

Work-based Experiential Learning in IT: Career Enhancement for Underserved Students at a 2-year HSI

Cynthia Pickering

Cynthia Pickering is a PhD Student, Research Program Manager and Process Architect at the Center for Broadening Participation in STEM at Arizona State University. Cynthia has 35 years of experience working in industry with demonstrated technical leadership in software development, artificial intelligence, information technology architecture / engineering, and collaboration systems research. Cynthia is currently studying Human and Social Dimensions of Science and Technology in the School for the Future of Innovation in Society in ASU's College of Global Futures. She practices Socio-technical Integration Research as an embedded social scientist who collaboratively works with technologists (STEM students, STEM faculty, and Tech Companies) to increase reflexive learning during technology development and implementation to pro-actively consider the impact of technology decisions on local communities and society at large. This work creates spaces and processes to explore technology innovation and its consequences in an open, inclusive and timely way.

Mara Lopez

Katy Pinto

Dr. Pinto is a Professor of Sociology at CSU, Dominguez Hills. She is a proud product of the California State public school system in having attended El Camino College and San Diego State University (B.A in Sociology and Spanish) before completing her Ph.D. in Sociology at UCLA. Her research examines inequalities in Work (e.g., unpaid/paid--the household division of labor, sex work, platform workers), Education (e.g., education research, STEM diversity in computer science Community College students, Latinx Contingent Faculty in STEM), and Faculty Professional Development (grant-seeking behaviors).

Gloria Gonzalez

Marcus Jerome Garcia (Work Based Experience Coordinator)

Caroline Vaningen-dunn (Director)

Work-based Experiential Learning in Computer and Information Technology: Career Enhancement for Underserved Students at a 2-year HSI

Abstract

In the midst of the pandemic, a 2-year Hispanic Serving Institution (HSI) in metropolitan Phoenix launched the Information Technology Institute (ITI), and a five-year National Science Foundation (NSF) sponsored program to provide culturally responsive work-based experiential learning opportunities for adult students balancing multiple jobs and responsibilities. This paper discusses the benefits to students in gaining IT experience alongside industry mentors, how peer mentoring increases engagement, and the challenges of hybrid delivery during the pandemic.

Two types of paid opportunities were designed and are currently in pilot mode to provide real-world IT experience for undergraduate students: 1) externships situated on-campus, under the supervision of faculty and assisted by peer-mentors and industry mentors and 2) internships situated with local companies under the supervision of industry employees. When career preparedness elements were interwoven while learning and practicing new IT skills within hands-on project deliverables, externs reported benefits such as increased confidence in seeking out employment opportunities, preparing for interviews, professional networking, leadership development, and conveying their industry experience in their resumes and on LinkedIn.

Lessons learned to date related to engaging and retaining targeted students include the need to: prioritize student well-being and work/life balance, pay students during the externships or internships, intentionally immerse students within the work-based experiences, provide continual guidance and structuring on projects where students own a specific work deliverable - yet collaborate, incorporate culturally responsive mentoring from peers, faculty, and industry to meet students where they are in terms of technical and professional skills, design flexibility into the work schedule, and accommodate both virtual and in person work sites.

1. Introduction

The primary goal of this 5-year National Science Foundation (NSF) sponsored program is to demonstrate intentionality in providing culturally responsive work-based experiential (WBE) learning opportunities for undergraduate students. Targeted students include adult learners who are part-time or full-time students and hold jobs to support themselves and their family while they are pursuing higher education in a STEM related career. The targeted participants include students of color, women, and those who have exceptional financial need. Participants have declared computing and information technology majors at both urban and rural two-year Hispanic Serving Institutions are the primary participants in paid WBE opportunities for internships and externships with industry partners. This paper describes the second year of the program that conducted WBE pilots at an urban HSI in Phoenix with the aim to transfer high impact evidence-based WBE practices to four additional HSIs in years three through five.

The Latinx community in the United States is in danger of becoming an expansive underclass due to unprecedeted population growth, lower retention and degree completion rates for Latinx in STEM education, and underrepresentation of Latinx in the STEM workforce (Torres & Zerquera, 2012). Five million additional STEM workers are needed to keep the United States competitive in the global economy (Pickering et al., 2019). Accounting for over half of the United States population growth, the Latinx group has the potential to boost the STEM workforce, their economic mobility, and community sustainability options (Torres & Zerquera, 2012)

Experiential learning (e.g. service to the community) is a key component creating equity in STEM at HSIs (Gomez et al., 2018). Gomez summarized: “HSIs achieving equitable STEM outcomes for underrepresented students employed a host of practices proven elsewhere, adopted and adapted for their students.” and “HSIs achieving equitable STEM outcomes for underrepresented students also exhibit a culture/belief/value that the success of their students is the success of the institution which is dependent on strong faculty commitment with leadership support for promoting institutional change.”

The Teaching and Learning group at York University in Canada defines Experiential Education (EE) as “The application of theory to a concrete experience, either within the classroom or within the community, which advances the learning outcomes of a course or program and requires students to reflect upon their learning.” Gage has developed a common language at York University (Gage, 2018) and a toolkit for experiential education and learning in which externships are characterized as a work-focused experiential education strategy. Carleton University has adapted and expanded the York framework and created a mapping to Kolb’s theoretical model of experiential learning. Kolb’s model posits that humans are naturally capable of learning, and that experience plays a critical role in knowledge construction and acquisition. In other words, learning occurs when someone creates knowledge through experiential transformations (A. Y. Kolb et al., 2005; D. A. Kolb, 1984). The work at Carleton further emphasizes the importance and value of experiential education and learning because it: makes learning relatable to students, increases the effectiveness of learning, increases student engagement, assists in memory retention, and leads to the development of skills for lifelong learning (Carleton University, 2022).

The research described in this paper explores the extent to which work-based experiential education strategies, augmented with cross-sector partnerships that involve industry and academia increase underserved student engagement/success in Computer Information Technology (CIT)/ Science, Technology, Engineering, Mathematics (STEM) and contribute to future STEM workforce development. The research is guided by the goal to engage Phoenix College students in CIT/STEM work-focused learning experiences to increase retention and better prepare them to enter the workforce. Four objectives contribute to achieving the goal:

1. Provide work-based experiential learning via industry internships and on-campus, work-like experiences enabling students to learn and practice critical workforce skills.
2. Demonstrate upward trends in CIT/STEM student self-efficacy, enrollment, retention, completion, and transfer (SERCT).
3. Establish Leadership strategies committed to accelerating Latinx student success in CIT.
4. Capture evidence-based practices in CIT/STEM at Phoenix College to enable other departments & 2-year HSIs to adapt these practices.

In the next section, this paper will describe WBE baseline data at Phoenix College. Section 3 will discuss the results of culturally responsive WBE pilots at a 2-year HSI. The paper finishes with overall Lessons Learned in Section 4, the Conclusion in Section 5, and Implications for Future Research in Section 6.

2. Baseline Data

CIT majors are representative of the larger HSI population of Phoenix College. The CIT majors have steadily increased at Phoenix College between 2018-2022, with a total of 496 majors in 2022 (see Table 1). The racial and ethnic distribution of the CIT majors by academic year during 2018 to 2022 shows the large number of students in the major who are Latinx, but the very small number of students in the major who are Black and even fewer numbers who are American Indian/Alaska Native (see Figure 1). In addition, the percentage of Latinx students in the major decreased about three percentage points during the 2020-2021 academic year which was in the middle of the pandemic. At the same time, there have been small and notable increases in the number of Black and American Indian/Alaska Native students in CIT. The majors are overwhelmingly men with women making up less than half of the majors in 2022 (see Figure 2). As a whole CIT majors were largely first generation college students (See Table 2). The students' program of study falls into three areas: a general degree of Computer Science (30.5%), Computer Information Systems, and Cybersecurity (15.5%) (see Table 3). During 2019-2022, 2.1 percent of students had Deferred Action for Childhood Arrivals (DACA) status and 48% were Pell Eligible.

Table 1. Academic Year Term Distribution, CIT majors, Phoenix College, N= 1242

		Frequency	Percent
Academic Year	AY 18-19	106	8.5
	AY 19-20	259	20.9
	AY 20-21	381	30.7
	AY 21-22	496	39.9
	Total	1242	100.0

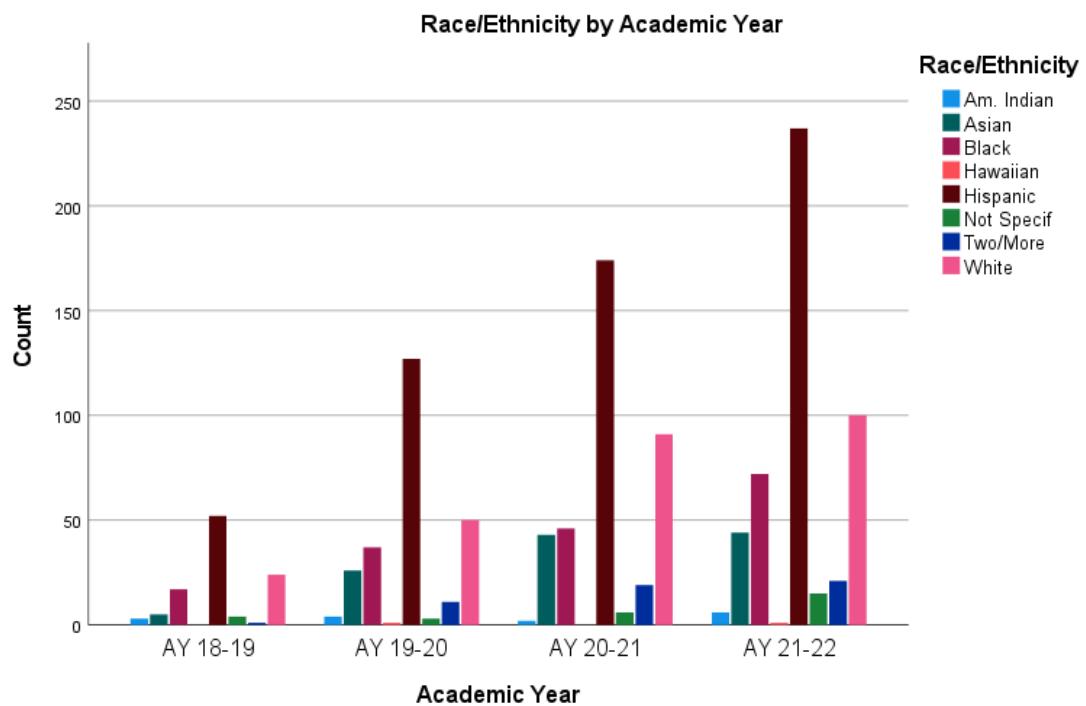


Figure 1. Race and Ethnicity of CIT majors at Phoenix College by Academic Year (2018-2022)

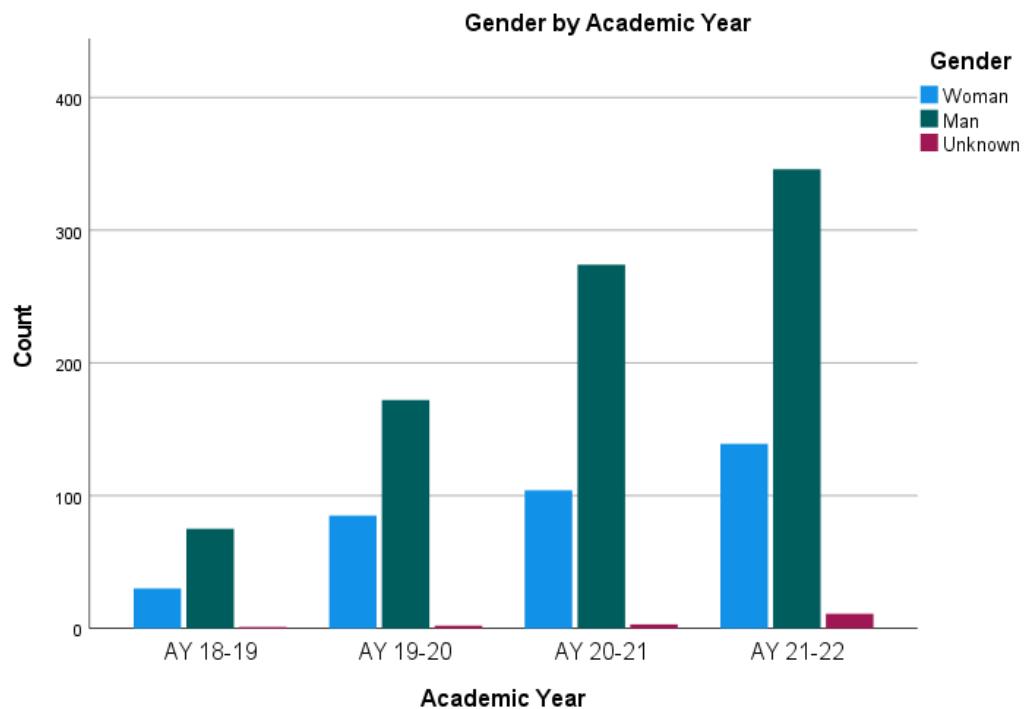


Figure 2. Gender of CIT majors at Phoenix College by Academic Year (2018-2022)

Table 2. Ethnicity by First Gen Status Study Computer Information Technology Majors at Phoenix College, Fall 2018-Spring 2022, (N=1125)

% First Generation			
		No	Yes
Ethnicity	Am. Indian	1.8%	0.5%
	Asian	13.3	8.3
	Black	9.8	12.6
	Hawaiian	0.00	0.3
	Hispanic	30.2	56.2
	Not Specified	4.1	1.3
	Two/More	3.8	4.3
	White	37.0	16.6
		100	100
Total Pop			
1st Gen%	N=1125	27.2%	63.4%

*Unknown first-gen omitted
(N=117)

Table 3. Ethnicity for Computer Information Technology Majors at Phoenix College, Fall 2018-Spring 2022,(N=1242)

	Frequency	Percent
Am. Indian	15	1.2
Asian	118	9.5
Black	172	13.8
Hawaiian	2	0.2
Hispanic	590	47.5
Not Specific	28	2.3
Two/More	52	4.2
White	265	21.3
Total	1242	100

Experiential learning at Phoenix College in general, outside of the CIT department and the NSF program included 2,414 students in 2018/19, and 3,031 students in 2019/20. Many of these WBEs were required clinical experiences or practicums in nursing programs. The CIT department has just begun WBEs for its students in 2021. Opportunities for WBEs are posted on the Pipeline AZ job board, where featured high demand careers are highlighted. Examples of high demand careers include Computer User Support Specialist, Nursing Assistants, Licensed Practical and Licensed Vocational Nurses, Medical Assistants, Paralegals and Legal Assistants,

Medical Records and Information Technicians. Each high demand career has information about salary, currently available and projected jobs through 2024, top expected tasks, and required knowledge, skills, and abilities.

3. Culturally Responsive Work-based Experiential Learning Pilots

Work-based experiences are beneficial to students, industry, and educators. Students gain real-world job experience and establish professional networks, industry and community partners gain access to diverse educated workers who may turn into new hires, and educators gain opportunities to translate theory into practice. Greater benefit comes from culturally responsive work-based experiences that support the achievement of all students by providing effective teaching and learning in a “culturally supported, learner-centered context, whereby the strengths students bring … are identified, nurtured, and utilized to promote student achievement” (Richards et al., 2007). Culturally responsive teaching uses “the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant and effective for them” (Gay, 2013).

To achieve culturally responsive WBEs, intentionality must permeate the end-to-end process including identification of industry and community partners who will offer WBE opportunities, student recruiting, hiring, onboarding, and during the WBE delivery itself. With numerous internal and external players who contribute to each WBE at various stages of the process, a robust effort towards being culturally responsive is achievable through collaboration. Students stand to benefit from the collaborative effort by potentially seeing themselves integrated into each stage through the implementation of culturally responsive practices.

This section will describe the ways in which we embedded culturally responsive practices into the Year 1 and 2 WBE pilots, the challenges, areas for improvement, and the successes and their impacts. Two types of pilots were conducted, externships and internships. Externships are defined as 80-hour paid experiences that are under the supervision of faculty, assisted by peer-mentors and industry mentors, and situated on-campus or using virtual/hybrid delivery via the college’s education technology infrastructure. Internships are defined as 80-hour paid experiences that are under the supervision of industry employees, and situated with local companies. Internships may also be virtual work experiences, via the company’s information technology infrastructure.

3.1 Common Processes

Processes common to both externships and internships include:

1. Identifying Industry and Community Partners
2. Identifying WBE opportunities with Employers
3. Student Recruiting
4. Student Hiring

3.2 CIT Externships

Two cohorts of externships have been conducted at Phoenix College. Our cumulative numbers for completed WBEs are 15 total. The racial and ethnic demographics of the students in the externships followed a similar pattern of the major demographics but show areas for improvement. For example, 27% of students were Hispanic, 20% were White, 27% were Black, and 27% were Asian. In addition, 73% of the students were men and 27% were women. Based on the race and ethnicity of Computer Information Technology Majors at Phoenix College in Table 3, this data suggests that we need to proactively recruit Hispanic Students into our work-based experiences because Hispanic students make up almost half of the students in the major. While we were close to the CIT major population for women in our sample, it is clear that we should also make more proactive efforts to recruit women students as well because they remain a very visible minority in the student groups we are creating.

During the first externship, a cohort of four CIT students applied digital divide technology in low-income urban neighborhoods where residents face inequities in access to education, broadband, and computing resources. The externship engaged STEM undergraduate externs who were students of color as contributors to the digital divide solutions for the neighboring community.

In the summer and fall of 2021, the four externs worked with the Phoenix College Chief Information Officer during an 80-hour paid externship program to learn about the technology and gain first-hand experience with it. The four externs were a diverse group of two women and two men in their early twenties, one self-identified as Latinx/Hispanic, two self-identified as Black/African American, and one self-identified as Asian.¹. All externs had jobs in non-information technology fields. Two were part-time workers and two were full time workers with family responsibilities. All were taking CIT courses during the externship. They had applied for and formally interviewed for the 80-hour externship position, before onboarding as paid employees. The externships were held on-site at the Phoenix College Information Technology Institute. Very quickly it became apparent that not all students could be on-site on the same day and same time because of obligations that competed for externs' time. As an initial response we polled for at least one common day a week, and began recording all sessions and making the recordings available to those who were not able to attend in person. One drawback of this approach was that remote participants viewing the recordings could not benefit by asking questions either about work assignments or the digital divide technology.

The purpose of the externship was to gain hands-on, real-world experience working with CIT solutions to advance their career goals. Teamwork, research, presentations, writing, managing their schedules, and other employability skills were also part of the bundled experience. The externship opened with a culture sharing activity where participants highlighted where they were from, favorite things from their culture or country, and their "why" for participating in the externship, and/or their "journey" to their current situation. Reflecting upon the culture shares,

¹ We recognize that one's experience is shaped and determined by one's intersectional social identities such as race/ethnicity and gender, and to protect the confidentiality of participants, we do not identify participants by both race/ethnicity and gender.

participants noticed similarities and differences that helped them get to know each other and feel more at ease during ongoing interactions and activities.

From a technology angle, initially the externs spent time learning about the digital divide in education by looking at case studies from different locations around the world. They also studied the technology landscape. Other activities included a site visit to local installation points and comparing device data sheets. During hands-on work with four devices, the externs created written instructions and videos showing high school students how to set up and care for a digital divide device in their home. The externship closed with demos of the devices and a group presentation to the high school digital divide technology team.

The final externship session included a discussion about career exploration and next steps to enhance their professional portfolio with the externship experience. Q&A with students led to advising them in practical areas such as setting up LinkedIn profiles, interviewing skills, etc. Based on extern engagement in these discussions, a decision was made to explicitly include more career exploration and other career services in the next round of externships.

Prior to the externships taking place, CIT students were asked to complete a survey and “rate the importance of having an externship as part of your college experience at Phoenix College.” Of the 16 CIT students that completed the pre-survey, 56% reported externships extremely important, 31% reported as very important, and 13% reported as moderately important. This perspective about the relative importance of externships, was confirmed in post-internship interviews for those that participated in the externships. Follow-on interviews with the externship participants revealed various satisfying and growth learning experiences and aspects of the externship. They included: being exposed to new technical skills through hands-on, real world, timely and meaningful topics; learning about the digital divide and how their work is positively impacting their community; building their communication and interpersonal skills in collaborative group work and presentations; receiving feedback on their feedback by the externship project team; and exposure to individuals they would not otherwise have access to, e.g., externship team members at Phoenix College. One extern attributed the experience as “life changing” due to it being their first work experience outside of studying, their first time working with leaders in the field, and their first time working with peers on a project. All students expressed they would recommend the externship to their peers.

A second round of externships began January 14, 2022 and completed March 4, 2022. This second cohort was made up of a diverse group of nine students that included seven persons of color and two Whites. Eight of the nine externs were men and one was a woman. All were CIT students, and during the externship many worked part-time or full-time in jobs unrelated to CIT. One student from the prior externship cohort was invited to serve as a peer mentor to the second cohort of externs, which provides coaching that is contextually relevant to the externship processes. Three faculty from Phoenix College each supervised three technology projects related to CIT that were discussed and agreed upon in collaboration with the local utility company’s employee mentors. Each project ran over a two week cycle and used agile methods. The three projects were: 1) Website Accessibility, company website accessibility assessment and recommendations; 2) Website and Account Security, identification of phishing and other security vulnerabilities to the company, and 3) Management of Employee Computing Devices.

The externship was virtual, offered through Zoom and recorded. Participants attended live Zoom sessions or viewed recorded sessions. Additionally, the eight week program was translated into Canvas Modules, Assignments, Discussions, and weekly check-ins, based on feedback from the first externship to provide more structure. The zoom sessions were held weekly, in morning and afternoon sessions.

The first and last sessions were unique and borrowed from successes in the first externship, but with improvements. In the first session, more time was spent on developing a connection and rapport. An activity called "Culture Share" was implemented wherein students took time to create a slide that is inclusive of images representative of their culture. In this activity, students then shared their slides with the group. Together students created a bond, a shared connection and learned about other people's cultures, favorite foods, hobbies or things that they love as well a cultural and contextual understanding of who is participating in the externship. Some faculty also shared their cultures, which further developed a sense of camaraderie in the group. Additionally, Career Services staff joined the session to discuss the importance of career exploration and preparation, also introducing a series of related topics to be covered throughout the eight week externship. The final session included a presentation and discussion with the employee mentors summarizing the technology project outcomes and value of the externship experience. The final presentation provided the opportunity for the externs to practice and showcase teamwork, presentation, and communication skills in addition to technical skills.

The other weekly sessions had a common structure, where the morning session focused on the CIT project and the afternoon session focused on career development. The morning session was facilitated by the faculty member assigned to the project. Externs were encouraged to team up and work together to understand the tools and technology and apply them to a company-related scenario. The company mentors joined for a portion of the morning session to hear progress from the externs, ask questions and to provide advice and guidance for the project. During the week, teams of externs self-organized and worked together on the project. This developed their technical skills, leadership, teamwork, and project and time management skills. With respect to career development, the externs participated in weekly intensive career preparedness coaching sessions with Phoenix College career services where they worked on fine-tuning their resumes, developing a strong understanding of career exploration skills, e-profiles for the Pipeline AZ job board and their LinkedIn presence.

3.3 CIT Internships

Two web-design student internships with a single employer began in March 2021 and completed May 25, 2021. During their 80-hour internship, the students explored and tested in a development environment with fewer restrictions and more opportunity to be creative. They created and published content in a production environment as well. Feedback from the Employer indicated that the interns were able to hone industry-recognized skills and gain experience in relevant web-based tools and content management systems. The internship experience was successful in providing practical, hands-on experience relevant to the certificate and degree programs the students are pursuing. The feedback that the employer received from the Interns was overwhelmingly positive, and they expressed their enthusiasm in working as a team to

accomplish clear goals from their supervisor. Post survey results from the employer indicated supervisor satisfaction with interns' on-the-job contributions and performance.

4. Lessons Learned

Dedicated Work-based Experiences Coordinator (WBEC): A full-time WBEC was hired to facilitate the interactions between faculty, students, career services, human resources, and industry employers and mentors. This person needed to have support from the administrative leader(s) to negotiate institutional barriers to change as they implemented new processes to intentionally serve students via paid internships and externships. The more trusted connections at their institution, the easier it becomes to efficiently navigate institutional or organizational barriers and forge new directions. This will take time especially if the WBEC is a new position. It is really important for the WBEC to be an advocate for the students, value their assets, and sincerely care about their wellbeing and aspirations. As the organization evolves, sometimes the WBEC will be the central person that makes sure that a student successfully completes the steps to becoming an intern or extern. The WBEC is also instrumental in recruiting students (e.g., classroom presentation) and also in preparing the students to apply (e.g., resume preparation and interview coaching). Over time the WBEC will build a network of fellow travelers increasing organizational capacity to build navigational capital in students to gain entry or access to a quality Work-Based Experience.

Student-centered Case Management: Intentional, intrusive coaching with career services, academic advisors and peer mentors are required for cohesive student-centered case management. Intentional integration of Career Services into the common processes leading up to the WBE and the WBE itself, meets students where they are, rather than expecting them to seek out the career advice and support they need. Types of integrated support include helping students recognize their cultural assets and highlighting them in their resumes, cover letters, and interview responses. Peer mentors who have recently participated in WBEs serve as a neutral, informed sounding board and role models in ways that are sensitive and respectful to cultural differences.

Flexibility in Scheduling: Wherever possible, flexibility needs to be built into the internship and externship schedules to interweave work schedules with classes, part-time jobs, and other commitments. All parties involved need to agree with the scheduling decisions. For example, this may be easier with an individual internship assignment, where a student intern agrees to work certain hours with their industry supervisor to fulfill the 80-hour internship requirement. With externships, where students work in teams at the IT Institute or remotely, the experience should include a mix of fixed hours and options for flexible hours for assignments that can take place outside of the physical location, with team and customer agreement. Recording sessions during fixed hours accommodate those who cannot attend when schedule conflicts arise.

Impact of Covid-19: Our WBE experiences happened in the wake of the Covid-19 pandemic. Like many other institutions, we had to manage a "new normal" for taking learning experiences that would traditionally be face-to-face to online formats. We had fully virtual zoom externships and also hybrid formats. As mentioned previously, there was a small decline in the Latinx

students enrolled during the height of the pandemic in the 2020-2021 academic year, and the loss has still not been fully regained in the 2021-2022 academic year.

Hybrid Delivery: During the pandemic, many educational institutions and businesses closed physical facilities and offered remote learning and working. The internship and externship opportunities were affected by these closures and adjustments to daily practices. For example, both industry mentors and student externs preferred a virtual experience in one externship and a response to pandemic conditions was accommodated in conjunction with flexibility in scheduling. The virtual experience included both sessions where participants met at the same time, and other online activities coordinated through email, discussions, and bringing results from individual task work together in a common online document that was shared across the team. To create and foster a sense of community with a fully online group we recommend that the participants discuss and agree to a general protocol on the use of cameras and other online interactions.

Access to basic needs services: The pandemic exacerbated the need for access to basic needs services in our targeted student population. Basic needs such as food and housing security and healthcare are often taken for granted. Pointing faculty and staff who are providing WBE opportunities to campus and community basic needs services is a start, and integrating these resources into the curriculum resources will establish a systematic process that will enable faculty and staff to share these resources with students. Childcare is another important consideration. For example, a part-time extern faced juggling childcare responsibilities, work outside of school, and attending the externship and their classes.

Paying Students as Employees during WBEs: The brevity of the 80-hour WBE has some advantages and drawbacks related to compensating students during WBEs. Benefits include: a tangible exchange of money that sends a message about the value of students' time, skills, and assets; additional income; and exposure to real-world jobs and industry mentors which can convey the option for continuous learning in the workplace. Drawbacks include temporary income without benefits; need to continue "other" job while engaged in the WBE to maintain necessary income and benefits; more time needed for project training and implementation; and extra overhead and paperwork for the WBEC, HR, and students required to hire interns and externs into the employment systems. Tracking time cards in light of flexible scheduling and hybrid delivery is also high overhead, and in retrospect a stipend upon completion may be a better option, although the initial intent for hiring interns and externs as employees at Phoenix College was to provide bi-weekly paychecks rather than a lump sum payment upon completion of the 80 hours.

Explicit Structure and Regular Communications: Although good structure and communications are important in all work based experiences, for the externships, it is even more important because there are more people with different responsibilities and roles who must coordinate during the externship which may be delivered virtually, as a hybrid experience, or in-person. Based on feedback from the initial round of externships, where more communication and structure was requested, an explicit framework was defined in Canvas that included both technical and career exploration aspects as well as culturally responsive practices. The Canvas framework provides a bridge between course structuring that students are used to and a more

fluid job experience, where tasks are assigned but it may be the responsibility of the employee to capture what they are required to do and figure out how to show evidence of task completion to their supervisor. The Canvas framework also serves as a template for future externships.

Student Leadership Enablement through Soft Skills: The primary means for developing soft skills embedded opportunities to practice speaking, teamwork, networking, working with racially and ethnically diverse teams, presentation, and writing in the context of the work based experience. It is important to set an expectation that each person develops these skills by actively participating in such activities and monitor turn taking to ensure that each intern or extern practices these skills. For example, during presentations, each person contributes a slide or content, and speaks to that content, rather than one person speaking to the entire presentation on behalf of the team. Reminders may be needed if one or two people appear to be handling most of the work. The peer mentor can be helpful in subtly exploring the extent to which the work is being shared, and suggest ways to partition the work across the entire team.

Faculty Professional Development: In order to delve further into and strengthen intentionality to serve Latinx students in STEM, the team held extensive discussions and reflections about diversity, equity, inclusion, and culturally responsive instruction to contextualize and internalize expectations for different roles to intentionally serve Latinx students in STEM through work-based experiences. To that extent, faculty were encouraged to highlight the importance of internships and externships to support the larger efforts of the institutional initiative to bring work-based experiences to CIT majors. We also asked faculty to help in our internship and externship efforts. Interviews with students revealed that faculty played a vital role in promoting internships and externship experiences. Students who participated in qualitative interviews routinely stated that they learned about the opportunity from their professors.

5. Conclusion

Despite challenges faced during the pandemic, the first two years of the work-based experiential learning effort has benefitted the targeted students, increased particular faculty and staff capacity to serve, and produced artifacts that can be transferred to other institutions seeking to implement WBEs. Harnessing these outcomes while also scaling servingness through institution-wide change and across institutions to serve more students through culturally responsive WBEs will be an ongoing focus for the next three years.

6. Implications for Future Research

In year three, four additional 2-year HSIs will join the project to offer WBEs to their students. It will be important to transfer lessons learned, processes and evidence based practices to these 2-year HSIs to streamline onboarding. Adjustments to specific contexts may be needed as systems may vary. Optimizations to institutional practices and processes will be ongoing, as the service providers build competencies to better serve adult learners of color, females, and those with exceptional financial need who are part-time or full-time students and hold jobs to support themselves and their family while they are pursuing higher education in a STEM related career.

References

Carleton University. (2022). *Theory and Scholarship—Experiential Education*.
<https://carleton.ca/experientialeducation/experiential-learning-theory-and-scholarship/#sc2>

Gage, W. (2018). *Common Language for Experiential Education*. York University.
<http://avptl.info.yorku.ca/files/2018/02/2018-02-01-Common-Language-for-EE-AMEND-ED.pdf>

Gay, G. (2013). Teaching To and Through Cultural Diversity. *Curriculum Inquiry*, 43(1), 48–70.
<https://doi.org/10.1111/curi.12002>

Gomez, A., Krystle Cobian, & Hurtado, S. (2018). Improving STEM Degree Attainment Rates: Lessons from Hispanic Serving Institutions. *American Educational Research Association*.

Kolb, A. Y., Kolb, D. A., Kayes, D. C., & Lingham, T. (2005). *Experience-Based Learning Systems*.

Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Prentice Hall.

Pickering, C. K., Craft, E. L., & VanIngen-Dunn, C. (2019, June 15). *The Emerging Impact of Community College Hispanic-Serving Institutions (2-year HSIs) in Educating Technicians in Advanced Technologies – Defining the Opportunities and Addressing the Challenges*. 2019 ASEE Annual Conference & Exposition. <https://peer.asee.org/33389>

Richards, H. V., Brown, A. F., & Forde, T. B. (2007). Addressing Diversity in Schools: Culturally Responsive Pedagogy. *TEACHING Exceptional Children*, 39(3), 64–68.
<https://doi.org/10.1177/004005990703900310>

Torres, V., & Zerquera, D. (2012). Hispanic-Serving Institutions: Patterns, Predictions, and Implications for Informing Policy Discussions. *Journal of Hispanic Higher Education*, 11(3), 259–278. <https://doi.org/10.1177/1538192712441371>