

Understanding the Impact of the ATE Delta Information Systems and Cyber (DISC) Initiative at Phillips Community College *~Year 4 Evaluation Activities~*

A Report To:



Phillips Community College

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Introduction

This report presents key findings from evaluation work supporting Year 4 activities conducted for Phillips Community College's ATE program, "Arkansas Delta Information Systems and Cyber (DISC) Initiative." Through this NSF-ATE project, Phillips Community College will work to (1) increase the quality and capacity of technicians in the Information Systems Program that graduate with certificates and degrees ready to enter the workforce, and (2) increase the quality and capacity of the faculty that teach in the Information Systems Program. As this is the third year of program implementation, results focus on the student outcomes that best fit anticipated formative and summative achievements within the fourth year of programming:

- ✓ Industry relevant, "hands on" curriculum is created,
- ✓ Student enrollment increased by 20%/year,
- ✓ Student retention rate increased by 5% each year,
- ✓ 12 students enrolled in Information Technology degree program,
- ✓ 9 additional students graduate with Certificate of Proficiencies,
- ✓ 9 additional students graduate with Information Systems degree,
- ✓ 80% of graduates obtain industry certifications, and
- ✓ Faculty earn three high level certifications each.

To assess progress toward these outcomes, program evaluator Dr. Megan Mullins, in partnership with the Principal Investigators, conducted the following evaluation activities¹:

- ✓ Analysis of Secondary Institutional Data: Assessment of 2019-2023 academic enrollment and demographic data,
- ✓ Survey Research: Year 3 Pre/Post Recap², Year 4 student annual student satisfaction survey,
- ✓ Key Partner Interviews: Sustainability interviews with administration, community partner, and program graduate participants, and
- ✓ Focus Groups: Two Year 4 student focus groups.

Year 4 Progress and Achievement of Identified Outcomes

The following performance measures are linked to the program's completion outcomes. Evaluation results will be organized under each indicator subheading.

- The extent to which the project has been implemented as intended (timeline, enrolled participants, activities, cost),
- Increased student information technology knowledge and "hands-on" skills,

¹ The scheduled site visit was canceled and in-person student focus groups moved to an online format to conserve remaining funds.

² Y3 Pre/Post results presented in this report as the fullest example of improvements in content knowledge and skill sets.

- Student satisfaction with their overall program experience, and
- The extent to which investigators gain increased understanding of faculty and student needs and challenges as the DISC Initiative is implemented,
- Most and least sustainable components, and
- Program elements with the most amount of impact.

Extent to Which Project is Implemented as Intended

The program is being implemented as planned and the project is also operating within cost and inside its projected timeline, especially now that it is operating with fewer COVID and natural disaster challenges as was faced in previous years. This program has met its goals despite multiple challenges across the years of its implementation.

<i>Table 1. Course Enrollment Demographics</i>	Year 1 2019-2020 (n=18)		Year 2 2020-2021 (n=30)		Year 3 2021-2022 (n=32)		Year 4 2022-2023 (n=42)	
	#	%	#	%	#	%	#	%
Sex	18	100%	30	100%	32	100%	42	100%
Female	3	16.7%	8	26.7%	8	25.0%	14	33.3%
Male	15	83.3%	22	73.3%	24	75.0%	28	66.7%
Ethnicity								
White/unknown	9	50.0%	15	50.0%	16	50.0%	23	54.7%
Domestic students of color	9	50.0%	15	50.0%	15	46.9%	17	40.5%
Other					1	3.1%	2	4.8%
First generation	6	33.3%	13	43.3%	8	25.0%	7	16.7%

The program is continuing to show graduates in both the AAS and CP programs. Graduate numbers fluctuate due to rotation of classes. Enrollment continues to increase and graduate numbers are forecasted to increase next year.

<i>Table 2. Graduates in AAS Degree and Certificates of Proficiency</i>	Year 1 2019-2020 (n=9)	Year 2 2020-2021 (n=28)	Year 3 2021-2022 (n=30)	Year 4 2022-2023 (n=18)	Total (n=85)
	Year 1 #	Year 2 #	Year 3 #	Year 4 #	Total #
IS.AAS	2	5	9	4	20
MANPC.CP	5	6	4	3	18
MSOPSYS.CP	1	6	5	4	16
CYS.CP	0	6	4	4	14
PROG.CP	1	5	8	3	17

IS.AAS (Information Systems Technology Degree)

MANPC.CP (Managing & Maintaining PC - Certificate of Proficiency)

MSOPSYS.CP (MS Operating Systems Desktop Support - Certificate of Proficiency)

CYS.CP (Cyber Security - Certificate of Proficiency)

PROG.CP (Programming/Coding - Certificate of Proficiency)

Curriculum implementation is proceeding as planned. Instructors have moved to a web-based simulation product called Infosec Learning Labs. Due to a ransomware attack on the college network, instructors selected another simulation software that provide even more high-tech virtualization practice sets. Students can access these learning labs through the web-based platform and receive feedback on what they missed. These Learning Lab simulations provide a real-world learning environment for students.

Increased Student Information Technology Knowledge and “Hands-On” Skills

This section is informed by the Year 3 pre- and post-program survey results, the 2023 student satisfaction survey, and student focus groups.

Respondents of the Year 3 pre- and post-program surveys were asked to rate their ability to understand and utilize ten skills and concepts introduced in the curriculum both upon entering and completing the program using a scale from “Not At All” (1) to “To A Very Great Extent” (5). When comparing pre- and post-test responses, testing revealed statistically significant growth in all ten of the skills and concepts measured, providing strong evidence that the program has contributed to an increase in students’ knowledge and skills in relevant task areas. The effect size for each of these differences is very large, further demonstrating the impact the program has had on students. Importantly, however, these tests violated the assumption of independent observations, and the results should therefore be interpreted with caution (see Table 3, next page).

Table 3: Significant Growth in Ability to Engage with Program Skills & Concepts³				
	Group Means		Test Statistics	
	Pre-Test (n = 11)	Post-Test (n = 6)	Sig.	Hedge’s g⁴
<i>Use your critical thinking skills effectively</i>	4.00	5.00	**	1.16
<i>Configure desktop operating systems for use in a networked environment</i>	2.82	5.00	***	1.47
<i>Understand how Cybersecurity concepts relate to legal regulations and risk mitigation for industry and home-based environments</i>	2.64	4.83	***	1.60

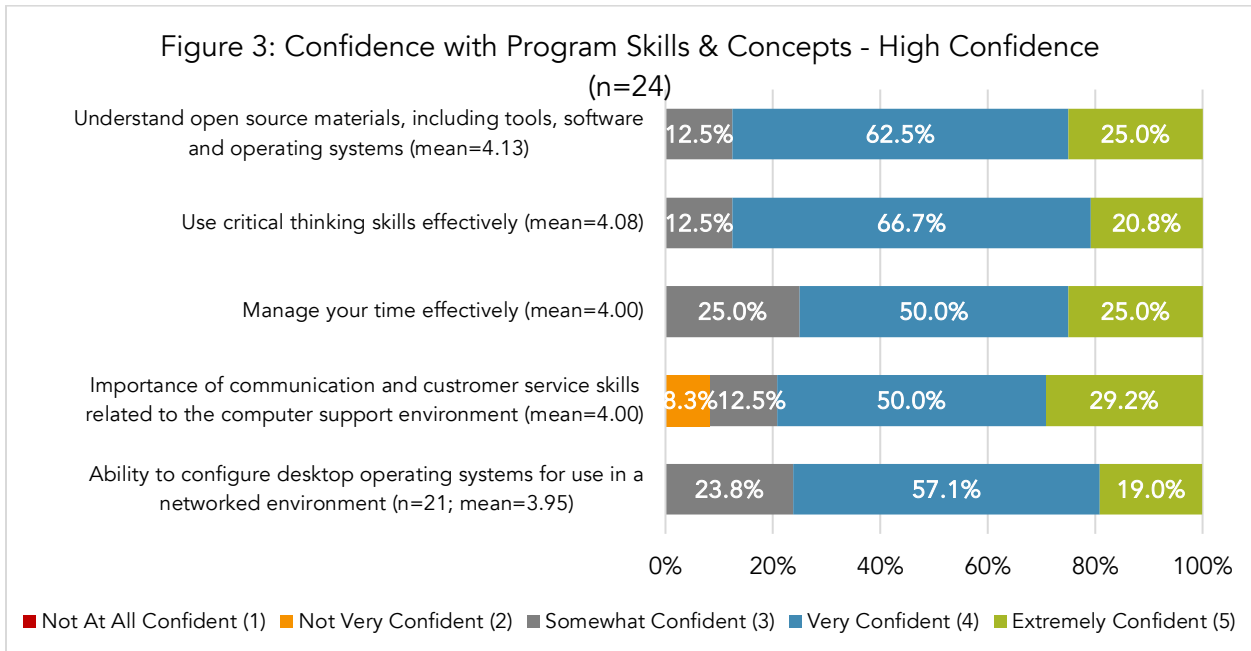
³ These tests violate the independent-samples t-test assumption of independent observations. Use caution when interpreting results.

⁴ Hedge’s g is a measure of effect size, which provides a standardized way of assessing the magnitude of the differences observed in the data. Hedge’s g is interpreted as “no effect” when $g < 0.20$, “small” when $g < .50$, “moderate” when $g < 0.80$, “large” when $g < 1.00$, and “very large” when $g \geq 1.00$.

Configure firewalls and servers for a network environment	2.64	4.83	***	1.49
Understand open source materials, including tools, software and operating systems	3.64	4.83	***	1.44
Code, debug basic programs, and test applications	2.91	4.67	**	1.10
Confidently communicate service skills related to the computer support environment to others	3.55	4.67	**	1.10
Use acronyms/terminology associated with computer and networking technology with ease	2.45	4.67	***	2.03
Build virtual machines	2.73	4.50	**	1.12
Manage your time effectively	3.64	4.50	*	0.92

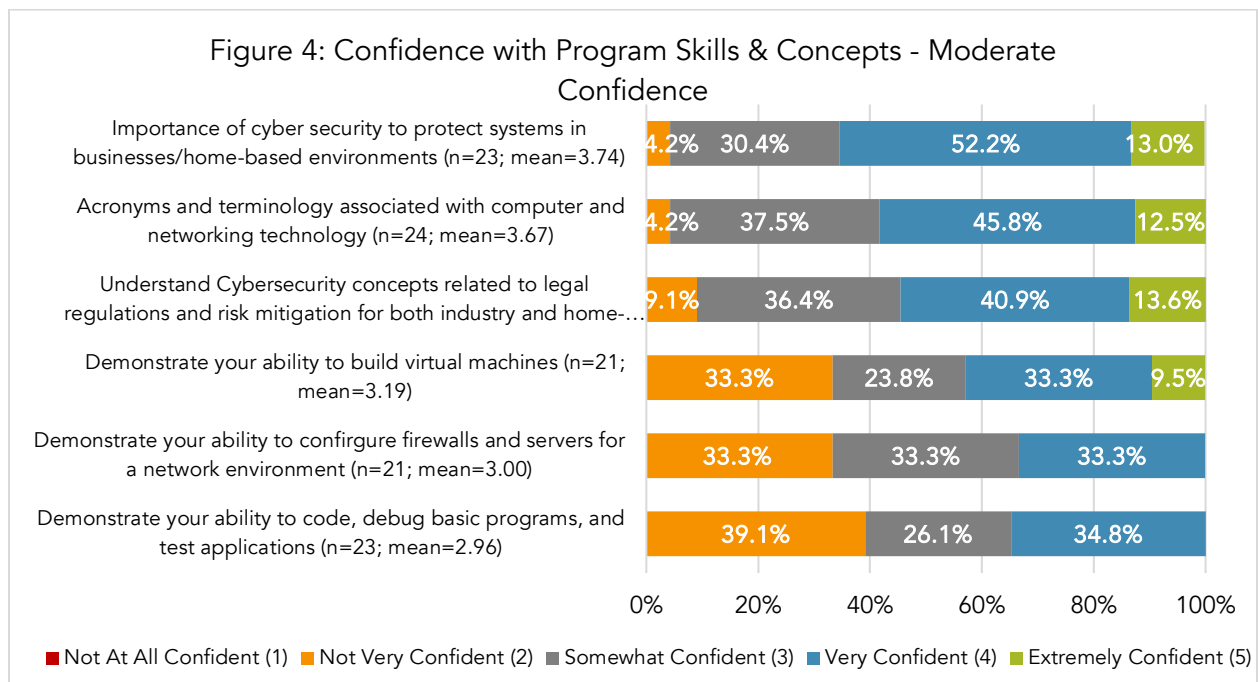
Note: All significance testing is one-tailed.
 Sig.: *p<.05; **p<.01; ***p≤.001

The 2023 satisfaction survey results indicate that, on average, students are either “Somewhat” or “Very” confident in all of the skills and concepts covered. Students express the greatest confidence in their ability to understand open-source materials (mean=4.13), use critical thinking skills (mean=4.08) and manage their time effectively (mean=4.00), understand the importance of communication and customer service skills in a computer support environment (mean=4.00), and configure desktop operating systems in a networked environment (mean=3.95).



Note: Respondents were given the option to select “N/A.” These responses are treated as missing.

Satisfaction survey results indicate that students are less confident in their ability to understand the importance of cyber security to protect systems in business and home-based environments (mean=3.74), use acronyms and terminology associated with computers and networking (mean=3.67), and understand Cybersecurity concepts related to legal regulations and risk mitigation (mean=3.59). Students are least confident in demonstrating their ability to build virtual machines (mean=3.19), configure firewalls and servers for a network environment (mean=3.00), and code, debug, and test applications (mean=2.96).



When asked to identify something they have learned in the program that is helpful as they prepare for their career, those completing the student satisfaction survey primarily identify the technical skills gained in the program and their growth in professional skills (e.g., organization, communication, proficiency with Microsoft applications, etc.).

Verbatim Comments:

- "Programming different software through virtual environments." (Helena-West Student)
- "Networking and many other computer related skills" (Stuttgart Student)
- "I have learned how to do system updates on computers." (Helena-West Student)
- "How to create a database and why they are important." (Stuttgart Student)
- "I have learned how to be organized and keep up." (Stuttgart Student)
- "...The type of patience, work ethic, and communication that you would need to have not only in this field but in others." (Helena-West Student)
- "This class has taught me how to successfully use PowerPoint, Word, and Excel for many different things. – to create flyers, help track money, or even just a presentation." (Stuttgart Student)

Year 4 focus group results also demonstrate student acquisition of professional skills through program activities. When asked about what other professional skills they are learning, students note communication, teamwork, organization, and time management.

Verbatim Comments:

- *"...Learning to communicate simply through email is something new to me, but I feel like it will carry on into a career that's more professional than sending somebody a text message."* (Helena-West Student)
- *"Asking for help, because one thing I [had] trouble with was doing all the work and then struggling by myself... You can apply that broadly in life because you can't do everything in life by yourself. You have to ask for help sometimes."* (Helena-West Student)
- *"But definitely the teamwork, I'm used to working by myself. In Maintaining PC, when we're working together to build a computer, there is communication about who's going to do this."* (Stuttgart Student)
- *"It's really teaching me how to be more organized than I am because you have to have all the screws in a certain place and all the parts."* (Stuttgart Student)
- *"It's helped me a lot with time management especially in the coding classes. You're given a whole packet of things you have to do, and it looks like it's just one assignment, but it's really several things that you have to, so you have to go in early on, look at all of it and really manage your time on how you're going to get all of them done by the due date."* (Stuttgart Student)

Lastly, key partner interview participants note program highlights after four years as being caring, high quality faculty, a general heightened awareness of cybersecurity as a career in the business community and on campus, and how the professional resources that come with working on an NFS grant have benefited the infrastructure of the institution by supporting program implementation as well as faculty professional development.

Verbatim Comments:

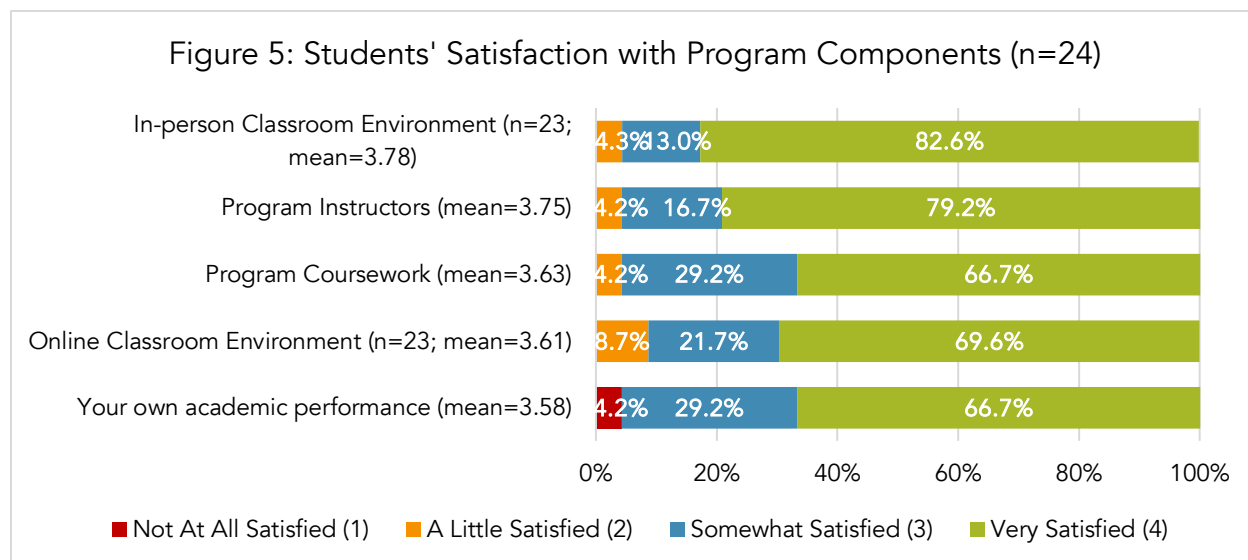
- *"It has elevated student engagement because they started a Women in Cybersecurity program. There aren't as many women as men. I think we might be the first in Arkansas. They are very proud of it. We have also opened a CompTIA testing site for the certification. We have had people come from all over, some of them have not really had formal training here, and they have expressed interest."*
- *"With all the emphasis on cybersecurity, I just think the exposure they've been able to give the students and just the way they've expanded that program, I think that's been the biggest benefit to the college. They've [also] established a women in cybersecurity group on campus."*
- *"Students are going through the program, and then they are ready to hit the workforce when they leave us. They are ready to go into a four year or two, or even go higher. I see more involvement with businesses and partnerships trying to help keep the program going for many, many years. I don't see this going away anytime soon and we are all going to make sure that we keep it going. The most important thing is the students have the ability to go out in the workforce and do what they have learned from us."*

- *“They reconfigured the degree with more basic courses to attract them into cybersecurity. It is a certificate that is within a degree, but initially with that certificate, you couldn't study and get financial aid. We are applying to the US Department of Education to get financial aid with this reconfiguration of the cybersecurity [program] it is one of the eligible standalone programs. If we get approval for this... it would mean that students could come and just get this and use Pell to pay for that. They wouldn't have to get an associate degree or technical certificate.”*
- *“The most important qualities from after the four years have been a huge benefit to the community, just overall businesses, students, the college being a small community, our resources are really limited. Having this program to educate students I think is great.”*
- *“The professional development that has gone with this has been pretty amazing. The resources that this grant has put them in contact with have been overwhelming. They have gone to workshops; they went to an NSF [conference]. They came back with all sorts of stuff and they are still connected with people that they met at that conference. That that is very, very important because it gives you somebody to call to say, ‘I'm not sure how to do this.’ That has been great. They have done a wide range of networking to ensure that every time there is a professional development opportunity, they take advantage of it.”*

Satisfaction with Program

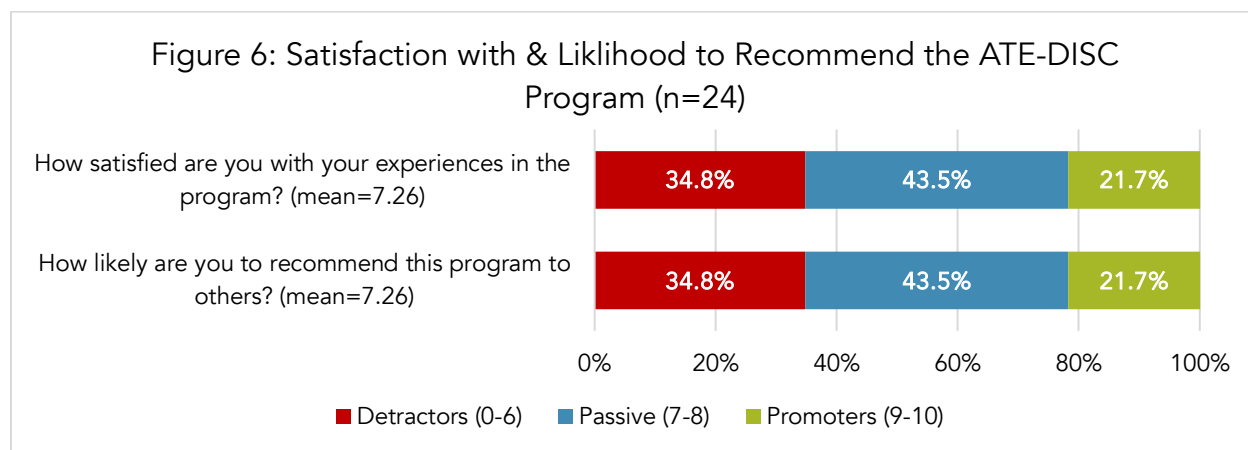
These results are informed by data collected from the 2023 student satisfaction survey and Year 4 student focus groups.

The survey asked students to rate their satisfaction with five program components on a scale from “Not At All Satisfied” (1) to “Very Satisfied” (4). Students were most satisfied with the in-person classroom environment, program instructors, and coursework, and were slightly less satisfied with the online classroom environment and their own academic performance.



Note: Respondents were given the option to select “N/A.” These responses are treated as missing.

To measure overall program satisfaction, students completing the 2023 satisfaction survey were asked to rate their satisfaction with the experience and the likelihood that they would recommend the program to others on a scale from “Extremely Dissatisfied/Unlikely” (0) to “Extremely Satisfied/Likely” (10). Although most respondents provide both satisfaction and recommendation ratings of seven or higher, about a third provide ratings that fall within the “detractor” range (0-6). This suggests that, while the program has had a positive impact on most students, there remains room for improvement.



Focus group participants also report that the program is very helpful, with quality instructors and supportive peers. However, changes envisioned by these students include more in-person learning opportunities and relevant work-study offerings at PCCUA.

Verbatim Comments:

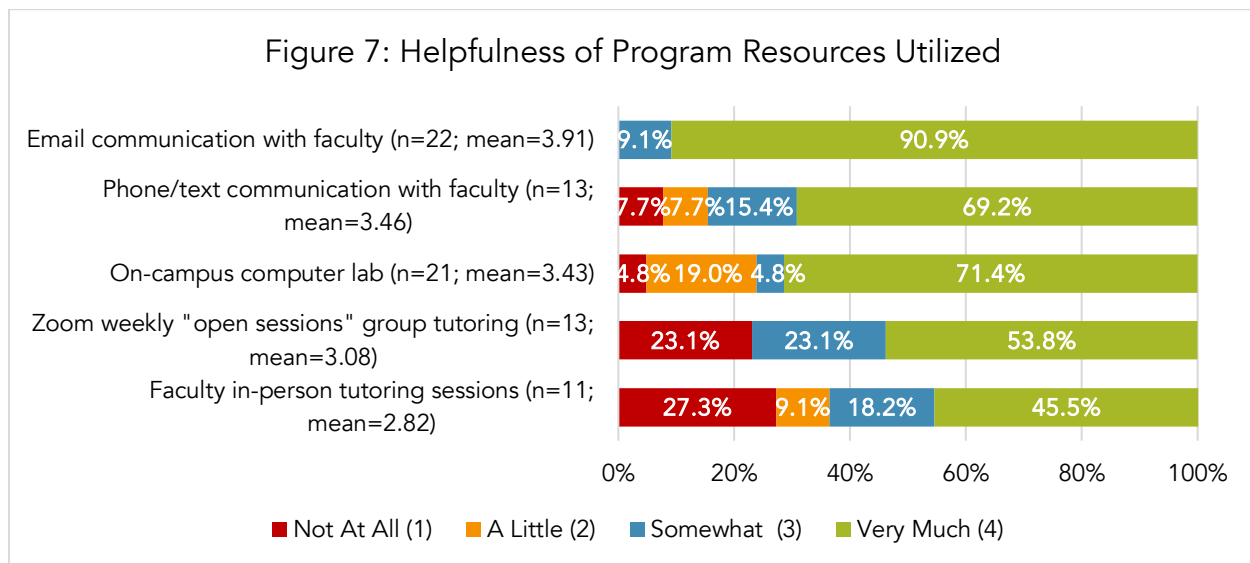
- *“Sometimes I do wish that more of my classes were in-person instead of just online to get to share that experience with everyone in the room.”* (Helena-West Student)
- *“I only see them in-person once a week in lab [but] sometimes I can’t make it because I either work or I’m caught up doing other homework, or something came up... I just wish that I can see them more in person.”* (Helena-West Helena Student)
- *“I would’ve liked a work group, but PCC does offer a work study for some of the other majors or degrees that they have... The only thing is the IT department, they don’t have that. I wish that they did.”* (Stuttgart Student)

Enhanced Faculty Understanding of Student Needs and Experiences

This summary is informed by data collected in the student satisfaction survey and student focus groups and results are then discussed with the project PIs who are teaching faculty to plan for the upcoming year.

To better document both resources used and resources needed by students, the 2023 satisfaction survey asked respondents the extent to which they utilize resources for their program assignments. Survey results indicate that most students found all resources to be “Somewhat” or “Very” helpful, though about one-fifth to one-third rate the on-campus

computer lab, Zoom group tutoring sessions, and in-person faculty tutoring sessions as only “A Little” or “Not At All” helpful.



Note: Respondents were given the option to select “N/A – Have not used this service” These responses are treated as missing.

When asked what additional resources they need to be successful in the program, survey respondents express a need for better informational resources and explanations of the course material, as well as a desire for ongoing support from faculty and peers.

Verbatim Comments:

- “An updated workbook to go with the new updated software.” (Stuttgart Student)
- “Maybe the book could give better step-by-step instructions.” (Stuttgart Student)
- “More explanation on why we use certain things in command prompt in the lab.” (Stuttgart Student)
- “Instructions and program explanations for non-Windows users. As a Mac user, there was nothing in place for me. I had to figure out anything computer specific on my own, including what coding program to use and how to use it.” (Stuttgart Student)
- “All the help I can get from teachers and others.” (Helena-West Student)
- “Having peers to talk to.” (Stuttgart Student)

Focus group participants also suggest program improvements to better support current and future students. Students from the Stuttgart campus suggest providing more internship opportunities and resources for Mac users, while students from the Helena-West campus predominately state that they are satisfied with things as they are and highlight the supportive faculty they have encountered during their time in the program.

Verbatim Comments:

- “An internship. I know Lenox has one, clinicals. She's trying to sign us up for clinicals, is what she's doing.” (Stuttgart Student)

- *"I think some kind of work program while you're in this to really help you see what it's going to be like when you get out there."* (Stuttgart Student)
- *"There aren't very many resources for people who use Apple or different things other than Windows. When I started coding classes I had to figure it out myself and do research and try to find my own coding platform basically that worked with the instructions that were in the book."* (Stuttgart Student)
- *"Honestly, I can't say that there's anything that's missing from our instructors. You could not ask for two better instructors. I mean as far as resources, help questions, communication, it's all there. I don't see what else there, there could be."* (Helena-West Helena Student)
- *"From the classes I have taking, I don't think it needs anything else other than the textbook and the instructor."* (Helena-West Helena Student)

Program Sustainability

Key partners were asked to speak to the sustainability of the initiative. When asked what decisions need to be made to sustain this program after external funding ends, participants focus on the need for more instructors in the future as the program continues to grow, keeping up to date on the latest technology, and getting information about the cybersecurity program out to the community and businesses who can mutually benefit from it. All believe that the program will continue and possibly expand in the future, especially considering the demand for cybersecurity professionals. The College will continue to fund the program internally and may seek additional promotion to attract more students.

Verbatim Comments:

- *"One of the main decisions to keep the program going is keeping an instructor on campus for students. With [name] retiring and moving down, she is just doing fewer classes this semester until she takes full retirement. She left the program with an instructor who can continue for many years, that was a big thing. The college as a whole really promotes this program because they have seen that it is steadily growing. It is not fast-paced growth, but it is growing."*
- *"There has been some discussion going a few years on bringing in another [instructor] to...make sure that we are on campus with the students. It is a lot to manage two campuses with just one instructor. This might be something that would be in the works later down the road."*
- *"Making sure that they have the latest technology that is available to them out there, the latest software, the latest literature, the latest books, just anything that ties into the latest technology that is out there. That way the students going through this program can get a step ahead of what is going on in the real world these days with cybersecurity and hacking. The real-world experience hands-on is what was most valuable to me as a student. That's what is most valuable for the program is the books, the hands-on experiences, the simulations, that is what is most important to me."*
- *As we will continue without grant funding, of course the college will continue to kind of mold that program into our business department as much as possible. Of course, any grant funding is always a welcome benefit. I don't see this program going away anytime soon. In fact, I would say that it would be expanded as time goes on."*

- *"I think support from the community and the businesses, and then of course the internal staff. Because IT and cybersecurity are growing, I think those will be beneficial in helping sustain the program. The advisory council gets that word out there more to the community. The college is great about being involved, but just making sure that maybe upcoming businesses know the importance of cybersecurity and that this program is there to educate and help."*

When asked what strengths exist at the college that support sustaining the program in the long run, participants highlight the small size of the college, faculty student relationships, and the individualized support faculty are able to offer to students. One participant lists the many resources that students have available to them at the college as an asset to the program. Other strengths include finding funding and supporting non-traditional students and built-in faculty course assessments to help students early on if they show signs of struggling.

Verbatim Comments:

- *"PCCUA is a smaller college and the class sizes are smaller. The teachers have more one-on-one time with the students. If I was still in the program and I needed help with an issue that I was having I could turn to [names] in the degree program and they would be readily available to help. I don't feel like you would get that kind of attention and help in a bigger university setting."*
- *"The administration and the staff, the faculty is huge to me. I had been out of high school for 10 years. I had a full-time job. They were all so accommodating to wherever you are in life. You had students that fresh out of high school didn't want to be there. I had no idea where to start and they walked me through. They are so helpful, even if it is not their job, they are going to get you the help that you need."*
- *"Passionate faculty and staff. Because we are passionate about the program, we are consistently recruiting students and talking to local businesses to see if they have employees that need to get an education in the program. The college, again, supports it as a whole. The investors support it with the college. We have a huge support system. We are seeing more and more interest in it, and we are starting to get more involvement. It doesn't look like it because numbers fluctuate in covid. They may not have enrolled yet, but they are in the process of it. As long as we can keep student numbers up, the program will just keep going."*
- *"Our students are poor and it is really hard for them to come and get a certificate... making this Pell eligible is going to be very, very important to students that don't have other resources. But the other thing with that is that we provide focused advising and the lead advisors are the lead instructors here, but we also have a food pantry. We have a career closet. We help them when they go for a job at a bank or wherever they choose to try and get a job. And then we also have a washing machine and well, we have two dryers and two washing machines so that if they have trouble, they can go there. For our parents, as long as they have a dependent child under 18, they qualify for gas and for childcare vouchers. These kinds of holistic supports make it more likely that they can stay in school and finish studies."*

The discussion on program sustainability was concluded by considering potential barriers to the success of the ATE-DISC program. Participants identify financial challenges, both on the college side and for students. Another challenge participants note is low enrollment, however that is improving after getting through the pandemic.

Verbatim Comments:

- *"As with all small communities, [there are] challenges financially on both sides. Our population is decreasing, people want to move away. A lot of potential students don't realize the financial help they can receive. Their first thing is, 'I can't afford to go to college.' I couldn't afford to go to college either, but I just talk to them. I do feel like that that is a challenge, the decreasing population, and the financial stability of people in the community."*
- *"A lot of high school students leave high school thinking, 'I'm going straight into a four year.' And then you see them the following semester coming to you saying, 'I need to enroll in classes.' That is the only struggle I see is just the low number of enrollments. Some students just can't afford to go to college or they don't qualify for Pell. They don't meet the requirements of a scholarship, so they are just working instead of coming to college."*
- *"As far as sustainability, I think that we are in a very good position. It was [name] that worked part-time initially, and now it is [name] and they are both very student focused, easygoing. They will do anything for a student that shows an interest."*

Toward the Future

In this fourth year of ATE programming, the team collected important process data from its students. Students have highlighted what they most value about the program and offered recommendations for program improvement. This continued feedback, as well as continued assessment of secondary institutional data on enrollment, retention, and number of certifications produced will determine how these and other indicators of student success shift over the duration of the program.

Overall, this program has achieved its anticipated outcomes and is in a position to continue to deliver on these successful outcomes in its future. Despite challenges to enrollment and certification processes, the new curriculum has been implemented, the program has hired new faculty to teach the curriculum, the program has switched its offerings and approach to address arising needs and challenges, the classroom has adopted hybrid and in-person formats, staff is devoted to student success, and degrees are being achieved.

Most successful components of the program have been identified as the online curriculum and devoted staff. Hiring in a program graduate as new program faculty has allowed the new faculty member to be mentored in continuing on with this hands-on and one-on-one approach to students. This approach, along with the demonstrated interest and community need for cybersecurity knowledge in IT positions, have been the ultimate drivers of this program's success. While fewer students than anticipated completed their certificate, the program continues to offer certification "boot camps" to students in order to continue to grow their technical skills and professional certifications and boost these numbers. Importantly, the program will be self-sustaining with support from both college leadership and program faculty championing its continued growth. The evaluation team has no further recommendations for program improvements that have not already been discussed with principal investigators.