Work-focused Experiential Learning to Increase STEM Student Retention and Graduation at Two-year Hispanic-serving Institutions

Cynthia Kay Pickering, Arizona State University

Cynthia Pickering is a retired electrical engineer with 35 years industry experience and technical leadership in software development, artificial intelligence, information technology architecture/engineering, and collaboration systems research.

In September 2015, she joined Science Foundation Arizona (SFAz) to lead the Girls in STEM initiative and translate her passion for STEM into opportunities that will attract, inspire and retain more girls in STEM to make it the new norm. She has also architected SFAz's enhanced Community College STEM Pathways Guide that has received the national STEMx seal of approval for STEM tools. She integrated the STEM Pathways Guide with the KickStarter processes for improving competitive proposal writing of Community College Hispanic Serving Institutions.

Throughout her career, Ms. Pickering has written robotics software, diagnostic expert systems for space station, manufacturing equipment models, and architected complex IT systems for global collaboration that included engagement analytics. She holds a US Patent # 7904323, Multi-Team Immersive Integrated Collaboration Workspace awarded 3/8/2011. She also has twenty-five peer-reviewed publications.

She has recently begun the Human Social Dimensions PhD program in Arizona State University's School for the Future of Innovation and Technology in Society (Fall 2020).

Caroline VanIngen-Dunn, Arizona State University

Caroline VanIngen-Dunn is Director of the Science Foundation Arizona Center for STEM at Arizona State University, providing services for Maximizing the Educational and Economic Impact of STEM. VanIngen-Dunn is the inspiration behind the programs and resources designed to assist community colleges, particularly rural and Hispanic Serving Institutions (HSIs), through a rigorous process leading to improvements in their capacity building, infrastructure, and proposal development efforts that support students in their STEM education and career pathways pursuits.

VanIngen-Dunn as built her career on years of experience as engineer and project manager in human crashworthiness and safety design, development and testing, working for contractors in commuter rail, aerospace and defense industries.

VanIngen-Dunn has an MS degree in Mechanical Engineering from Stanford University and a BSE degree in Biomedical Engineering from the University of Iowa. She serves on the University of Iowa's College of Engineering Advisory Board, and the YWCA Metropolitan Phoenix Board of Directors.

Miss Maria A. Reyes, Phoenix College

With over 25 years of higher education experience, Maria Reyes has devoted her time to strengthening the efforts of recruiting and retaining underrepresented populations in the STEM disciplines. This first began at Arizona State University's Ira A. Fulton Schools of Engineering where she garnered many grants supporting minority engineering students. For almost 20 years and counting, she continues serving Maricopa Community Colleges, beginning at Estrella Mountain Community College, Chandler-Gilbert Community College, and currently as the Dean of Industry and Public Service for Phoenix College in the central core of the metro area.

In April 2020, Ms. Reyes was awarded a National Science Foundation (NSF) Grant from the Division of Undergraduate Education (DUE) for $2.4 million. Ms. Reyes is the Principal Investigator (PI) for the five-year project entitled: Work-focused Experiential Learning to Increase STEM Student Retention and Graduation at Two-year Hispanic-serving Institutions. She has also developed and worked with grants from the National Aeronautics and Space Administration (NASA), the US Department of Education, and the US Department of Labor with an estimated grant impact total of $13.5 million.

She has designed leadership and outreach programs for women of color in STEM and has mentored countless women throughout her career at one point serving as the Chairwoman for Hispanic Women's Conference in 2009 and 2010. Her most proud career distinction is the establishment of the Hermanas: Diseña Tu Futuro Conferences for middle and high school students, which aims to increase the number of Latinas in engineering. For over 15 years, "Hermanas" has served more than 6000 young women across the county. In 2019, she was inducted into the President's Circle of Distinction by the Association for Career and Technical Education of Arizona and honored by the Greater Phoenix Chamber ATHENA Awards as a Nominee for the 32nd Annual ATHENA Awards.

Ms. Reyes is a civil engineer, earning a BSE and MSE in Civil Engineering from ASU and served as a consulting engineer on several freeway projects statewide. She was awarded a Masters in Public Administration from Harvard University's Kennedy School of Government as a result of her passion for public policy and technical background. Ms. Reyes is the author and contributing writer of more than 20 academic publications with an emphasis on the social and cultural pedagogies of minorities in STEM environments.

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Abstract

With support from the National Science Foundation's Division of Undergraduate Education, this five-year project led by a two-year Hispanic Serving Institution (HSI) seeks to provide underrepresented students with mentored work experiences in computer information systems. Students will have access to paid on-campus work experiences and internships in businesses and industries. It is anticipated that some examples of potential student projects include mobile application development, cybersecurity, and computer support. It is expected that these experiences will increase undergraduate student interest, persistence, and success in computer information systems, as well as in STEM more broadly. To ensure that they are well-prepared for and gain the most from their work experiences, students will receive training on employability skills such as communication, teamwork, and project management. In addition, during their work experiences, students will be mentored by faculty, industry professionals, and peers. To strengthen the capacity of faculty to serve all students, including Hispanic students, the project will provide faculty with professional development focused on an equity mindset. This framework to provide mentored work experiences will be developed and piloted at Phoenix College, in the computer information technology department and eventually expanded to other STEM fields at the institution. Following this, the project also intends to expand this framework to four other two-year HSIs in the region. Through this work, the project aims to develop a replicable model for how two-year institutions can develop work experiences that foster increased student graduation and entry into STEM career pathways. This project, which is currently in its first year, seeks to examine how a curriculum that integrates cross-sector partnerships to provide work experiences can enhance STEM learning and retention. Using mixed methods and grounded theory, the project will expand knowledge about: (1) the impact of cross-sector partnerships that support work-focused experiential teaching and learning; (2) systematic ways to maintain and better use cross-sector partnerships; and (3) the degree to which a model of work-focused learning experiences can be adopted at other two-year HSIs and by other STEM fields. Baseline data about Hispanic serving identity at the pilot institution has been collected and assessed at the institutional, departmental, and for different educator roles including faculty, support staff, and administrative leaders to produce inputs towards developing a detailed plan of action. Early results from baseline data, visualizations, planning responses, and initial project activities for student work experiences and faculty professional development will be reported in the submission. The impact of Covid-19 to Year 1 activities will also be discussed. Expected long term results of the project include: development of sustainable mechanisms to foster cross-sector partnerships; increased student retention and workforce readiness; and measurable successes for STEM students, particularly Hispanic students, at two-year HSIs.

Background

This Track 1 Building Capacity project aligns to Priority Area 2 of the NSF HSI program: Innovative Cross-Sector Partnerships. Partners include: Phoenix College (PC), Maria Reyes; Science Foundation Center for STEM at Arizona State University (SFAz/ASU), Caroline VanIngen-Dunn; and *Excelencia* in Education (Excelencia), Deborah Santiago. PC, a 2-year HSI, will lead the overall effort. The partners will facilitate the adoption of the STEM Evidence-based Student Serving (STEM-ESS) framework (see Figure 1 and Table 2) at five 2-year HSIs. The STEM-ESS integrates the SFAz/ASU's KickStarter (KS) STEM framework and processes [1] [2] [3] [4]with Excelencia's data, practices and leadership metrics [5], the exemplars found by Gomez in 4-yr HSIs with equitable outcomes for Hispanic students in STEM [6], and the National Academy of Science and Medicine's Indicators for Monitoring Undergraduate STEM Education[7]. SFAZ/ASU-intensive coaching on use of STEM-ESS helps HSIs incrementally progress to a Hispanic serving identity and build capacity that enables success of underrepresented students in STEM. Annual refresh of the STEM-ESS processes will establish data-driven STEM planning and decision-making that spreads across multiple levels of the institution. PC will pilot the STEM-ESS in their computer information technology (CIT) department, curricula, and degree programs, a priority that was identified during their participation in the SFAz/ASU KS program. The PC CIT initiative will include a mixed model of paid on-campus work-like experiences and industry internships to implement work-focused experiential learning into credit-bearing electives. The CIT work experiences effort will be captured as an evidence-based practice for potential reuse by other HSIs. During years three through five, the STEM-ESS framework and evidence-based practices will be rolled out to four 2-year HSIs that include two urban and two rural community colleges. At least one of these four HSIs will have benefited from prior technical assistance through participation in KS. As the four HSIs use the STEM-ESS to improve their CIT programs, they will seek to adapt the work-focused evidence based practices developed by PC. Throughout the project, PC will mentor other 2-year HSIs and SFAz/ASU will facilitate STEM-ESS use.

Goals and Objectives

The project goals and underlying objectives are shown in Table 1.

Table 1: Goals 1-4 and underlying objectives align to Research Questions 1-4 and Hypotheses 1-4			
Goal 1 Establish mechanisms through STEM-ESS that continually identify and foster cross-sector partnerships	**Goal 2** Engage Phoenix College students in CIT/STEM work-focused learning experiences to increase retention and better prepare them to enter the workforce.	**Goal 3** Apply STEM-ESS in other PC STEM departments to increase intentionality to implement and advance evidence-based practices in STEM pro-grams towards achieving measurable successes for Latinx STEM students.	**Goal 4** Increase the number of 2-yr HSIs that demonstrate intentionality to implement and advance evidence-based practices in CIT/STEM programs towards achieving measurable successes for Latinx STEM students.

Obj 1.1 Use STEM-ESS to effectively engage with industry partners who participate in and contribute to the experiential learning environment, aligning the development of students' skills to industry workforce needs. **Obj 1.2** Establish strategies for enlisting industry partnerships that become self-sustaining **Obj 1.3** Use STEM-ESS to strengthen relationships among academic pipeline partners towards achieving curriculum alignment and transfer pathways that align to STEM workforce needs.	**Obj 2.1** Provide work-focused experiential learning via industry internships and on-campus, work-like experiences enabling students to learn and practice critical workforce skills. **Obj 2.2** Demonstrate upward trends in CIT/STEM student self-efficacy, enrollment, retention, completion, and transfer (SERCT). **Obj 2.3** Establish Leadership strategies committed to accelerating Latinx student success in CIT. **Obj 2.4** Capture evidence-based practices in CIT/STEM at PC to enable other depts & 2-yr HSIs to adapt these practices.	**Obj 3.1** Propagate intentional Latinx-student-serving practices across STEM at PC (Physical Sciences, Life Sciences, and Social Sciences) **Obj 3.2** Demonstrate upward trends in STEM student self-efficacy, enrollment, retention, completion, and transfer. **Obj 3.3** Establish Leadership strategies committed to accelerating Latinx student success in STEM	**Obj 4.1** Deploy CIT-oriented STEM-ESS at four additional 2-yr HSIs (2 within the lead institution's system of ten colleges and 2 Rural colleges). **Obj 4.2** Demonstrate upward trends in CIT/STEM student self-efficacy, enrollment, retention, completion, and transfer. **Obj 4.3** Establish Leadership strategies committed to accelerating Latinx student success in CIT

Research Design/Program Description

STEM-ESS provides the means to intentionally develop institution-wide STEM plans and projects while also methodically measuring with data, the emergence of practices and leadership strategies that enable STEM student success. STEM student success will be characterized by positive trends in student enrollment, retention, degree-completion, and transfer at the institutional level, and formative results reported in STEM initiatives to address gaps identified during the STEM-ESS Assessment and Planning. The proposed project applies evidenced based practices, cross-sector partnerships and experiential learning to STEM programs in 2yr HSIs which fills an important gap in the current research on underrepresented (UR) STEM students in higher education.

New knowledge will be generated by studying: 1) how cross-sector partnerships that support work-focused experiential teaching and learning for underrepresented students at 2-yr HSIs contribute to STEM student success and workforce development, 2) systematic ways to maintain and better use cross-sector partnerships, 3) the degree to which STEM-ESS advances adoption of evidence-based student-serving practices in other STEM departments within a 2-yr HSI and 4) benefits of adapting evidence-based student-serving practices in CIT departments at other 2-yr HSIs. Moreover, the project closes/fills a gap in current research on higher education by studying how capacity building and development at 2yr HSIs might affect student

success for UR STEM students. Specifically, SFAz/ASU guided use of STEM-ESS at 2yr HSIs provides the means to intentionally develop institution-wide STEM plans and projects while also methodically measuring with data, the emergence of practices and leadership strategies that enable STEM student success (e.g. increased STEM enrollment, retention, degree completion, and transfers). Table 2 contains the research questions and hypotheses that will be tested by the project. Each research question and hypothesis pair aligns to the goals and objectives in Table 1.

Table 2: Research Questions and Hypotheses	
Research Questions	**Hypotheses**
RQ1. How does the systematic use of STEM-ESS aid in maintaining cross-sector partnerships in CIT/ STEM that contribute to underrepresented student success?	**H1.** STEM-ESS will iteratively foster cross-sector partnerships that better serve UR students.
RQ2. How do cross-sector partnerships that support work-focused experiential teaching and learning for UR students at Phoenix College (PC) contribute to future local STEM workforce development and student success?	**H2.** Work-focused experiential education strategies, augmented with cross-sector partnerships that involve industry and academia will increase UR student engagement/success in CIT/STEM and contribute to future STEM workforce development.
RQ3. To what extent does the use of STEM-ESS at PC lead to organizational cultural shifts that propagate evidence-based student serving practices in other STEM departments at PC?	**H3.** STEM-ESS will enable other departments at the 2-yr HSI to integrate cross-sector partnerships into their STEM programs that will better serve UR students.
RQ4. To what extent do evidence-based practices for CIT at PC become adaptable by other 2yr-HSIs as they use STEM-ESS to improve their CIT programs and what organizational culture shifts will occur?	**H4.** As other 2-yr HSIs use STEM-ESS to improve their CIT programs, they and their students will benefit from PC's learnings in CIT by adapting PC's evidence-based student-serving practices.

The project will use mixed methods and grounded theory to investigate the research questions and test the hypotheses. Figure 1 shows the design to investigate the research questions and test the hypotheses and Table 3 details the quantitative and qualitative data that will be collected from each of the major groups (e.g. institutional and individual STEM team members).
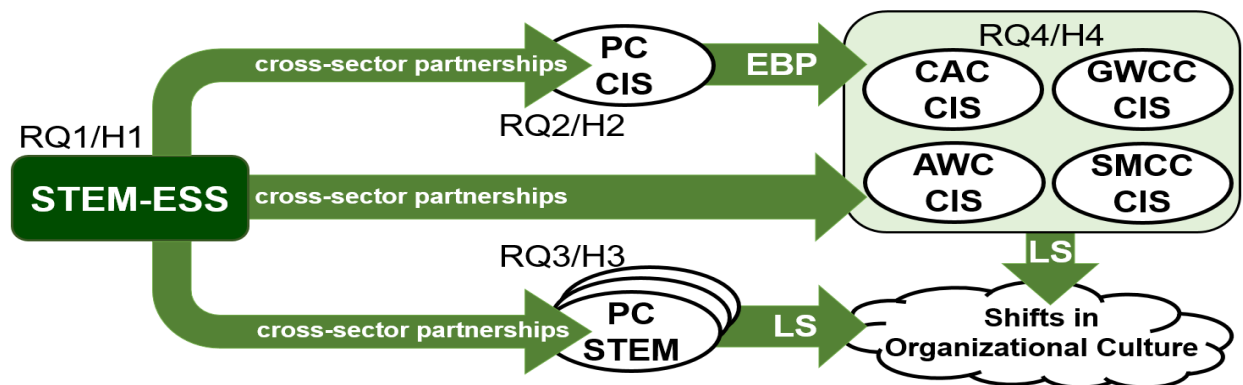

Figure 1: Research Design used to test Hypotheses and investigate the Research Questions

To investigate Research Question 1 and test Hypothesis 1(RQ1/H1) (Figure 1), SFAz/ASU and Excelencia will work with Phoenix College (PC) to update their KS STEM Assessment and STEM Plan, using STEM-ESS to focus on cross-sector partnerships that contribute to UR STEM students' success. Considerations include developing partnerships with industry and along the K-20 academic pipeline to not only align curriculum with industry needs but to also enable diversity in the future workforce. This requires understanding the current state, establishing common goals and devising leadership strategies (LS) to recruit, retain, and graduate more underrepresented students, using evidence-based practices (EBP).

To investigate and test RQ2/H2, PC will pilot a mixed model of 80-hour on-campus work-like experiences for CIT/IT and grant subsidized internships to implement work-focused experiential learning. RQ3/H3 will be investigated and tested as other STEM departments at Phoenix College use STEM-ESS to integrate cross-sector partnerships into their programs and to "sense" shifts in organizational culture towards Latinx-serving [3] that are enabled by leadership strategies (LS) established through STEM-ESS.

To investigate and test RQ4/H4, PC will disseminate the CIT evidence-based practices (EBP) to its sister institutions Gateway Community College (GWCC) and South Mountain Community College (SMCC), and rural institutions Central Arizona College (CAC) and Arizona Western College (AWC). The shifts in organizational culture will inform RQ4/H4.

Table 3 shows the level (individual//team/organizational) and type of data (quantitative and qualitative) that will be collected from different sources (institutional research groups, STEM Teams that include faculty, administrators, students, and cross-sector partners at participating HSIs). Baseline data (e.g. STEM student data trends for Enrollment, Retention, Completion and Transfer and STEM Faculty demographics) will be collected from institutional research groups at the beginning of the first year of participation and data will be refreshed annually (RQ1-4). STEM Teams will rate their perceptions of cross-sector partners' contributions to curricular alignment, work-focused experiential learning, evidence-based practices, STEM student support, and leadership strategies using a 5-point Likert scale (RQ2-4).

Focus groups, semi-structured interviews, attitudinal surveys, and examination of STEM Team artifacts produced as they navigate the STEM-ESS will also be used to collect other qualitative data about STEM-ESS capacity building (RQ2-4). The education researcher will triangulate the data to investigate and test the research questions and hypotheses focusing specifically on student success outcomes (e.g. retention, completion, transfer). To study impacts of students' internship and on-campus work experience to student success, the education researcher will triangulate data from interviews, surveys, content analysis of classroom syllabi, student learning outcomes or other important artifacts, seeking to identify how shifts in the HSIs' organizational cultures that focus on student empowerment rather than student deficit are passed to the classroom and students.

Table 3: Research Data collected with STEM-ESS during baseline and annual refresh	
STEM-ESS Institutional Data Trends (Quantitative Data Collected From Institutional Research Groups)	
Student Data	Enrollment, retention, completion, and transfer (disaggregated by major, ethnicity, first in family, Pell, FTE vs. part-time)
Faculty Data	Demographics, rank, length of term, adjunct/tenure, teaching, research, and service loads
STEM-ESS Self Assessment by Institution's STEM Team Members (Qualitative and Quantitative Data)	
Cross-Sector Partnerships (E.g., industry and K20) contributions to:	
STEM Curricular Alignment	Industry inputs to curriculum and alignment across K12, 2-year, and 4-year. to transfer credits and prepare students to meet workforce needs
STEM Learning Innov.	Experiential Learning, Undergraduate Research Experiences, Culturally Relevant Pedagogy
Evidence-based Practices	On-campus work experiences, Externships, Faculty professional development (Equity, Inclusivity, Cultural Relevance, Industry Engagement, 21st Century Workplace Skills)
STEM Student Support	Industry, Faculty, and Peer mentoring; Tutoring, Financial Aid, Advising and Career Centers
Leadership Strategies that map to HSI Exemplars in STEM	
Faculty/Individual	● Equity/anti-deficit mindset ● Change agents ● Receptive to learning and improving ● Belief that the success of their students is the success of the institution
Departmental/Team and Organizational	● Promoting a "high-touch' culture across departments ● Hiring diverse faculty who care about teaching ● Hiring faculty who have experience working with underrepresented students ● Creating a master teacher category for promotion and tenure

Results/Evaluation

The project activities as proposed in Year 1 are shown below.

Year 1: April 2020-March 2021
● PC: STEM Team and CIT STEM-ESS baseline ● PC: CIT Faculty Professional Development (PD) ● PC: 8 CIT Externships ● PC: CIT Industry Advisory Board (IAB) Annual Meeting

In Year 1, PC assembled a diverse STEM Team of 10-12 members, including STEM faculty, CIT/IT faculty, Deans and Department Chairs, Strategic Planning/ Institutional Research, Career and Technical Education, Student Support Staff, Financial Aid, Facilities, IT Services, and STEM students. The STEM Team members provided individual inputs to the STEM-ESS assessment of PC's evidence-based practices, student support, learning innovations, cultural

relevance, industry partnerships, and curricular alignment for CIT. The individual data were aggregated, along with institutional data trends for CIT/STEM students and faculty to produce a green/yellow/red color-coded grid that depicts strengths and gaps, establishing a baseline which will be refreshed in Years 3 and 5.

The SERVING Latinos Characteristics diagram in Figure 2 shows how Phoenix College exhibits the characteristics associated with SERVING Latinos as defined by Excelencia in Education and based on aggregated ratings of capabilities from the STEM-ESS Assessment that pertain to each characteristic.

SCALE: 0 = NONE, 1 = MINIMAL, 2 = ADEQUATE, 3 = COMPREHENSIVE

0	1	2	3
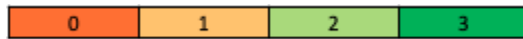
Not in isolation: *Serve Latinos not to exclusion of others, but ensure Latinos are included.*	1.7
Beyond Enrollment: *Also focus on retention, transfer, affordability, faculty/staff representation, and completion of Latinos.*	1.6
Aligning Data Practice and Leadership: *Link strategies to intentionally leverage strengths and address the needs of Latinos.*	1.6
Culturally Responsive campus climate: *Create intentional learning environments where Latinos thrive.*	1.8
Strong Support System: *Know who they serve and target services that reinforce academic and social needs for Latinos.*	1.7
Explicit link to workforce needs and opportunities: *Recognize Latinos pursue college for good jobs/well-being and implement practices to prepare for and link to workforce opportunities.*	1.4
Engage in strong national and local Latino STEM student success communication efforts: *E.g., storytelling/ promotion, leadership advocacy, refinement of strategy/updates*	1.7

Figure 2: SERVING Latinos Characteristics

The above data tells us that Phoenix College has good traction in a culturally responsive campus climate, strong support system, serving Latinos but not to the exclusion of other students, and strong national and local communication. The lowest areas are the explicit link to workforce and aligning data, practice, and leadership to intentionally leverage strengths and address the needs of Latino's. The funding from NSF for the project, Work-focused Experiential Learning to Increase STEM Student Retention and Graduation at Two-year Hispanic-serving Institutions, should lead

to improvements in these two areas.

A group discussion was facilitated among the Team members, about their observations and conclusions from the data. The Strengths, Weaknesses, Opportunities and Threats (SWOT) Diagram in Table 4 provides an alternative interpretation of the STEM-ESS Assessment.

Table 4: SWOT Diagram	
Strengths: Already Have	**Opportunities: Could do in the future**
1. Expanding faculty - hiring 2. Facilities - New labs 3. Leadership support (from administration-president, VPs, Dean, etc.) 4. Relationship with Academic Advising 5. Flexible program offerings, online, dual enrollment, 8 weeks or 16 weeks long 6. 11 programs with 28 certificates and 6 degrees 7. 17 Industry Recognized Certifications 8. Digital Divide Project	1. Leadership support for Latinx student specific efforts 2. Equity minded approaches 3. Faculty support to have more externships 4. Continued CIT outreach to K-12 5. Off campus student computer loans. 6. Buses that sit in neighborhoods to provide wifi access. 7. Leverage existing industry partnerships throughout the district to engage them in the areas we want to develop. 8. Soft skills for students wanting to get into the workforce. 9. Professional Development (workforce skills and equity and inclusion practices) 10. Use Listening Session and IAB roundtables to expand industry partnerships
Weaknesses: Areas for Improvement	**Threats: What your competitors do better or external factors that impact student success**
1. Links to industry (including various levels of mentorship and WBEs) 2. Equity minded practices that support hiring, teaching, internships and externships 3. Lack of dual language marketing, or instructional materials, advising 4. Connections to Career Services 5. Possibly: lack of institutional capacity for supporting activities, services. E.g. infrastructure. 6. End to end Latino student experience from selecting field of interest, continuing throughout the CIT pipeline and on to career, including wrap around student supports AND industry agrees that it meets their needs.	1. Other colleges move faster providing new classes/programs 2. Growing competition from private sector IT training 3. Other colleges offer classes that we do not offer (we lose students).

Next, the team developed a detailed plan that focused on goals, objectives and activities to foster cross-sector (industry and academic) partnerships, develop faculty professionally and introduce work-focused experiential learning innovations into the CIT program.

Two faculty PD activities were completed by three Computer Information Technology (CIT) faculty and the department chair. The first offering focused on active recruiting strategies, the importance of diversity in computing, stereotype threat, and inclusive pedagogy. Hands on activities to apply in the classroom for a more inclusive course were also provided. The format for the training included 2-hour self-paced pre-recorded modules with assignments and tests, and two virtual meetings for group discussion. During an interview with the evaluation and research team, faculty each highlighted personalized learnings and things they planned to apply in their classrooms to make them more inclusive. The department chair created three top strategies for departmental implementation including adjunct faculty. In terms of implementing what they learned within CIT courses, the team discussed either CIS 105 and/or CIS 126 as possible courses, because they are widely taught introductory courses that could have high impact.

The second PD offering included two PC CIT faculty and two support staff who provide academic counseling and career guidance for students. The forum was sponsored by the Center for the Future of Arizona and ElevateEdAZ, with daily 1.5 hour webinars over a week. During the daily webinars, industry representatives provided an overview of their companies and discussed job opportunities for interns and future employees and the skills needed by their business. Post session interviews with PC participants by the evaluation and research team revealed that the forum provided good contacts and a starting point from which to form relationships with different companies and an understanding of the job market in the sector. Many of the sectors outside of CIT also had IT departments that could hire qualified CIT interns. Some of the companies talked about the importance of employees "putting a good face forward for the company when interacting with customers, and that verbal and written communication, and teamwork were important skills that complement technical skills. Companies at the event included Google, Intel, Infosys, Walmart, Sprint, Bank of America, H&R Block, Compuvision, Hulu, Home Depot, Compuvision, and Best Buy. Faculty expressed interest in attending such a forum again and stated that everyone should have this PD opportunity. They also thought that students would have benefited from attending the sessions and would benefit from listening to the recordings, which are available on the ElevateEdAZ YouTube channel.

Hiring a dedicated work experience coordinator (WEC) to coordinate between faculty, industry, and students was significantly delayed due to Covid-19. Despite this delay, the processes for coordination of the work focused experiences were defined and used to pilot implementation of two internships. The initial internship experiences will be virtual rather than situated on location with the employer.

A decision was made to run a Tri-College Computer Information Systems/Information Technology industry advisory council jointly with South Mountain Community College (SMCC) and Gateway Community College (GWCC) moving forward. Each college provided industry representatives to a consolidated member list. The initial meeting was held March 30, 2021. To further engage industry, Phoenix College hosted the March 4, 2021 Future of Work Summit that included a track for the Information Technology(IT) / Cybersecurity industry segment along with three other segments. As prework, participants were asked to review highlights for the

Segment(s) that they plan to engage with during the event. Panels for the different Segments were held in breakout groups. The segment panels were moderated by Chamber Executives, hosted by College Presidents and included faculty, students and industry representatives. Other industry engagements included IT Roundtable Events hosted by the Greater Phoenix Chamber of Commerce and leveraging the Maricopa Community Colleges Foundation Board of Directors to help connect the PC IT Institute to other IT stakeholders.

Conclusion(s)

Despite Covid-19 setbacks the team has made significant progress towards its year 1 goals and laid a strong foundation for the next four years.

Future Plans

Year 2: April 2021 - March 2022
● PC: STEM-ESS baseline other STEM Departments Life Sciences, Physical Sciences, Social Sciences ● PC: CIT course data from year 1 ● PC: CIT/STEM Faculty Professional Development (PD) (Equity, anti-deficit mindset, inclusivity) ● PC: 8 CIT Internships and 20 students participate in On-campus Work Experiences (WE) ● PC: CIT Evidence-based Practices (EBPs) captured for sharing with CIT Faculty at other HSIs ● PC: CIT Leadership Strategies (LS): Planning, Hiring, Guidance for IABs and Mentoring of Faculty at HSIs
Year 3: April 2022 - March 2023
● 4 HSIs: STEM Teams, CIT STEM-ESS baseline, CIT Faculty PD to learn PC EBPs for CIT/IT ● SMCC, GWCC, CAC, AWC: 26 CIT Externships, 10 students participate in On-campus WE ● PC: Annual IAB Meeting - include SMCC and GWCC IAB members ● CAC and AWC: IABs up and running with Annual IAB Meetings ● PC: 8 CIT Internships and 10 students participate in On-campus WE; Begin Transitioning to Sustaining Mode ● PC: STEM-ESS data refresh for CIT, other STEM Depts ● PC: Guidelines for Institutional Change to advance Latinx STEM student success
Year 4:April 2023-March 2024
● All: CIT STEM-ESS data refresh shows upward trends in CIT student student self-efficacy, enrollment, retention, completion, and transfer (SERCT) ● All: 26 CIT Internships and 30 on-campus WE, CIT Faculty PD (Equity, anti-deficit mindset, inclusivity) ● All: Leadership Strategies comparison to HSI Exemplars in STEM ● All: PC to host Annual IAB Meeting - include 4 HSI's and IAB members from other colleges
Year 5: April 2024 - March 2025
● All: CIT STEM-ESS data refresh shows upward trends in CIT student SERCT ● All: 26 CIT Internships and 30 on-campus WE, ● All: Leadership Strategies comparison to HSI Exemplars in STEM ● All: Guidelines for Institutional Change to advance Latinx STEM student success ● All: PC to host Annual IAB Meeting - include 4 HSI's and IAB members from other colleges

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Appendix - Acronyms

Acronym	Meaning
ASU	Arizona State University
AWC	Arizona Western College
CAC	Central Arizona College
CIS	Computer information systems
CIT	Computer information technology
EBP	Evidence-based practice
FTE	Full-time equivalent
GWCC	Gateway Community College
HSI	Hispanic Serving Institution
IAB	Industry Advisory Board
IT	Information Technology
KS	KickStarter
LS	Leadership Strategies
NSF	National Science Foundation
PC	Phoenix College
PD	Professional Development
SERCT	Self-efficacy, enrollment, retention, completion, and transfer
SFAz/ASU	Science Foundation Center for STEM at Arizona State University
SMCC	South Mountain Community College
STEM	Science Technology Engineering and Math
STEM-ESS	Evidence-based Student-serving STEM
WEC	Work Experience Coordinator