



Building Effective Technology Internships

What community colleges can do to ensure that technology internships are effective learning and talent development tools for both students and employers

AT A GLANCE

A three-year study that JFF conducted for the National Science Foundation shows that community college technology internships can be effective bridges to employment for postsecondary students. The research showed that when internships were required for graduation students were much more likely to participate. But for internships to be effective, community colleges need to put structures in place to support, guide, and engage both students and employers. This is more likely to occur when the internships are required.

AUTHORS

Lois Joy
Research Director, JFF

MARCH 2022

Acknowledgments

Much gratitude goes to our research partners from the Florida College System and the engineering technology (ET) and IT students, faculty, administrators, and employers for taking the time to talk to us and share their insights, experiences, and understanding about how internships work, for whom, and under what conditions. Our research would not have been possible without their generosity. A committed group of researchers conducted the data collection and analysis that made this brief possible. From JFF, Lois Joy, research director, served as the project PI; Tara Smith, associate research director, developed interview protocols, conducted interviews, developed codes for analysis, and analyzed and summarized the qualitative interview data; and Nia Yisrael, project manager, coordinated and scheduled the interviews; arranged for gift cards for students and faculty; conducted, coded, and analyzed interviews; and managed the budget for the project. From WestEd, Angela Estacion, senior research associate, served as co-PI to the project; Valentine Pedroza, senior research associate, analyzed the student administrative and survey data that supported the qualitative analysis; Adrienne Washington, research associate, developed codes for the analysis of interviews and analyzed and summarized the qualitative interview data.

This material is based upon work supported by the National Science Foundation under Grant No. NSF 1760993. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

About JFF

JFF is a national nonprofit that drives transformation in the American workforce and education systems. For nearly 40 years, JFF has led the way in designing innovative and scalable solutions that create access to economic advancement for all. www.jff.org

About WestEd

WestEd is a nonpartisan, nonprofit agency that conducts and applies research, develops evidence-based solutions, and provides services and resources in the realms of education, human development, and related fields, with the end goal of improving outcomes and ensuring equity for individuals from infancy through adulthood. www.WestEd.org

Contents

Introduction	4
Key Findings	7
Insights	22
Promising Practices	25
Appendix	29
Endnotes	31
References	32

Introduction

Despite the growth in technology jobs over the past 10 years, community college technology graduates face challenges finding jobs in their field (Holzer 2015, Holzer and Dunlop 2013, Hughes and Karp, 2006).¹ While there is growing recognition that midlevel IT jobs and other tech-related occupations do not require a four-year computer science or engineering degree, employers have been slow to develop midlevel technology career pathways in their organizations and rewrite job descriptions that match (Lanahan 2019). Another challenge facing community college students seeking jobs in technology is that employers consistently report that while the students may have desirable technical skills, they often lack professional skills, such as the ability to communicate effectively, work well on a team, and solve problems (Brookings 2020). Moreover, members of groups that have historically been underrepresented in technology—including women of all backgrounds and Black, Latinx, and Indigenous students—encounter additional barriers to technology employment, such as negative stereotypes and marginalization (Arthur 2020).

Effective technology internships can address some of these challenges by creating bridges to employment for community college technology graduates (Carnevale and Smith 2018). Research demonstrates that internships increase student persistence and graduation and employment rates, and that they are especially important for people who are members of groups that have historically been underrepresented in technology—including students from low-income backgrounds; Black, Latinx, and Indigenous individuals; and women of all backgrounds (Rodriguez,

Fox, and McCambly 2016, Simard 2007, Hora et al. 2019). By contextualizing classroom learning within the workplace, internships can provide students with access to hands-on applications of the lessons they learn in class and give them opportunities to hone their skills in real-world settings. In addition, internships give students the chance to develop key professional skills (Swail 2002, Bragg 1995) and provide them access to professional role models and networking opportunities, which are essential elements of job-hunting strategies (Carnevale and Smith 2018).

Although research has begun to document the usefulness of technology internships for postgraduate employment, most of the research has focused on students in four-year programs. It is not clear how those lessons apply to two-year programs. Compared with their counterparts at four-year institutions, students at community colleges come from more ethnically and racially diverse communities and lower-income backgrounds. They tend to be older, with competing family-care and work responsibilities. Hoar (2018) has noted that it can be a challenge for community college students to secure

relevant and paid internship experiences without sufficient support. In addition, few studies have focused specifically

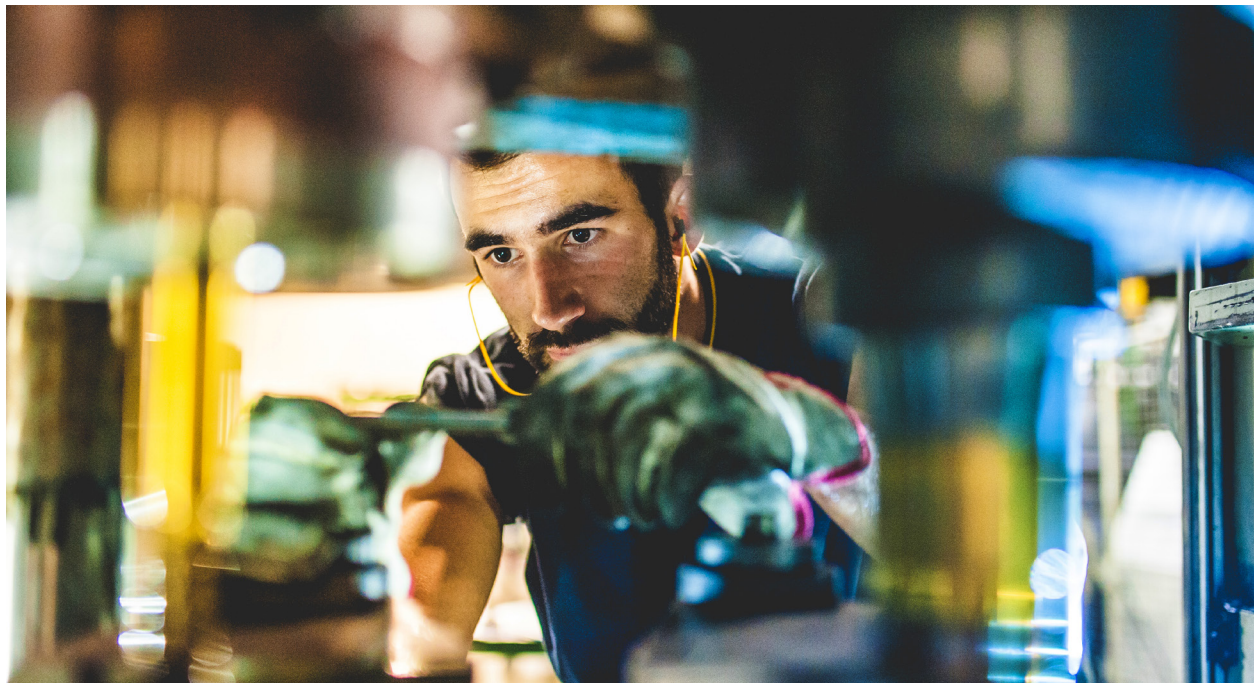


on IT and engineering technology (ET) internships at two-year colleges and the structures that are essential to building effective internships in this field. Since community college technology programs primarily prepare students for careers in technology—rather than readying them to transfer to four-year programs—the impact of internships may be especially significant for this group. Also, we know very little about the impacts technology internships can have on people from communities that have been underrepresented in both technology careers and technology education—including students from low-income backgrounds; Black, Latinx,

and Indigenous individuals; and women of all backgrounds. Because students from those and other underrepresented groups face barriers in technology employment, including negative stereotypes, marginalization, and a lack of role models, mentors, and champions (England 2010, Starr 2018), it is not clear whether technology internships would open opportunities for them or reproduce barriers (Chopra 2020).

To fill these gaps in knowledge, the National Science Foundation provided JFF with funding to conduct a three-year mixed-methods study of credit-bearing technology internships.² To analyze internships, we conducted case study analyses at two Florida community colleges, which we call

Gulf West Community College and Gulf East Community College. Since internships were required for graduation at Gulf West but only in some technology programs at Gulf East, the two schools provide an interesting comparison of how this requirement affects internship participation and outcomes. Case study data included interviews with 116 students, faculty, administrators, and employers; 10 years of student administrative records (2010-2019); and a survey of internship students at Gulf West (N = 107).³ (see Appendix for Data and Methodology). The case studies enabled us to explore internship structure, student participation by demographics, and correlations between internship structures and outcomes.⁴



Key Findings



Findings on the Student Experiences

Technology internships have the potential to serve as an effective bridge to employment.

- By participating in quality technology internships, students:
 - ▶ Learn how to find and apply for technology jobs.
 - ▶ Gain hands-on, real-world technology experiences.
 - ▶ Develop professional skills.
 - ▶ Earn money while they learn.
- Problem-solving on the job builds students' confidence and self-efficacy in their pursuit of technology education and career goals.
- Internships provide students with important opportunities to learn about career pathways in technology and network with technologists and managers—both at the companies where they serve as interns and at other organizations.
- Benefits from internships were found for students from populations that are underrepresented in technology careers, including women of all backgrounds and Black, Latinx, and Indigenous students.

Despite these benefits, few technology students have the opportunity to participate in internships.

- Most technology students leave college before they are eligible for an internship.
- For those who stay, barriers to finding and applying for internships, along with lack of pay and challenges with scheduling and transportation, keep most students from participating unless they are required to do so for graduation.
- Students often lack adequate supervision and mentorship in internships.
- Students from populations that are underrepresented in technology—including Black and Latinx individuals and women of all backgrounds—face added challenges when participating in the internship process.



Findings on Employer Perspectives

Employers offer technology internships to create a talent pipeline into middle-skill technology jobs.

- Local community colleges are a primary source of technology interns.
- Effective technology internships support regional economic development.

Employers may face challenges related to internships. It can be difficult for them to set up an internship program for the first time, create job postings that enable them to find students with the necessary skills, and structure internships that meet student learning objectives and college requirements.

- Employers also had problems understanding students' levels of technology and professional skill, structuring an appropriate level of challenge in the job, and fitting the internship into a short time frame.
- Most employers lack an adequate diversity, equity, and inclusion framework for supporting students from populations that are underrepresented in technology.
- Many employers lack the capacity to provide interns with adequate supervision and mentorship.



Findings on Community College Role

Community colleges act as necessary “hubs” that bring students and employers together for effective internships with equitable access.

- Community colleges are in the best position to provide the essential scaffolding of supports, resources, and staffing that students and employer need.
- Without effective supports, it is likely that only students who face the fewest barriers to degree completion and employment will have access to high-value internships.
 - ▶ Because of this, elective internships (those not required for graduation) may inadvertently contribute to inequality.
 - ▶ When offering internships as electives, colleges may not provide enough support and resources to make them feasible for most students.

Internship Learning Opportunities

Hands-On Learning

Students who participated in internships reported many benefits, including opportunities to get real-world practical experience, develop professional skills, and meet people who can support them as they pursue their education and career goals. A major theme cutting across many student interviews was that internships are beneficial because they offer hands-on learning experiences in actual work settings. Through internships, students engaged in practical applications of the lessons that they had learned in class. In some cases, they also had opportunities to learn how to use equipment and systems that were new to them and earn industry certifications. Many interviewees shared some version of the idea that there is no substitute for real-world experience. One employer illustrated this concept with the example of students from large universities coming into the workplace with extensive classroom knowledge but “no idea how to turn a wrench.” And a student recounted learning how to write instructions for processes and said that they had not realized how much technical writing is part of the engineering field.

Trial-and-error experiences on the job helped students develop the agility to consider different ways to solve problems and try new approaches when initial ideas were unsuccessful. One student recounted extensive learning through the iterative nature of developing an app, describing a continual improvement cycle of building, hacking, debriefing, and modifying. Others echoed that, saying the experience of learning while doing was a benefit of internships because it allowed students to figure things out along the way and engage in problem-solving in meaningful real-world scenarios. They also learned about workflow and how their day-to-day tasks fit into the larger organizational mission.

Students responding to the Gulf West internship survey overwhelmingly agreed that the day-to-day work in an internship “was related to my technology education” and that “the internship gave me the opportunity to learn new skills to further my education and career goals.”⁵

“You know, it’s pretty cool stuff. Some of it is way over my head, but I’m trying to pick up what I can and learn what I can. I know that when I leave I’m gonna have a better skill set than when I went in.”

—Gulf West student

Professional Skills

Students reported that they developed professional skills in addition to technical skills. They said they became aware of “workplace citizenship,” where qualities such as reliability, teamwork, and consideration of others made them effective and productive team members. Some had to develop an aptitude for customer service, along with time management skills and the ability to communicate effectively with coworkers and supervisors. Students reported benefitting from the opportunity to learn from coworkers to expand their skills in all areas of work and added that they came to appreciate the way collaboration fosters creativity. One student specifically noted learning the importance of saying “I will figure that out” instead of saying no. Others said they learned to interpret what clients want even when they might not be familiar with the terminology or lacked the know-how to express those needs clearly.

“[The internship] helped me more with my soft skills. Working with people, being able to delegate tasks, making sure that I was able to complete tasks on time and efficiently. It helped me become more of a team player.”

—Gulf East student

Networking and Career Exploration

Internships also opened avenues for networking with managers and other decision makers in pursuit of education and career goals. Students also gained valuable knowledge about technology career pathways that begin with entry-level positions and got an opportunity to see if technology was a good career fit.

“Sometimes we’re not sure if what we are studying is what we really want to do. The opportunity to go and work in something related, then definitely say, ‘Yes, I want to do this,’ or maybe, ‘I need something else.’”

—Gulf East student

Students said they valued exposure to multiple roles and experiences within a company, especially seeing what others do and how the organization works. This enhanced their understanding of the field and their potential roles within it. One student recounted working with both a mechanical engineer and a machinist, explaining that one was “desk-focused” and the other hands-on. The student learned from observing the symbiosis between them, and from seeing the differences in their mindsets and roles.⁶ Students said they expected the skills and experiences they gained during their internships to benefit them in procuring future employment.

The positive networking and career exploration experiences students had in internships were also reflected in the Gulf West internship survey. All of the women respondents and 90 percent of the men reported, “I am a good fit with this company.” Similar results were found in responses to the statement, “My internship confirmed my technology education and career interests.”

Faculty, administrator, and employer perceptions about internship learning opportunities overlapped significantly with those of students. More specifically, employers said that internships provide students with the opportunity to develop their technical and professional skills, build work experience for their resumes, and cultivate professional networks. Faculty and administrators emphasized that the main purpose of an internship was for students to gain work experience, develop technical and professional skills and confidence in their abilities, and build bridges to employment opportunities.

Many of the technical and professional skills that students said they developed through internships corresponded to what students, employers, and college faculty

and administrators said were skills needed to succeed in the field of technology. For example, students—both those who had internship experience and those who did not—reported that problem-solving was one of the most important skills one needs to be successful in technology. While technical skills were noted to be important, students emphasized the even greater importance of personal and interpersonal skills, including proficiency in customer service, listening, and communicating with customers, coworkers, and managers. Self-direction, self-motivation, and self-regulation were also mentioned as critical for success in technology, along with a willingness to embrace lifelong learning, see things from multiple perspectives, and understand when to lead and when to play a supportive role.

Employers emphasized the importance of having a learning mindset, being receptive to feedback, and demonstrating flexibility in fast-paced and often stressful work environments to successfully build customer service and communication skills. Employers felt knowing more about career pathways in technology boosted workers’ self-efficacy.

“I appreciate a four-year degree, but I honestly prefer someone who knows how to think rather than just what to think...People from two-year schools are taught that it is OK to not know something because they know how to figure it out.”

—Gulf West employer

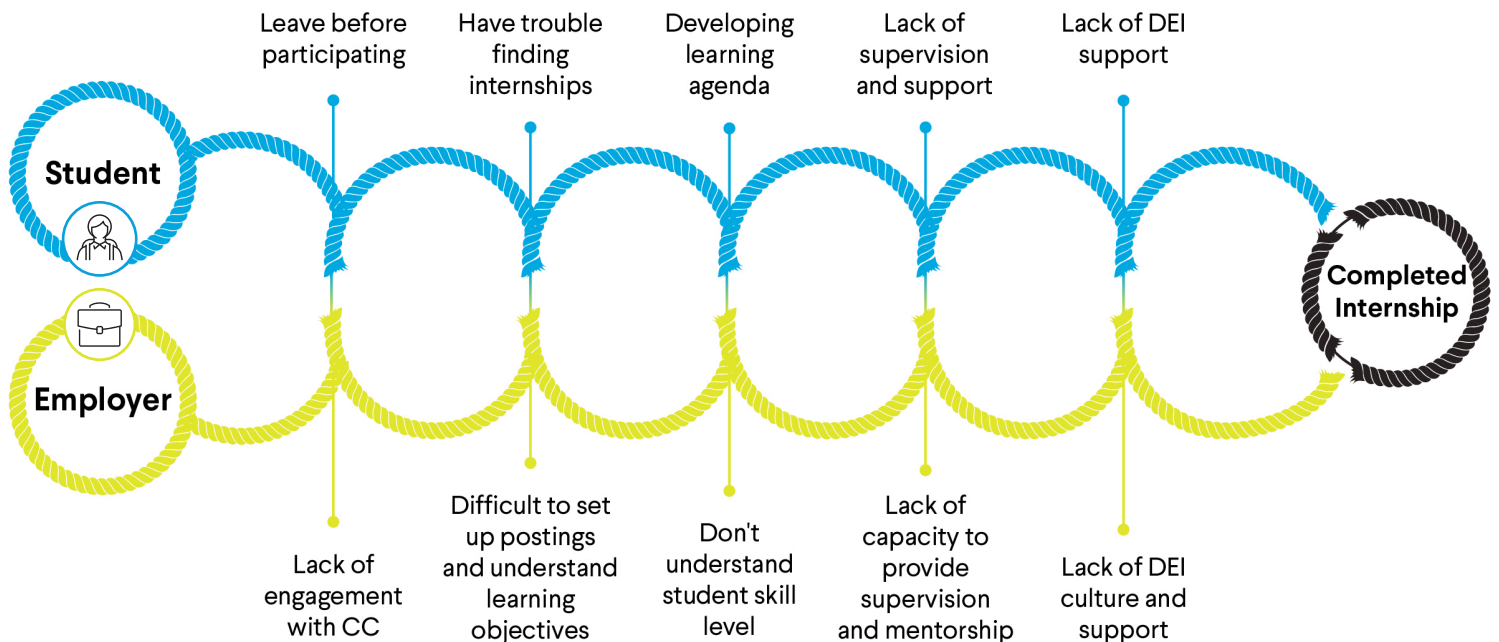
Faculty and administrators concurred that strong interpersonal skills, reliability, teamwork, critical thinking, continuous learning, and customer service capabilities played vital roles in succeeding in a technology program or career. While many technology instructors try to incorporate communication, teamwork, and professional skills into their coursework, some expressed the sentiment that internships may be a more effective way to learn those skills.

“We certainly work [in class] on soft skills any chance possible. But actually getting to experience a professional environment, learn how to interact with other professional people, to be able to work in a team, to be able to communicate with a manager and perhaps a client, if they get that opportunity at the internship, [those] are invaluable skills for them to learn.”

—Gulf East IT faculty member

FIGURE 1.

Missing Links in the Internship System





Internship Challenges for Students

Internship Participation

Despite the many benefits of technology internships, very few students at the case study schools participated. Many students who enter an ET or IT program leave the college before they are eligible to take the internship course.⁷ At both schools, less than 2 percent of the students who left the college before earning a degree participated in an internship.⁸ The majority of those students did not participate because they left college before earning enough technology credits to participate in the internship course or did not meet the technology GPA requirements to participate in the internship. More significantly, our research showed that for those technology students who make it to graduation the vast majority participated in an internship only when it was required for graduation. At Gulf West, where the internship is required for IT and ET degrees, 100 percent of the IT graduates and 84 percent of the ET graduates completed an internship.⁹ At Gulf East, where the internship is required for only the marine engineering technology degree, 100 percent of these graduates completed an internship compared with only 15 percent of the IT graduates.¹⁰

Understanding Internship Requirements

At both colleges, the first challenge that students interested in an internship faced was understanding internship requirements. Students reported not knowing if the internship was required and not being aware of eligibility prerequisites or alternative options for meeting requirements. They described a lack of guidance about internship requirements and the overall process, including when the internship should take place, the sequential pathway toward completion of the requirement, and the paperwork and preparation necessary. Illustrating this confusion at Gulf East, while the IT internships were not required, every IT student we interviewed who had completed an internship told us that it was a required class for graduation. Many students indicated they lacked a clear path to and through the internship process, including timelines and benchmarks to guide their journeys. At Gulf East, several IT students were advised not to participate in internships for reasons students did not fully understand. In one case, a student was opted out of an internship because they had already completed an alternative class.



“There’s an internship part of the degree, but it can also be opted out of [with] a certain class, and somehow I did that without knowing, so I didn’t get the opportunity to do the internship. I was opted out before I knew it existed.”

—*Gulf East student*

Finding and Applying for Internships

At both colleges, students said finding and applying for the internship was a challenge. Students—both those who had completed internships and those who had not yet completed them—said they would have liked additional support from the college in preparing for and securing internships. Interviewees expressed a strong need for help in identifying potential employers. Students without established contacts in the tech industry described being “left to flounder” in the search for an internship; one student at Gulf West lamented, “You’re almost having to beg people to take you as an intern.” The search was characterized as frustrating and difficult for several reasons. First, job postings often did not make it clear whether openings were for internships or permanent positions. Second, students reported that many openings were posted as formalities for jobs that were already designated for someone in-house, and

thus were not true openings. Students also found that their lack of technology work experience made them ineligible to apply for positions. And many jobs were located too far away for students to reasonably consider them.

“It’s been really frustrating getting an internship, because you can find a [job] at McDonald’s or UPS or anywhere else. But getting an internship, they’re like, ‘Oh, you need experience.’ How do you get experience? You need the internship. You can’t get an internship without experience. So you’re kind of then like, ‘Come on. What do I have to do?’”

—*Gulf East student*

The difficulty of finding internships persisted even though both colleges regularly hosted networking events to help students connect with employers and develop relationships with mentors, including alumni and people who work in the industry. Because of lack of data, it wasn’t clear how many students participated in these events. Even when students do attend, however, these efforts may not be sufficient to help them overcome the challenges they reported.



“I’m always trying to think of how we get this in [the college’s marketing and recruitment materials]—that the career center exists or that there are internship opportunities. . . . That to me is the challenge; there’s not really a way to make sure all students hear that these opportunities exist.”

—*Gulf East administrator*

The Gulf West internship survey reflected the challenges surrounding finding an internship. Seventy-eight percent of the women and 64 percent of the men reported that finding an internship was somewhat difficult, difficult, or very difficult. And 66 percent of white students, 59 percent of Latinx students, and 87 percent of Black students reported that finding an internship was somewhat difficult, difficult, or very difficult.

Communicating Technology Skills

Students also expressed a need for additional assistance from the college in communicating their skills and competencies to potential employers. With most lacking experience in the field, they struggled to communicate what they knew and could do in a way that would appeal to potential employers. Interviewees said they needed support in building attractive resumes and “selling themselves” to employers. In addition, students said

they found it difficult to capitalize on experience in fields outside of technology. This was especially true for older students who were changing careers.

“A lot of students are nervous about going to work. They don’t know how to look for a job—a job where you don’t just walk in and get an application like Chick-fil-A; a job that requires more than . . . reliable transportation. Finding a professional job is different.”

—*Gulf West faculty member*

Negotiating Internship Schedules, Pay, and Support With Employers

Students reported that some employers were unwilling to work around their class schedules. According to the Gulf West internship survey, juggling internships with competing family, work, and academic obligations was a challenge for students. Thirty-seven percent of the men and 33 percent of the women said that they found it difficult to fit in internships along with other obligations. By race and ethnicity, 25 percent of interns who identified as Asian said that they found this to be a challenge, as did 63 percent of Black interns, 40 percent of Latinx respondents, and 33 percent of white interns.

In addition to the scheduling problems, students noted that many employers did



not pay them for their work as interns, and they said they found unpaid internships untenable financially. According to the Gulf West internship survey, about half of the interns were paid, with no differences by gender or race or ethnicity.

Students additionally noted that potential employers seemed to misunderstand the concept of internship altogether by refusing to accommodate school responsibilities, expecting significant job experience, and not providing adequate training and onboarding.

“A lot of our students in [associate of science] programs work during the day, and they’re coming to school at night. So they don’t have the opportunity to do an internship—they can’t give up their jobs.”

—Gulf East IT dean

Skills Mismatches

Our research also revealed that many students reported feeling unprepared for internship work. They said internship positions required knowledge and skills beyond what they learned in their college courses. Some described a mismatch between the skills they learned in class and the skills needed on the job, partly related to differences between theory and practice and a general lack of hands-on activities in school. In addition, the general knowledge gained in the classroom sometimes

failed to transfer to the specificity of skills needed at work. Students found it challenging to figure things out on the job and reported needing support to learn how to do things and determine what needed to be done. This happened even though most students agreed that they received a good introduction to their companies at the start of their internships. In the Gulf West internship survey, 15 percent of the men and women reported difficulty finding assistance for technical questions, as did 17 percent of the white interns and 25 percent of Latinx interns. And 15 percent of Latinx interns said they found it difficult to get support communicating effectively in their organizations.

Support on the Job

In many cases, students described a marked lack of employer interest in developing their knowledge and skills beyond the narrow parameters of the employer’s own needs. Some students discussed both a general lack of training and support as well as a workplace environment that discouraged questions and de-emphasized on-the-job learning. As a result, many interns were left to figure out how to get things done on their own. These challenges may be related to the time students spent with their employer supervisors, which varied greatly from student to student, from little to no supervision to weekly check-ins.



“I think that if a company is going to offer an internship that they need to have a better understanding of what that really means. You have a student coming out of school [who] has never been in this position before and he needs guidance and advice. And if he has a question or doesn’t understand, don’t make him feel bad because that’s how I’m made to feel. If I am told to do something and I’m given very vague instructions on how to do it, if I then go back and ask another question, [the employer] makes me feel bad. And so then now I will sit at my desk for hours trying to figure it out on my own before I go ask him because he’s not approachable and I don’t feel comfortable.”

—Gulf West student

Gender, Racial, and Ethnic Disparities

A subset of challenges particularly affected nonwhite students and women of all backgrounds. In some cases, these students reported being treated as if they didn’t belong in the workplace. They said they felt a “What are you doing here?” attitude. One nonwhite student said this could result in self-doubt, explaining, “You can feel intimidated when you’re walking into a room full of people that don’t look like you. . . . Should I even be

here? . . . You get that type of vibe.” One female student reported feeling dismissed and discounted by both customers and coworkers, who expressed a preference—sometimes overtly—for dealing with her male counterparts. This student also recounted experiencing over-friendliness and “touchy-feely behavior” during her internship.

Students suggested potential reasons for the lack of nonwhite workers and women of all backgrounds in technology, saying the gap could primarily be the result of the perceptions of potential participants and the people who influence them. One student of color described a preconceived notion among populations that are underrepresented in technology that IT is too difficult, resulting in what the student characterized as “smart people who wrongly believe they can’t enter the field and succeed.” Multiple students discussed a perception that the tech sector is predisposed toward men. They perceived a belief in this field that men have more inherent interest in technology and noted concerns that women have to work harder to receive the same recognition, opportunities, or benefits as men. In addition, students noted a perception that women who are interested in technology are socially awkward.



Internship Challenges for Employers

Establishing Internships and Learning Objectives

For employers, internships can create a different set of challenges. Some college administrators said that the challenges they hear most often from employers include the difficulty of setting up an internship program for the first time and preparing detailed job postings to ensure that they find the right students to hire. Some employers also said that they need support to structure an internship appropriately to meet student learning objectives and college requirements. Faculty members who work with employers and students to develop learning objectives noted that employers struggle to provide mentors for interns, and finding mentors is especially challenging for small companies.

Scheduling

Employers of all sizes, whether offering paid or unpaid internships, noted that scheduling was a pervasive challenge. For some, the short time frames of internships (60 to 180 hours over a 15-to-16-week semester) meant that interns were constantly churning through a position. As one said, “You just get the intern up to speed, and it’s time for them to go.” Other employers identified a challenge with the hours that interns were available—those

who only worked one day per week took longer to onboard and were slower to pick up on the work.

Many employers noted that interns require more active supervision and thoughtful work assignments than regular employees. One frustrated small employer said, “You can’t just give them an assignment and walk away,” adding that there were many days when he struggled to keep an intern busy with relevant work. Others noted issues with the workplace behaviors of interns, saying some had poor phone etiquette or failed to show up or communicate about absences.

Skills Mismatches and Support

Some employers reported that interns didn’t understand the differences in expectations between classroom and work situations or had trouble applying what they had learned. Some said interns were unprepared to keep up with the activity level and pace of change in a real work environment—though employers did note that that is also a challenge for students from four-year colleges and universities. Employers believe that students need better guidance on job expectations.



“But getting back to the biggest challenge, so I would say it’s them [students] thinking they understand the actual business side of this. And the only way to help them understand that there’s a lot more than what they assume that they know is to actually speak to them and ask them questions and just bring light to what they think they understand but really don’t.”

—Gulf East employer

Lack of Support From Colleges

Several employers reported that there were not enough opportunities to connect with colleges for guidance or feedback. Large and small employers alike expressed a desire for more regular check-ins and active guidance from the college to help structure the internship experience, including support in developing effective job descriptions. They suggested that colleges offer employers ample opportunities to provide feedback to the college on individual interns and on their experiences with the internship program and their overall impressions of student preparation for IT and ET occupations. One supervisor at an employer offering a Gulf West internship echoed the need for this kind of feedback loop to help the college understand why students get hired, what works, and what needs to be adjusted

to help students better meet employers’ needs.

Employers also noted that students lacked an understanding of career pathways in technology, including what entry-level positions were available and how to advance. They also felt that students needed more assistance from the college with resume writing and interviewing skills. One employer suggested that students should do internships earlier in their college programs so they can learn what the day-to-day work is really like before they invest a lot of time and money in training and education.

“We could have used more help from the college setting up the internship.”

—Gulf West employer





Lack of Commitment to Diversity, Equity, and Inclusion

Employer perspectives on broadening the populations represented in the technology field differed from those of students. Employers largely deflected questions about the lack of racial and gender diversity in technology with statements about “hiring the best applicant” without regard to personal characteristics. Some reported that their workplaces had “a mix of people from all walks of life.” Only two employers said that their companies have specific initiatives related to diversity, equity, and inclusion, with one mentioning efforts to build more diverse applicant pools and the other noting that the organization offered diversity training for supervisors and other employees. Others reported that while they would love to expand the diversity of their workforces, the talent pipelines just aren’t diverse enough for them to do it.

Beyond this lack of attention to increasing workplace diversity, we found some employers revealed negative or limiting attitudes about women in technology. Employers expressed ideas like these (paraphrased): Older women are unlikely to understand technology and require special handling by IT staff, a woman should make sure the men around her are comfortable with her being in the

workplace, and women should be spoken to in a softer tone of voice and treated more gently than men. One biomedical engineering technology employer said that while he would ask a male applicant to demonstrate his skills on a piece of medical equipment, he would give a female applicant a task “more specific to typical female culture.” One supervisor shared a commonly cited stereotype in the field, saying that a female student had been hired as an IT intern only because she happened, by chance, to be there—not because she had earned the spot on her own merits. One biomedical ET employer, however, championed diversity in the workplace, saying, “It’s like a baseball team: You need people to play different positions and fill different roles to be successful.” This employer went on to describe the value of having women in biotechnician roles to create a better patient experience for families in maternity and neonatal intensive care units.

When asked what could be done to improve diversity in IT and ET fields, employers shared a number of ideas. One supervisor emphasized helping interns build networking connections and serving as a mentor for women and students from populations that are underrepresented in the technology field. This supervisor also stressed the importance of industry certifications as an objective way to



level the field for nonwhite applicants and women of all backgrounds. Another employer said more needs to be done to attract younger students to the field, so that the talent pipeline can grow increasingly diverse. One ET employer noted that in manufacturing, the shop floor could be a hostile environment for workers who aren't white males, so companies need to do more to address workplace culture if they want to build more diverse workforces. Another employer said diversity initiatives should include efforts to recruit people with criminal

records, who face significant barriers to employment. These candidates need to be counseled on ways to talk about their past and how to “build a personal brand” that emphasizes the positive steps they have taken and the skills they have acquired.

One employer offered this perspective: “Could we use additional help on improving diversity and inclusion? Yeah, I think everybody could. I don't think anybody is telling the truth if they say, ‘No, we got this.’”

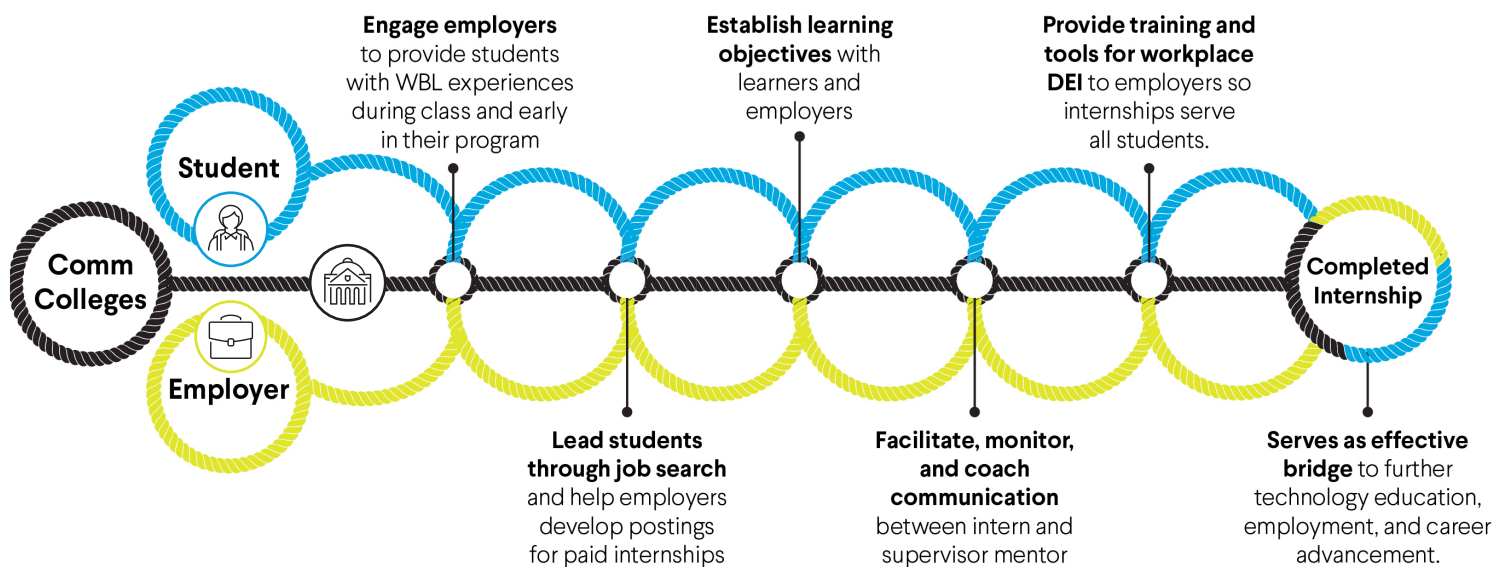


Insights

Internships have the potential to serve as an effective bridge to employment for community college technology students. With the right structures and resources, they provide students with meaningful hands-on real-world technology experiences and help them build professional skills, cultivate self-efficacy, and gain the capacity to reach their education and career goals. Since employers look for these same qualities in job candidates, internships can help students demonstrate that they are prepared for the workforce. For internships to be effective, however, structures need to be in place to support, guide, and engage both students and employers in the process.

FIGURE 2.

CC Links That Bring Students and Employers Together for Effective Internships



The most important element of any effort to build effective internships is to make them a requirement for graduation. At our case study schools, if an internship was not required in a particular course of study, few students participated. This is most likely because of how difficult it was for students to find relevant internship opportunities without extensive support from the college—support that schools are more likely to provide when an internship is required. Without the expectation that all students will participate in an internship—and without adequate structures and resources to support such a requirement—internships will likely remain beyond the reach of most community college technology students. And when sufficient supports are not available, it's likely that only students who face the fewest barriers to participation will pursue internships—meaning technology internship programs could inadvertently reproduce the employment inequality that already exists in the tech sector.

Our research shows that the challenges with internship programs do not end with the difficulty of finding internships. For example, once they were in internships (required or not), students reported feeling unprepared for what they were being asked to do on the job and said they needed more support from supervisors to help

them navigate technical and professional challenges. Moreover, students said taking part in an internship was difficult when they were already juggling competing school, work, and family responsibilities, and they said that unpaid internships were simply untenable.

In addition to helping ensure that every technology student had an opportunity to access all benefits that internships offer, making internship a graduation requirement would spur colleges to provide the supports that maximize learning outcomes. As hubs of student and employer engagement and as providers of technology education, community colleges are well-positioned to lead these efforts.

Our research demonstrates that community college students require ongoing assistance from faculty and career counselors with the process of finding and applying for internships. Of particular importance is the need to identify viable technology internships out of the overwhelming number of job postings students will find online. Once on the job, students need faculty support with developing and assessing learning objectives, navigating workplace cultures, building productive relationships, communicating with supervisors and mentors, and solving problems in a fast-

paced environment. And to re-emphasize two important points, for internships to be viable for students, they need to be paid and they need to allow for flexible scheduling and be geographically accessible (or include remote work options).

Employers require assistance from community colleges to understand how technology internships can promote recruiting efficiencies that aren't possible with approaches that involve an overreliance on four-year college degrees. They also need help creating an internship scope of work that matches the technical and professional skills students bring to the workplace while building opportunities for technical and professional growth. Additionally,

employers need guidance to learn how to effectively onboard interns and provide them with appropriate supervision, coaching, and mentorship.

To ensure that internships are effective for all students, community colleges need to provide students from populations that are underrepresented in the technology workforce with targeted support to help them navigate technology careers, and they need to provide employers with strategies for building diversity, equity, and inclusion into the internship experience.

In the final section of this report, we draw from our research findings to suggest strategies that community colleges can employ to build effective technology internships.



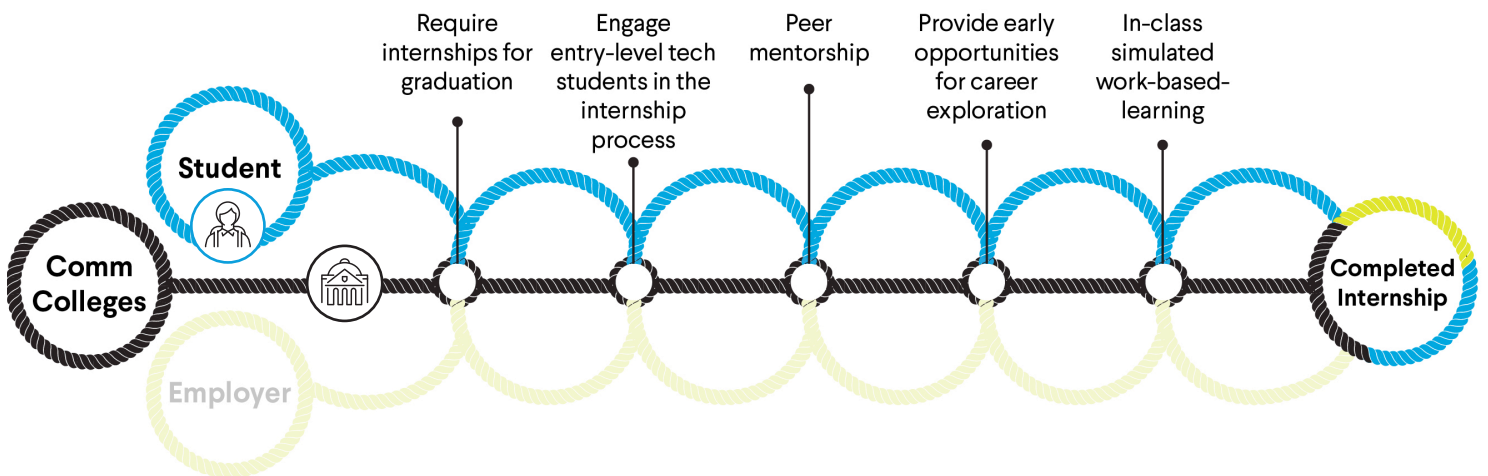
Promising Practices

Internship Requirement

Community colleges play a pivotal role in ensuring that internships are effective. They serve as the hub that brings students and employers together and supports their participation and engagement. Through their policies, programs, and participation, community colleges provide scaffolding necessary to build effective bridges to employment through internships. Community college internship programs that aren't adequately supported by college policies and don't have sufficient staffing and other resources will largely go underutilized. When community colleges require internships for graduation, it is more likely that they will make the investments necessary to build effective technology internships that are accessible to all students.

FIGURE 3.

CC Connections: Engaging Students to Internships



Pre-Internship Support

Engage entry-level technology students in the internship process:

Include an introduction to internships—with an overview of the benefits of internships and a rundown of how students find and participate in internships—in introductory ET and IT courses. This will familiarize students with the process and help them plan ahead, assure them that they will have the support of instructors and internship coordinators, and let them know what resources are available.

Provide early opportunities for career exploration:

Consider integrating employer engagements (such as job fairs, informational interviews, site visits, and job shadowing activities) into introductory ET and IT classes to encourage early career exploration and to help students understand technology career pathways. If these activities are built into the coursework, students who face time constraints or take classes online will have easier access.

Peer mentorship: Invite students who have participated in internships to serve as peer mentors to newer students. Women of all backgrounds and students of color would especially benefit from relationships with mentors who themselves are women and students of color. Peer mentors could provide in-class presentations about

the challenges and opportunities of the internship experience, offer one-on-one coaching for students who need help with the application process or with on-the-job challenges, help newer students see the benefits of hands-on learning and the importance of developing professional skills and building networks, and generally provide ongoing support during the internship.

In-class simulated work-based-

learning: Provide in-class opportunities for students to participate in simulated on-the-job technology projects—like case study projects in business programs—where students work in teams to solve real-world technology problems. These activities would help students develop both the technological expertise and the professional skills that are valued in the labor market and prepare them for the internship.

Application and Internship Support

Faculty internship mentor: At the start of their programs, students can be paired with faculty mentors—possibly their academic advisors—so they will have someone to guide them through the internship application process. Instructors who have established relationships with particular students and are familiar with their technological and professional skills

already serve as trusted resources. They can provide ongoing support, offering students insights on job search strategies and helping them connect with employers. They could also offer advice about adding technical and professional skills and prior work experiences to their resumes, negotiating pay and schedules, overcoming transportation challenges, and establishing internship learning goals.

Ongoing faculty support: Our research indicates that students benefit from support throughout the internship process. Faculty mentors should continue supporting students who have begun their internships, offering advice about communicating with supervisors, solving technical problems, working as a member of a team, breaking through the sense of isolation young people might experience in the workplace, and building a network.

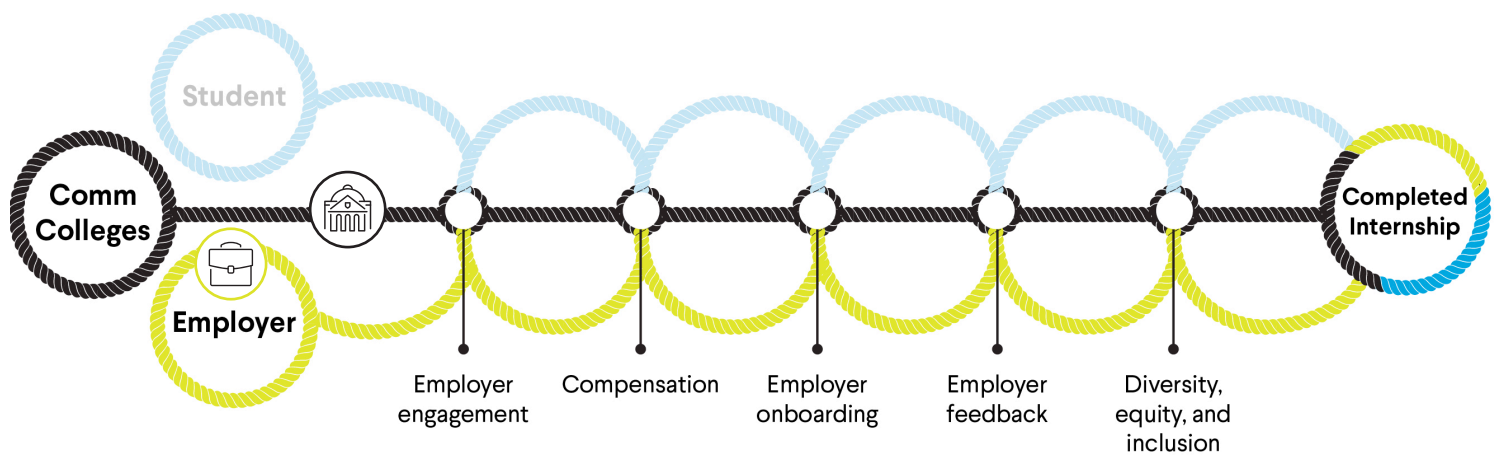
Employer mentors: The power of experiential learning diminishes if the participants don't have access to knowledgeable guidance. Therefore, interns will also need access to employer mentors to succeed and fulfill their technical and professional responsibilities. Employer mentors can help students navigate organizational cultures and network within companies and throughout industries, help them solve problems, and give them advice about where and when to seek additional help.

Employer Engagement, Support, and Partnerships

Employer engagement: To expand employer engagement with internships, [community colleges can work with employers](#) to define technology career pathways within their organizations and explore how these pathways benefit organizational workflows and effectiveness.

FIGURE 4.

CC Connections: Engaging Employers to Internships



Compensation: Because pay plays such an important role in students' ability to participate in internships, employers who cannot pay their interns should not be considered for partnership in most cases.

Employer onboarding: Community colleges should provide employers with online or in-person training on how to set up internships and work with interns. Among other things, they should offer instruction on onboarding new interns; supervision and mentorship; defining appropriate job tasks, scopes of work, and challenges; creating networking opportunities; and providing adequate supports for students from populations that are underrepresented in the technology workforce.

Employer feedback: Community colleges should meet with employers several times during internships to get feedback on programs' successes and challenges. When a student completes an internship, community colleges should conduct a debriefing with employer supervisors to gather feedback on what worked and what needs improvement.

Diversity, equity, and inclusion: Faculty and administrators should work with employers to help them build welcoming workplaces by emphasizing diversity, equity, and inclusion in their recruiting, hiring, and workplace practices.

Appendix: Context, Data, and Methodology

Florida's booming technology economy and strong state infrastructure for career and technical education (CTE) made it a robust state in which to base our research on building and diversifying STEM talent through community college technology internships. Florida has a large two-year college system, enrolling more than 801,023 students, and producing 166,936 associate degree graduates and certificate recipients in 28 colleges during in the 2015-16 academic year, the latest year for which data is available (Florida Department of Education). In addition, its innovative work-based-learning policies, which include subsidies for postsecondary instruction and WBL apprentices and strong support from state leaders, have increased awareness and interest in STEM on-the-job training and education. Florida's policies have made it a leading state in terms of the comprehensiveness and usability of its state longitudinal database, which links student and teacher P-12 data with CTE programs and two- and four-year state colleges and universities. Florida's growing tech sector, coupled with its policy and data infrastructure, make it a prime location for studying the diversification of the tech talent pool through community college STEM WBL programs.

Gulf West Community College is a large racially and ethnically diverse urban college serving 65,000 students from 100 countries.¹¹ Since 2011, Gulf West has required all engineering and information technology students to participate in an internship to complete their programs. Between 2010 and 2019, 6,277 students participated in technology education, including 1,126 engineering technology students and 5,151 information technology students. Seventy-seven

percent of the students were male, 64 percent were white, 13 percent were Black, 12 percent were Latinx, and 4 percent identified as Asian. At Gulf West, we conducted 63 one-hour interviews between October 2018 and August of 2019 with 30 technology students (18 who participated in internships and 12 who did not); 16 college faculty members, administrators, and staff members; and 16 employers.¹² Interviews were recorded and transcribed. Two researchers coded each interview. We also fielded an internship survey between March 2019 and March 2020, obtaining 106 respondents out of 162 students for a response rate of 66 percent. The survey consisted of questions related to student satisfaction and challenges with the internship process, education and career goals, and self-efficacy in pursuing goals. Finally, we analyzed 10 years of student administrative data (2010-2019) for trends in technology degree completion and internship participation by demographics, credits, and grades.

Gulf East Community College is a large racially and ethnically diverse urban college with a total enrollment of 62,508 students, 66 percent of whom are members of groups that are underrepresented in higher education. After graduating, students attain bachelor's degrees at a rate 50 percent higher than the national

average, and there is virtually no gap in three-year graduation/transfer rates between the overall student body and students who are members of demographic groups that are underrepresented in higher education (for whom the bachelor's degree completion rate is 46 percent). Internships are mandatory for marine and biomedical technology students, not an option for all other engineering technology students, and a nonrequired elective for information technology students. Between 2010 and 2019, 6,465 students enrolled in technology courses, with 1,697 in engineering technology and 4,768 in information technology. Men accounted for 83 percent of the technology students. Twenty-two percent of the technology students were white, 34 percent were Black, 34 percent were Latinx, and 4 percent identified as Asian. At Gulf East, we conducted 50 one-hour interviews with 31 students (12 who participated in internships and 18 who did not); 13 faculty members, administrators, and staff members; and 6 employers, following the same interviewing and analysis process that we used at Gulf West.¹³ We similarly analyzed statistics for 10 years of student administrative data (2010-2019).

Endnotes

- 1 According to the Bureau of Labor Statistics, between 2009 and 2019, the number of information technology jobs that don't require bachelor's degrees grew 11 percent over the past 10 years and the number of sub-engineering technology jobs that don't require bachelor's degrees grew 3 percent.
- 2 We focus on credit-bearing internships because neither the college nor the state collects data on noncredit internships. Also, due to a lack of standardization and oversight, noncredit internships are much more difficult to assess.
- 3 The survey was only conducted at Gulf West, and we collected responses before the COVID-19 pandemic. There were not enough internship participants at Gulf East to make a survey necessary.
- 4 Another component of our research project was a multivariate analysis of technology internship participation drawn from the restricted-use Florida Department of Education Data Systems (2010-2019).
- 5 It should be noted, however, that at Gulf East, a few students had an opposite experience, reporting that their internship was not a good fit with their technology skills. Attention to fit is something we address further in the discussion of findings.
- 6 There were no notable differences in the discussion of internship learning opportunities based on the gender or race of interviewees.
- 7 At Gulf East, for students who began prior to 2017, by 2019, 75% had left without completing a degree compared to 16% who did. At Gulf West, for students who began prior to 2017, by 2019, 51% had left the college without completing a degree compared with 24% who did.
- 8 Our analysis of the Florida Department of Education data confirms the low participation in technology internships. Only 2.4 percent of all technology students participated in an internship between 2014 and 2019, and just 4.8 percent of technology graduates had done so.
- 9 Participation was less than 100 percent in the ET program because some students were allowed to use prior work experience to earn their internship credit or substitute the internship with a capstone project.
- 10 At Gulf East, the internship was not offered for credit (either as an elective or required) in the computer-aided design and engineering technology programs.
- 11 Pseudonyms used for confidentiality.
- 12 Among the students we interviewed, 8 were female and 21 were male. By race and ethnicity, we interviewed 16 white, 4 Black, and 3 Asian students. Information about race and ethnicity was not reported for 7 students.
- 13 Among the students interviewed, 7 were female and 21 were male and one student did not report gender. By race and ethnicity, we interviewed 2 white, 1 Asian, 9 Black, and 14 Latinx students. Information about race and ethnicity was not reported for 5 students.

References

- Arthur, Brittany, and Batsheva Guy. 2020. “No, I’m Not the Secretary’: Using Participatory Methods to Explore Women Engineering Students Experiences on Co-Op.” *International Journal of Work-Integrated Learning* 21, no. 3: 211-222. https://www.ijwil.org/files/IJWIL_21_3_211_222.pdf.
- Bragg, Debra D., et al. February 1995. *Work-Based Learning in Two-Year Colleges in the United States*. National Center for Research in Vocational Education, Graduate School of Education, University of California at Berkeley. <https://eric.ed.gov/?id=ED378446>.
- Carnevale, Anthony P., and Nicole Smith. 2018. *Balancing Work and Learning: Implications for Low-Income Students*, Georgetown University Center on Education and the Workforce. <https://cew.georgetown.edu/cew-reports/learnandearn/>.
- Chopra, Shivangi, et al. 2020. “Gender Differences in Work-Integrated Learning Experiences of STEM Students: From Applications to Evaluations.” *International Journal of Work-Integrated Learning* 21, no. 3: 253-274. https://www.ijwil.org/files/IJWIL_21_3_253_274.pdf.
- England, Paula. “Reassessing the Uneven Gender Revolution and Its Slowdown.” December 22, 2010. *Gender & Society* 25, no 1: 113-123. <https://doi.org/10.1177/0891243210391461>.
- Florida Department of Education. *Florida College System: Facts at a Glance*. Accessed November 2021. <https://www.fldoe.org/schools/higher-ed/fl-college-system/facts-at-a-glance.stml>.
- Holzer, Harry J., and Erin Dunlop. 2013. “Just the Facts, Ma’am: Postsecondary Education and Labor Market Outcomes in the U.S.” IZA Discussion Paper No. 7319, March 2013. <https://ssrn.com/abstract=2250297>.
- Holzer, Harry J. 2015. *Higher Education and Workforce Policy: Creating More Skilled Workers (and Jobs for Them to Fill)*. Brookings Institution, April 2015. https://www.brookings.edu/wp-content/uploads/2016/06/higher_ed_jobs_policy_holzer.pdf.
- Hora, Matthew T., Matthew Wolfgram, and Zi Chen. December 2019. “Closing the Doors of Opportunity: How Financial, Sociocultural and Institutional Barriers Inhibit Access to College Internships,” Wisconsin Center for Education Research. https://ccwt.wceruw.org/wp-content/uploads/2021/02/CCWT_report_Closing-the-doors-of-opportunity.pdf.
- Hughes, Katherine L., and Melinda Mechur Karp. 2006. “Strengthening Transitions by Encouraging Career Pathways: A Look at State Policies and Practices,” Community College Research Center. CCRC Brief, February 2006. <https://files.eric.ed.gov/fulltext/ED494140.pdf>.
- Rodriguez, Jacqueline, Heather Fox, and Heather McCambly. 2016. “Work-Based Learning as a Pathway to Postsecondary and Career Success.” Office of Community College Research and Leadership. *Insights on Equity and Outcomes*, no. 18, October 2016. <http://eric.ed.gov/?id=ED574535>.
- Simard, Caroline. 2007. “Barriers to the

Advancement of Technical Women: A Review of the Literature,” Anita Borg Institute for Women and Technology. <https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.176.114&rep=rep1&type=pdf>.

Starr, Christine R. 2018. “I’m Not a Science Nerd!’: STEM Stereotypes, Identity, and Motivation Among Undergraduate Women.” *Psychology of Women Quarterly* 42, no. 4 (December 1, 2018): 489–503. <https://doi.org/10.1177/0361684318793848>.

Swail, Watson. 2002. A cursory review of literature related to work-based learning at the postsecondary level, Pell Institute for the Study of Opportunity in Higher Education, September 25, 2002. https://www.researchgate.net/publication/277282135_A_Cursory_Review_of_Literature_Related_to_Work-Based_Learning_at_the_Postsecondary_Level.



50 Milk St., 17th Floor, Boston, MA 02109

122 C St., NW, Suite 280, Washington, DC 20001

505 14th St., Suite 340, Oakland, CA 94612

TEL 617.728.4446 **WEB** www.jff.org