvas and other learning management systems. LTI integration allows for seamless communication between systems and gives students access to all of the tools they need in one place with a single sign-on. In addition, it substantially saves time for faculty in managing their classes and grading students work.

Team members appreciated the structure of the process and the speed with which it enabled them to make decisions, particularly when it came to evaluating vendors and making a final selection. Mike Rose, Chief Technology Officer for the Ventura Community College District, said the vendor selection process helped solidify the plan put in place during the planning sessions.

"It was one of the times we felt like we made the most movement and really helped us get our arms around what we were going to do," he said.

Outcomes

Early results from the virtual labs proof of concept are positive. The pilot project will continue throughout the coming academic year. If this proof of concept is successful, the virtual lab service can be expanded to include other sectors and K-12 schools.

Throughout the testing and early implementation process, Practice Labs has proven to be much more than a service provider. The company has existing relationships with CompTIA, Microsoft, Cisco, and VMWare and allows students to earn certifications alongside their classroom instruction.

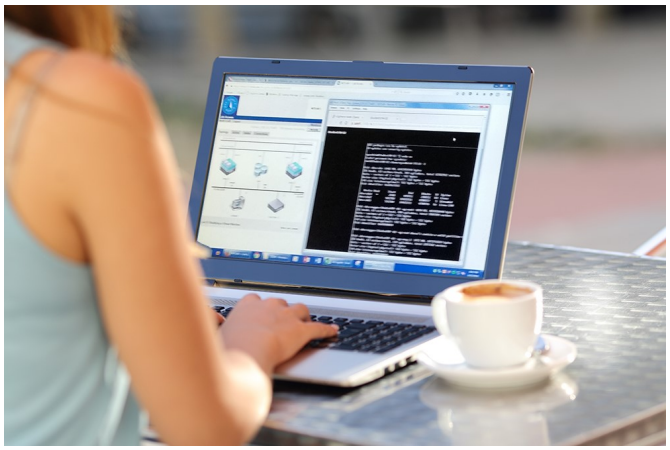

Figure 2 Community College IT student accessing a class lab from a coffee shop.

The organization has provided excellent support to faculty throughout the proof of concept phase. Like any new software implementation, things did not go perfectly during testing, but the project team felt that Practice Labs proved to be a business partner and not just a vendor. Their virtual labs solution aligns with creating virtual Labs as a Service (LaaS) and any challenges we have encountered thus far, are being addressed without additional cost.

Although the project is still in its initial phases, the team can already see the potential for breaking down the barriers that divide colleges with resources from those without. Virtual labs will put everyone on the same playing field. The project also shows the power that can be realized when community colleges work together to solve challenges that are greater than the sum of their parts.

Ed Garcia, an IT faculty member at Moorpark College, began using virtual labs in his courses this summer and has already been able to increase his class capacity from 25 students to 40 without adding any additional lab space, hardware and work to his already full plate. He estimates that his workload will be reduced by half, which will allow him more time to focus on training adjunct instructors and developing the curriculum for a new associate degree in cybersecurity.

“I really believe this is a new digital divide because the training is at a whole new level of sophistication and student confidence and experience will be off the charts,” Garcia said.

Utilizing a virtual lab service has the potential to bring equality of access to community colleges across the region. Smaller colleges and those in economically-disadvantaged areas can offer their students first-rate opportunities without incurring any additional overhead. Since access to labs is browser-based and requires relatively low-cost computers, colleges may also be able to shift funds from maintaining physical computer labs into purchasing inexpensive laptops, tablets,

or other devices that students can use to complete virtual labs — something that will benefit students who are not able to purchase these devices on their own.

Mark Peterschick, an IT instructor at Allan Hancock College, said virtual labs provide a critical missing piece necessary for students to complete A+ certification. Students can work at their own pace and gain the skills necessary to complement what they learn in the classroom and ultimately become workplace-ready technicians.

As ironic as it might seem, virtual labs may provide more real-world experience than physical labs due to the changing nature of IT work. Hodge has seen this transformation first hand over the course of her career.

“It requires significant overhead and capital expense to provide entry level training so that someone knows what a router looks like,” Hodge said. “But when you go into the real world, most likely an individual won’t see what a router looks like; they’ll manage it virtually.”

Next Steps

The proof of concept in the South Central Coast Region will continue through the end of the 2018-19 academic year. If successful, the project team will begin the RFP process for a long-term production contract for all eight of the region’s colleges.

One of the barriers to getting there is convincing faculty at those colleges that this change, while it will require extra work from them up front, will lead to the best outcome for their students. Jim Bowen, an IT faculty member at Antelope Valley College and member of project team, can appreciate this hesitation but thinks the benefit to students in terms of convenience and flexibility is well worth it.

“They might be frustrated if it doesn’t work perfectly the first time or embarrassed if they have to learn something new,” Bowen said. “When things get tight, people don’t drive to community colleges and our enrollment declines. With tools like this, students can do their classes and labs from home, from Starbucks, or wherever they are.”

Hodge would like to make virtual labs available to high school students to further expand the pathway toward IT and cybersecurity careers. Placing labs in the cloud removes the burden of hosting them from resource-strapped schools and provides access to students who might not have been able to engage with them otherwise. This is important for ensuring that underserved communities have access to the tools necessary to fill the IT job openings throughout California.

Beyond high school students, Hodge sees virtual labs as a tool to help anyone who is looking to sharpen their IT skills in a convenient and accessible way. If successful in IT labs, virtualization technology can be used for everything from Quickbooks labs for business students to anatomy labs for nursing students.

“One of my roles as a deputy sector navigator is to bring in the tools that the faculty need as they educate someone on new technical skills and competencies,” Hodge said. “I am in awe of the faculty and want to provide all of the tools they need to serve students, employees, and employers.”

Additional Information

For more information on the virtual labs project, contact:
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About South Central Coast Regional Consortium

There are eight-member South Central Coast Regional colleges whose service areas encompass the south central coast of California including all of Ventura County, north through Santa Barbara County, to San Luis Obispo, east to the northern end of Los Angeles County in Santa Clarita and onward into the Antelope Valley, over 9,000 total square miles. Home to over 2.2M people, this region is characterized by small and mid-sized metropolitan communities and expansive rural areas.

Member Colleges & CEOs

Allan Hancoock College, Santa Maria
(Kevin G. Walthers, Ph.D.)
Antelope Valley College, Lancaster
(Edward Knudson)
Cuesta College, San Luis Obispo
(Jill Stearns, Ph.D.)
Santa Barbara City College, Santa Barbara
(Dr. Anthony E. Beebe)
College of the Canyons, Santa Clarita
(Dr. Dianne G. Van Hook)
Moorpark College, Moorpark
(Luis P. Sanchez, JD, LLM)
Oxnard College, Oxnard
(Cynthia E. Azari, Ed.D.)
Ventura College, Ventura
(Dr. Damon Bell, Interim President)

About Doing What Matters for Jobs and the Economy – Strong Workforce Program

Doing What MATTERS for jobs and the economy is a four-pronged framework to respond to the call of our nation, state, and regions to close the skills gap. The four prongs are: Give Priority for Jobs and the Economy » Make Room for Jobs and the Economy » Promote Student Success » Innovate for Jobs and the Economy. The goals of Doing What Matters for Jobs and the Economy are to supply in-demand skills for employers, create relevant career pathways and stackable credentials, promote student success, and get Californians into open jobs.

About The Digital Transformation Hub (Cal Poly San Luis Obispo)

The Cal Poly Digital Transformation Hub provides students with experiential learning opportunities in the public sector. Cal Poly has a respected history and passion for the Learn by Doing approach to education. Amazon Web Services (AWS) is a leading provider of scalable cloud computing services. As the world's first university-based innovation program powered by AWS, the Cal Poly DxHub is dedicated to connecting public sector organizations with engaged students and world-class technology expertise.

About SynED

SynED is a non-profit organization dedicated to promoting educational excellence by providing higher education professional services to facilitate the development of new models of curriculum, industry alliance, service, and delivery. SynED seeks to facilitate collaboration and communication to find common ground in an increasingly complex and diverse educational ecosystem.

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