Five 2-year HSIs Collaborate to Provide Culturally Responsive IT Work-Based Experiences

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Abstract

Five 2-year Hispanic Serving Institutions (HSIs) recently joined forces to provide culturally responsive work-based experiences (WBEs) in a five-year program sponsored by the National Science Foundation. The goal of the WBE initiative is to intentionally serve Latinx and other non-traditional students in Information Technology (IT) programs of study. During the pandemic, a 2-year college in a large urban district launched and led the program in its first two years with the intent of developing a model and processes for IT WBEs to later adapt and implement at four other 2-year HSIs. In year three, two urban colleges in the same district as the lead, and two rural colleges in the same state joined the initiative. This paper discusses how intentionality and servingness were infused into the WBE model, processes, and practices, highlighting differences in rural and urban contexts. Faculty, support staff, and work-based experience coordinators collaborated within each institution and across participating institutions to make this happen, under the guidance and facilitation of the Center for Broadening Participation in STEM at Arizona State University. Surprises and challenges encountered in implementing the WBEs with intentionality to serve non-traditional IT students are described in the paper. The implemented WBEs provided benefits to the students who actively participated in paid IT job assignments under the mentorship of faculty, industry employers, and peers in the form of cultural learning, career preparedness, teamwork, communication, critical thinking, and real-world experience that supplemented the students' technical learning. Whenever possible, student's existing work and course schedules were accommodated through flexible work arrangements. A catalog of powerful stories that convey value and impacts for students throughout their WBE journey and continuing into placements with employers is beginning to emerge. Quantitative data summarizes participants' demographics demonstrating intentionality in recruiting, retention, and completion of WBEs in the first three years of the program. Longer term impacts to retention and completion of Latinx and other non-traditional students in IT programs at participating institutions remains under study.

1. Introduction

Broadening Participation in STEM (BPiS) is a major initiative funded by the U.S. National Science Foundation (NSF) in a range of micro, meso, macro, and exo level programs that span formal and informal education settings for pre-kindergarten through secondary, undergraduate, graduate, and postgraduate levels, on to transitioning into the STEM workforce as researchers, scientists, engineers, or other STEM professional careers. According to the NSF, "A diverse and capable workforce is vital to maintaining the nation's standard of excellence in STEM" (NSF, n.d.). At the micro level, for NSF, BPiS means increasing STEM opportunities for individuals from underrepresented groups, regardless of their "racial, ethnic, geographic and socioeconomic backgrounds, sexual orientations, gender identities and to persons with disabilities" (NSF, n.d.).

In their book, *Broadening Participation in STEM: Effective Methods, Practices, and Programs*, Wilson-Kennedy, et al., compiled fourteen case study programs and their high impact practices (HIPs) that improved inclusion and success of underrepresented persons in STEM (Z. Wilson-Kennedy et al., 2019). Importantly some of the HIPS are related to *Experiential Learning,* defined by Dewey (1937) as a cyclical learning model in the education process with four components: concrete experience, reflection, abstraction, and application (Dewey, 1937).

The chapter 7 study in Wilson-Kennedy, et al., (2019) provides ten high impact practices (HIPs) of which two are work-based forms of experiential learning (Peters et al., 2019). That is, they are situated in real-world problems, tasks, and projects in partnership with an employer or community partner. The two work-based learning HIPs are internships and community service/community-based learning. Two additional HIPs are worth noting, but do not by default offer work-based learning scenarios. They are capstone projects and collaborative projects that could be contextualized to work-based learning. This is also discussed by Kuh, who, in addition to internships, presents community service and capstone projects as "high-impact practices" (HIPs) that enhance students' employability (Kuh, 2008).

This paper will focus on IT work-based experiences, internships and externships. For the purpose of this paper, internships are defined as 80-hour paid experiences for 1-2 students who are under the supervision of industry or IT employees, and situated with local companies or college IT departments. Internships may also be virtual work experiences, using the company's information technology infrastructure. Externships are defined as 80-hour paid project-based learning experiences for a group of 4-10 students who 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.

Section 2 will discuss the foundations established by Phoenix College in Years 1-3. Expansions upon this foundation will be covered in Section 3. The paper finishes with overall Lessons Learned in Section 4, the Conclusion in Section 5, and Implications for Future Research in Section 6.

2. Foundations established by lead 2-year HSI (Years 1, 2, and 3)

In addition to Phoenix College offering three internships and two externships to sixteen students (4 interns, 12 externs) in years 1 and 2 of the grant, significant effort was invested to mobilize knowledge to pass on to four additional 2-year colleges as they came on board in year 3. This was packaged into a work-based experiential learning toolkit which provided considerations, guidelines, tools and templates for paid externships and internships. Information in the toolkit covered recruitment protocols, interview templates, coaching tips, practices for running an externship, placing interns with employers, and paying students with grant funds. To collect student data, recruiting flyers carefully designed to attract Latinx students included QR codes linked to an interest survey. Surveys to collect student feedback at the beginning and conclusion of their participation in an internship or externship were also provided in the toolkit. Student participants could also opt in to a thirty minute discussion with researchers.

3. Expanding upon the Foundation

In year 3, three areas of expansion have occurred. The first area of emphasis has been on Knowledge Transfer to four additional 2-year HSIs as they ramp up to provide WBEs for their CIT students. The second area of emphasis has been to develop the career prospects of students who participated in WBEs during years 1 and 2. The third emphasis has been to continue ramping up WBE offerings at the lead institution.

3.1 Expansion and Knowledge Transfer to Four 2-year HSIs (Year 3)

In year 3, four additional colleges that were 2-year HSIs joined Phoenix College and Arizona State University (ASU) the project. Two of the colleges are urban institutions in the same district as the lead college. The other two colleges are rural institutions. The foundational tools and processes developed at the lead college were used to onboard all four colleges. The work-based experiential learning toolkit developed by the lead college was shared with faculty and coordinators at the new colleges, who began using it to plan student internships for year 3. The WBE Coordinator at the lead college and the ASU co-PI partnered with the new college faculty and coordinators to identify potential internships and externships with the institutional IT departments and external companies with IT needs.

Initial projects for internships were identified at the two rural HSIs. The year 3 goals specified placement of five interns by each rural college. Rural College One (Arizona Western College) began working with two companies (real estate and website/graphic design) and its internal IT department to define job tasks for five intern positions involving IT operations for Real Estate, installing and coding applications, graphic design, re-imaging loaner laptops, classroom machines, and managing assets in Active Directory. Rural College Two (Central Arizona College) identified projects with the city of Coolidge to install city employee computers, re-image desktop computers, perform server maintenance; and manage network infrastructure at the local high school where the IT supervisor is Hispanic. For Rural College Two's internal IT department, intern tasks included re-imaging loaner laptops, programming patch code, pulling network cabling, installing classroom desktop computers, and Help Desk positions.

A major delay resulted in starting the planned internships when Rural College Two required a formal memorandum of agreement (MOA) with the lead college to ensure reimbursement of funds required to pay student stipends during the internships. The MOA is close to final, yet took over eight months to establish. The original students who were interviewed for the planned internships were placed in other positions with CAC, outside of the scope of the grant. Site research approvals from institutional research boards (IRBs) at new colleges also took time to process since one rural college was not set up to process research site approvals under their IRB, and the two new urban colleges' IRBs in the district also needed research site approval. All of these research site approvals were required prior to district level IRB approval of the amendment adding the four new research sites, associated modifications to research questions and recruiting mechanisms, and the need to renew Humans Subjects Research certifications for research personnel.

WBE opportunities with eight employers were identified at the three urban HSIs in the same district for future placement of 50 interns and externs. These are described in Section 3.3 **Ramping up WBE Offerings.** Challenges were also encountered at the urban colleges that caused issues in starting and/or completing planned internships and externships. Delayed reimbursement of faculty who had previously supervised groups of students for year 2 externships; the complexity of internal faculty payment processes beyond their academic contract at the lead college was the primary issue. This has since been resolved and four externships are moving forward. Another roadblock occurred in establishing district level experiential education partnership legal agreements with smaller and niche employers covering safe working conditions, nondiscrimination policies, liability insurance, etc.

The Advanced Cybersystems Lab WBE, housed at Gateway Community College (GWCC), a new urban HSI in the program, provided a practical collaborative experience between three students, a new intern, a peer-mentor and a cohort graduate/college graduate. Under the supervision of a GWCC faculty member, the students collaborated to build out the Advanced Cyber Lab using donated computing equipment. The students also worked together to develop how-to manuals and guides for new users and small business owners explaining setup, configuration, and use of various computing equipment in exploring Cyber Security strategies and desktop support. However, the students involved in this WBE did not complete the full 80-hour grant-funded internship due to extenuating circumstances with one of the students.

3.2 Career Development and Outcomes of Students who completed Prior WBEs

In the third year of the program, longitudinal career opportunities that led to ongoing career development for previous completers of work-based experiences materialized. That is, students who participated in 80-hour grant funded internships or externships have gone on to become peer mentors, were hired by companies into new internships or continued their sponsored internships as paid employees. For example, three students who participated in the local power utility externship from year 2 were hired into part time positions at local companies in year 3. One student who participated in the same externship continued as a peer mentor for the Advanced Cybersystems Lab WBE and moved on to a part-time internship position with a local Phoenix firm as an IT support specialist working 30 hours per week. Another student from the aforementioned year 2 externship continued on to participate in a sponsored internship with PipelineAZ, a company that assists community members in gaining employment, determining

student interests and possible job pathways, and job training/career development events and workshops. The student was then hired by PipelineAZ following completion of the sponsored internship.

Another student was hired by Phoenix College faculty to moderate the virtual and in person Zoom Sessions at a hybrid NSF sponsored conference event hosted on a community college campus attended by nationwide participants. Adding this work experience to the students' resume and career search profiles was key in arranging a second interview with a local company the student had interviewed with prior to the conference. The student used the experience from the hybrid conference to respond to questions about specific technology used by the organization. Insights from the events management experience were also shared with other IT students looking to pursue a similar role within the organization.

These examples demonstrate ideal outcomes for our externship and internship cohorts.

In year 3, an emphasis has been to capture success stories from prior student participants. Forty-five minutes of footage from three students was recorded and is being produced into bite-sized testimonials of 2-3 minutes, 1 minute, and 30 seconds that show value and benefits to other students, potential industry partners, faculty, and on-campus groups that support the Phoenix community. The testimonials are being used for recruiting students, industry partners and other WBE sponsors. Sharing student experiences evokes a sense of community that reflects the underrepresented groups we look to serve.

Some students require more time and intensive coaching to build acumen and confidence in communicating their IT knowledge in an individual or panel interview format. On-campus employment provides the opportunity to focus on one durable skill at a time, build confidence and practice. This creates a smoother pathway to developing the skills necessary to gain placement in an industry internship. This approach enables companies to see community college students as possible future employees. Supporting additional time in longer paid WBEs beyond 80 hours is being explored.

Allowing students to build skills from campus-based employment experiences and share them in an interview is vital for the students to stand out amongst other job applicants. By collaborating with students on the screening, interviewing, and hiring process, we are demystifying the steps needed to gain entry into these sought after internship roles. The insight is especially relevant for students with little-to-no professional work experience, and it also gives perspective to the overall job market while building the confidence of students looking to break into a STEM industry where they do not have a network, knowledgeable peers, or mentors.

As follow-on to the resume development playbooks provided by Career Services, and with guidance from the WBE Coordinator, groups of students are actively conducting research and participating in discovery meetings following network events and job fairs. Positions and opportunities are identified, for which research and discovery projects are defined. This information is shared with the small network of participants and faculty. Connections are made and resumes, applications, and cover letters are refined to identified positions and reviewed as a group. Corporate communication (introductory emails) is practiced, including messaging and professionalism.

In resume customization sessions, students look at the job posting and align their skills and promote their experiences that align with the job posting. Students check each other's spelling and ensure that key terms companies use for screening are included. One student created three resumes and used them to apply for 20 positions.

When an interview is scheduled, the research into the organization continues. The group deep dives into online resources to help find out what questions may be asked, who is participating in the interviews, and connect with known interviewers. The group shares any and all insights during this process to maximize the opportunity to gain a final interview. Preparatory mock interviews develop confidence and clearer, more concise responses to interview questions. These are all durable skills. We see immense growth in students' ability to portray their knowledge, skills, and abilities.

3.3 Ramping up WBE Offerings

In addition to working with existing interns and externs, significant effort has been invested in pursuing WBE offerings for new students. This involves recruiting a pool of students and working with industry partners and faculty to identify potential projects for externships and required skills for interns and externs. This section will describe these efforts and underlying characteristics.

To set the stage, Figure 1 shows the annual goals and actuals for numbers of students who have completed internships and externships, along with those planned and projected over the course of the five-year grant. The planned and projected numbers will contribute to the Total Actual when completed based on the current completion rate of 94%.

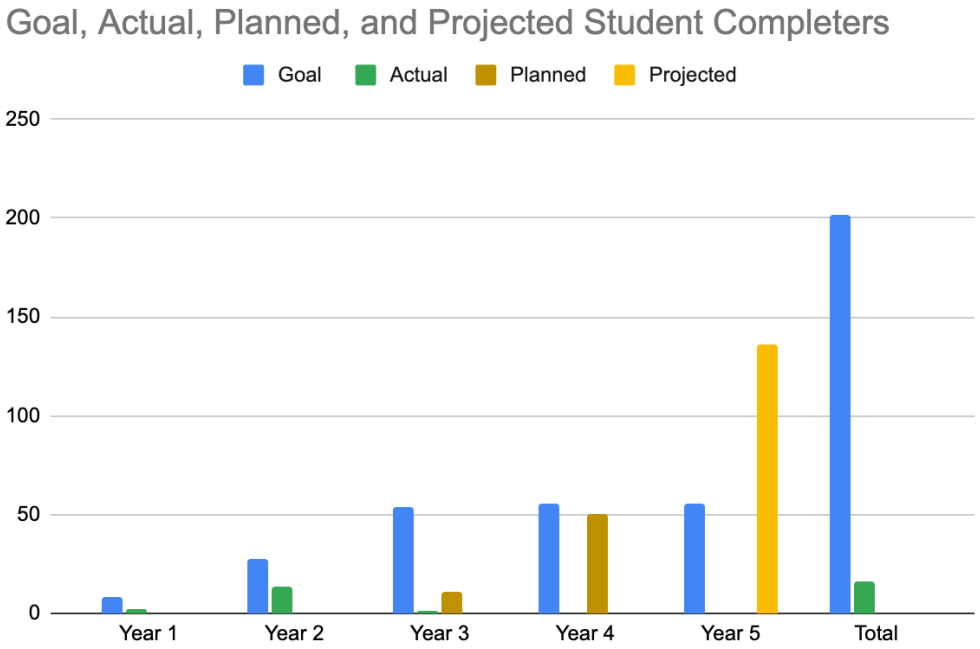

Figure 1: Cumulative Goals and Actuals for Completed Internships and Externships

A number of partnerships and projects for externships have been discussed for seventeen students who completed applications and a separate pool of ten who have interviewed and are ready to begin paid internships or externships. As plans for externships and internships are finalized, they will be ready to start WBEs in Year 4 which begins April 15, 2023. Among the twenty-seven students, twenty-five are from groups traditionally underrepresented in IT, of which nine self-identify as Hispanic, eleven as Black, two as Native American/Alaska Natives, and three as Asian.

Current discussions with four partners are underway to plan and offer forty-three externships in year 4. For example, a local international consulate office indicated that it could engage three IT externs and identified two peer-mentors to assist these externs. An industry partner specializing in sports management software that centralizes and maximizes player development, program/player marketing and access to corporate endorsements for both High School sports programs and players has expressed interest to support twelve externs, assisted by one peer-mentor and one prior cohort graduate. Another company specializing in virtual worlds and augmented reality, wants to engage with four externs to build a prototype of the IT Institute at Phoenix College as a virtual world. An extensive externship with up to twenty-four students in partnership with a local pet transportation service has been proposed to test and improve user experience within mobile applications and produce a findings report.

Five internships are planned in Year 4 with prior and new employers. Because of the positive experience with a prior IT support specialist intern, at a building automation company, discussions are underway to provide positions for additional interns in Years 4 and 5. One IT internship at a local electric power and water utility company is pending the candidate's enrollment in an internship elective course at Phoenix College and a successful interview. The City of Peoria has two geographic information systems (GIS) internship positions available. A local moving truck, trailer, and self-storage rental company will host at least one internship in Year 4.

Assuming 94% of fifty students complete the planned Year 4 WBEs, to meet our numerical goals we need a total of 139 additional intern and extern completions in Year 5, across all five campuses. We are facing a crossroads where we need to consider the tradeoff between quality versus quantity experiences that orchestrate a holistic career readiness for URM students. To achieve student-centered outcomes while also ramping up WBE offerings, we will implement six strategies:

1) Contact point persons for 200 employers in a database compiled from existing relationships of the PI on the grant who is the CIO for the lead college. Increased staffing will assist in this effort. Based on contacted employers' interest and needs, facilitate implementation of WBE's to place additional students across all five HSIs.
2) Conduct intentional outreach, including bilingual marketing efforts and compelling, professionally prepared video testimonials to attract diverse student participants that are more reflective of the diversity of the student population at participating campuses.
3) Build from relationships established during successful intern placements; we will use the success to be the priority pipeline for Work Based Experiences. In other words, completed internship participants will become college ambassadors for the industry partner. College ambassadors will compound the impact from one work-based

experience, to one new internship experience and one peer-mentor, or eight new students grouped together in a peer-mentored externship.

4) Re-use the LMS structure and curriculum from the twelve-week, 80-hour externship in Year 2 that featured cultural exchanges, faculty supervised technical learning in projects mentored by industry employees and peers graduated from prior cohorts, and career-development sessions with career services personnel (P____, et al., 2022). The externship led to several successful outcomes including new peer-mentors, job or internship placements, and student referrals. Basing new externships on established practices will enable efficient structuring of planned externships and repeatable outcomes.
5) Increased attention to invoicing and payments for all partners: Ensure all involved know the processes, and there is regular follow up from the lead college to ensure invoices and payments are up-to-date. The two most important items are timely payment of faculty stipends in return for supervising externships at the lead college and district colleges, and payments to the rural colleges who are paying student stipends and faculty supervisors up front and invoicing the lead college for reimbursement.
6) Change emphasis from making numbers for 80-hour paid WBEs to longer WBEs that optionally tie to credit bearing internship electives, required by some employers prior to hiring. This would also support students who need additional time to build skills to transition to internships paid by employers. This means fewer unique student internships/externships which is a quality versus quantity tradeoff.

4. Lessons Learned

This program has identified the need to develop and hone career building technology and soft skills earlier and reinforce them more often. A single 80-hour work-based experience is not enough time to develop ready-to-work skill sets and build confidence to transition to the workforce. Intrusive, iterative approaches to building these skills is critical for placement, and it is a durable skill students will continue to use throughout their careers. Utilizing multiple grants and fund sources is critical because while the 80-hour experience gives great exposure and leads to development of subsequent opportunities for entry level job placement, many employers have provided feedback about expectations for internship skills that indicate additional preparation is needed. A longer WBE or a series of three paid 80–hour WBEs that transition from an externship to a campus-based internship, to an employer situated internship. Graduates from prior WBE cohorts also benefit as peer mentors and/or when shadowing new Cohorts as they gain additional technology experience, develop leadership skills, and practice communication, teamwork, and project management. As students enter the workforce, they form additional relationships and connect back to future WBE cohorts multiplying the potential impact.

5. Conclusion

Year 3 of this program brought four new 2-year HSIs into the grant while also attempting to ramp up the number of work-based experiences for IT students at all five HSIs. This was a very ambitious endeavor, although there were positive outcomes to students who had previously completed internships and externships in years 1 and 2 due to the efforts of the Work-based Experience Coordinator. The opportunity for students to stack multiple WBEs ranging from on-campus experiences to build confidence, technical and professional skills, to workshops and

coaching that prepare students to interview with companies is paramount. In years 4 and 5, it will be critical for the entire project team to implement the six strategies described earlier and make intentional adjustments to prioritize a quality experience for fewer students over meeting the original quantities of 80-hour work-based experiences.

6. Implications for Future Research

The "Experiential Learning Coordination" component of this project is a complex endeavor that is more than a one-person job, especially as the number of participating institutions increases. The coordination function includes interactions with industry, faculty, and students to orchestrate the content and timing of the WBEs. Each one of these interactions requires a great deal of time while maintaining a dedicated focus to orchestrate a holistic career readiness experience for URM students in STEM. For example, faculty and industry partners engage in dialogs to identify and agree upon example problems and projects for student externs. A challenge in matching student ability, availability with Industry Partner proximity and capacity is not unique to IT or hiring practices in general, but our students have expressed the need for specific support structures. More bluntly, reliable transportation or childcare are additional barriers for students to pursue a high quality work based experience. Another important coordination function is to connect the dots between faculty and career services, to make sure students update their resumes with industry certifications they have earned in courses. Thus experiential learning coordination also requires navigating institutional support structures in the interest of student success.

Coordination with other institutional organizations such as Human Resources and Legal occurs both within the educational institution and the industry employers to hire and onboard students and ensure they are paid. To ensure legal compliance, partnership agreements and certificates of insurance must also be signed off and filed for each partner. The agreements allow for employers to recruit from all district campuses, expanding the opportunity for inter-campus collaboration and flexibility for students to swirl among multiple campuses to enroll for specialty courses that may not be offered at their home campus. The evergreen agreement is managed through the District Contract Lifecycle Management process, a repository of legal paperwork. Once adopted at one campus, all other district campuses are covered.

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