

Understanding the Impact of the ATE Delta Information Systems and Cyber (DISC) Initiative at Phillips Community College

~Year 3 Evaluation Activities~

A Report To:



Phillips Community College

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June 2022**



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Introduction

This report presents key findings from evaluation work supporting Year 3 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 achievements within the third 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 2021-2022 academic enrollment and demographic data,
- ✓ Survey Research: Student Pre-test Survey, Post-test Survey, & Annual Student Satisfaction Survey, and
- ✓ Focus Groups: Student Annual Focus Groups.

Year 2 Progress Toward Outcomes

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

- The extent to which the project is implemented as intended (timeline, participants, activities, cost),
- Satisfaction with recruitment efforts,
- Increased student information technology knowledge and "hands-on" skills,
- 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 (e.g., NetLab, tutoring).

¹ The scheduled site visit was canceled and in-person student focus groups moved to online groups due to COVID-19 challenges.

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.

<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)	
	#	%	#	%	#	%
Sex	18	100%	30	100%	32	100%
Female	3	16.7%	8	26.7%	8	25.0%
Male	15	83.3%	22	73.3%	24	75.0%
Ethnicity						
White/unknown	9	50.0%	15	50.0%	16	50.0%
Domestic students of color	9	50.0%	15	50.0%	15	46.9%
Other					1	3.1%
First generation	6	33.3%	13	43.3%	8	25.0%

The program is on target for its enrollment goals. Numbers below show total certifications and degrees to date, demonstrating a 80% increase (5 to 9) in AAS degree completion. Once Fall 2022 completion numbers are included, rates will be compared to pre-pandemic expectations for enrollment and completion increases.

<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)	Total (n=67)
	Year 1 #	Year 2 #	Year 3 #	Total #
IS.AAS	2	5	9	16
MANPC.CP	5	6	4	15
MSOPSYS.CP	1	6	5	12
CYS.CP	0	6	4	10
PROG.CP	1	5	8	14

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)

Extent to Which Curriculum is Implemented as Intended

Curriculum implementation is proceeding as planned. Faculty have continued to implement NetLab+, a high-tech virtualization software, into the course curriculum. Utilizing NetLab+ as part of the curriculum provides quality instruction with hands-on simulations for students to apply classroom or textbook information in a real-world environment.

Focus group results indicate that since its adoption, NetLab+ has become a more natural, integrated component of the program. Students explain that this program provides them with important hands-on experience in a way that simulates an industry environment. These results are especially promising given the differential impact NetLab+ has had for students in previous years, which suggests a deepening of the integration and understanding of the resource. The 2022 post-test survey results demonstrate that as adjustments to the COVID-19 pandemic have become more routinized, stability of home life and internet

connection have stabilized for students, allowing for interaction with NetLab+ to be more routine. Further past-year development in curriculum implementation is seen in certification attainment. The testing center had re-opened for certification testing in Spring 2021. Students have embraced its reopening, with 2022 satisfaction survey results, 2022 post-test survey results, and Fall 2021 focus group results indicating that students are planning on earning multiple industry certifications.

The program also continues the important addition to their certification offerings by providing new “Boot Camps.” In these camps, students participate through Blackboard with online study resources that review materials and provide online practice exams. Instructors conducted Zoom sessions to answer questions and provide additional instruction in areas where students show weakness or explain materials as it relates to the certification and testing. Instructors provide tutoring sessions as a group and one-on-one as needed. Once students have completed all assignments, review materials, and practice exams, they are provided a test voucher. Student feedback about the boot camps has been positive and very interactive. Students learn from each other also providing support for success. The ITF+ (IT Fundamentals) Boot Camp is offered each semester and remains available for students to continue practicing and preparing for the exam. During the Fall 2021 semester, five students participated in the boot camp. Six students participated in the Spring 2022 semester camp.

Faculty have continued providing weekly tutoring sessions through Zoom and individual sessions when students request special appointments. Weekly on-campus tutoring sessions were also offered to allow study groups as well as faculty interaction to answer questions and provide additional instruction when needed. These tutoring sessions also provide opportunities for students to receive support and study resources that promote student retention and success.

Satisfaction with Recruitment Efforts

This section is informed by results from the student pre-test survey and Year 3 focus groups. Feedback from students on recruitment efforts for their first year indicate that students became aware of the program from a college advisor (50%), followed by a faculty recommendation (25%) and by students looking the program up independently (25%).

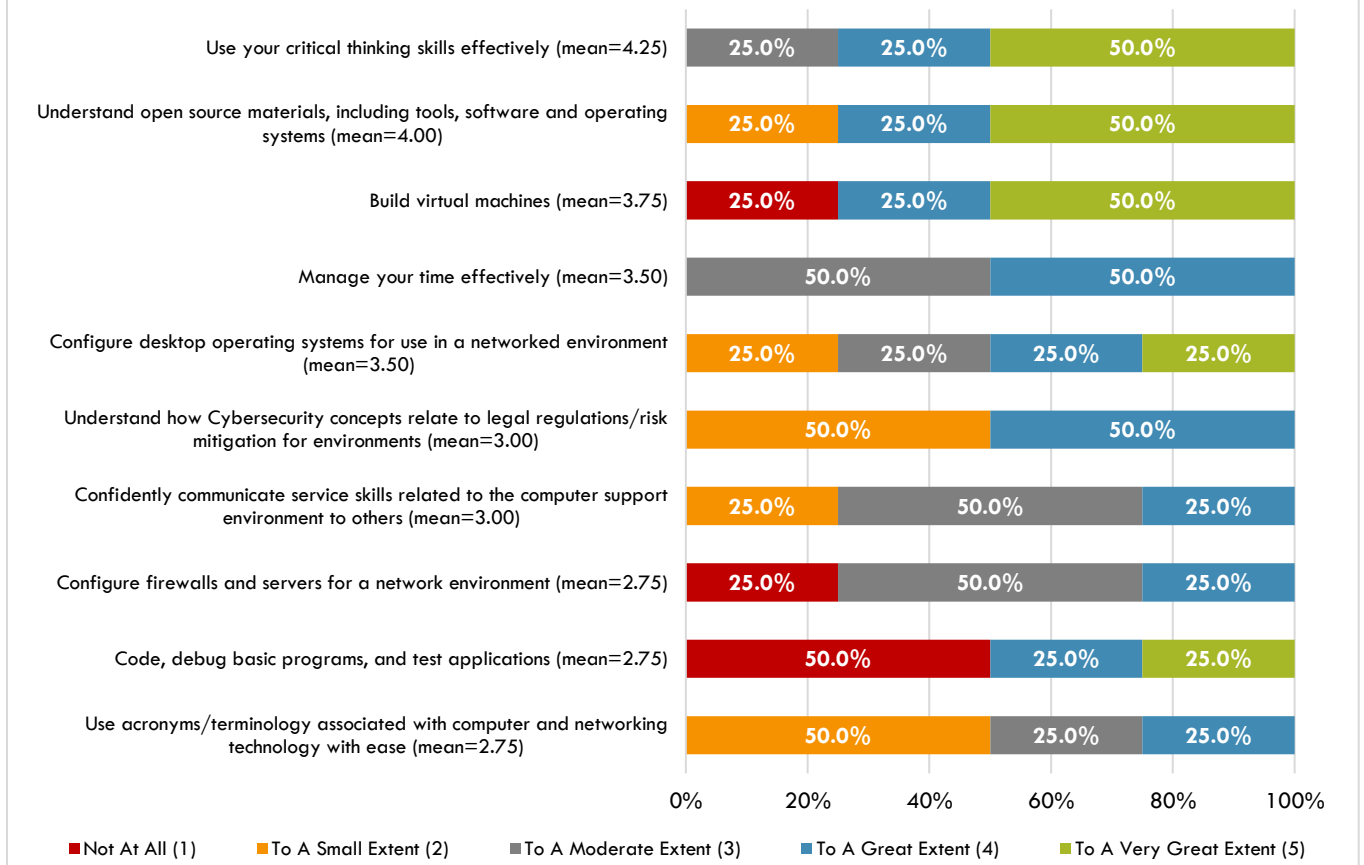
Focus group results also reflect the effectiveness of direct one-on-one recruitment efforts made by college faculty and staff and the public information available about the program (i.e., through the PCCUA website). Students in the focus group explain that prior connections with faculty and self-driven research into potential degree programs led them to this program at PCCUA.

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

This section is informed from the pre-test survey, post-test survey, student satisfaction survey, and student focus groups.

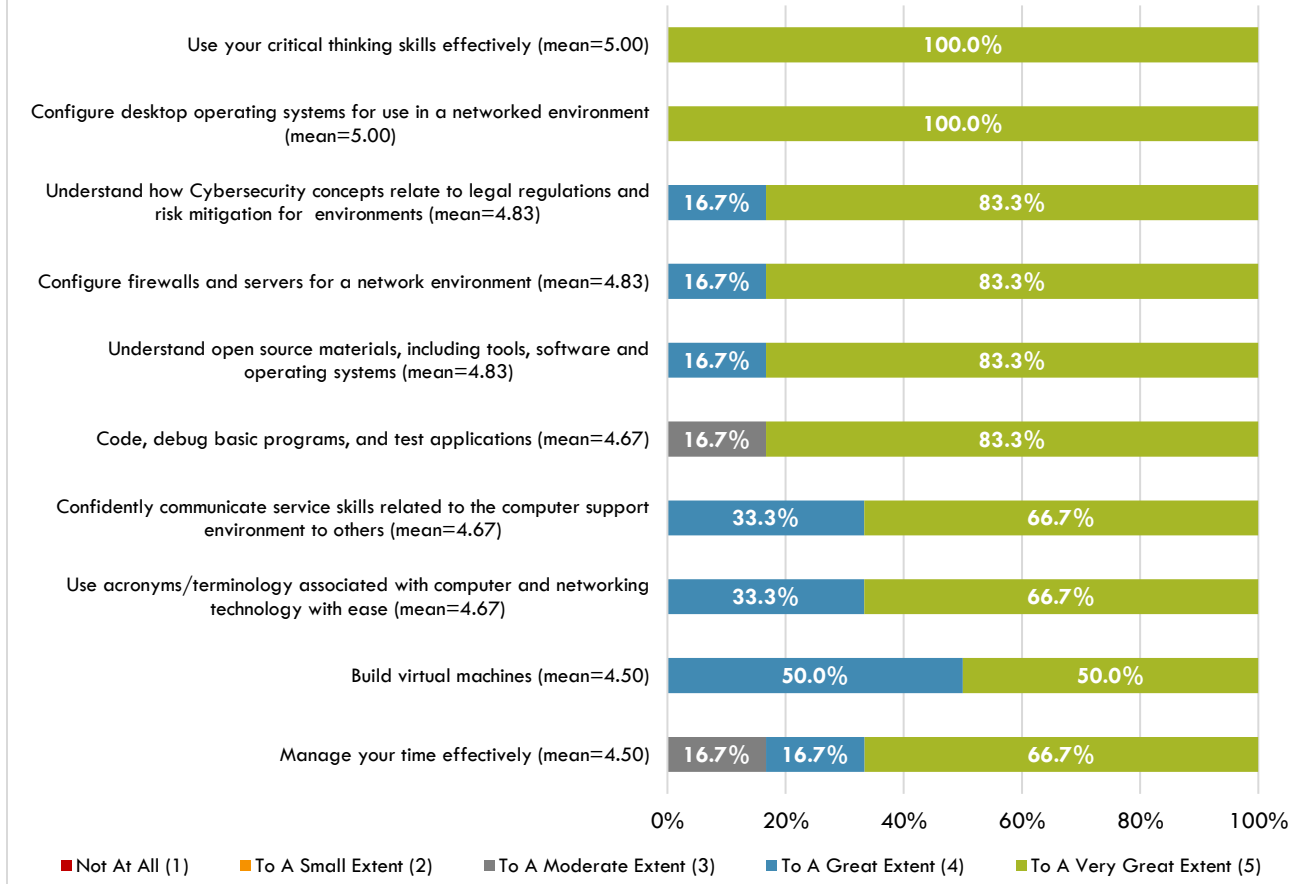
Respondents of the pre-test survey were asked to indicate their ability to understand and utilize an assortment of skills, concepts, and resources upon entering the program. More specifically, students were asked to rate their baseline ability to understand and utilize ten skills and concepts that are introduced in the program on a scale from “Not At All” (1) to “To A Very Great Extent” (5). At the start of their PCCUA education, this year’s pre-test respondents indicate having the most skill in using their critical thinking skills effectively (mean=4.25) and understand open source materials (mean=4.00) Students are least skilled in their ability to use acronyms and terminology associated with computers and networking (mean=2.75) and to code, debug basic programs, and test applications (mean=2.75).

Figure 1: Pre-Program Ability to Engage with Program Skills & Concepts



Post-test respondents were also asked to rate their ability to understand and utilize these ten skills and concepts on a scale from “Not At All” (1) to “To A Very Great Extent” (5). These respondents provide high confidence in their abilities with all ten program components measured. Indeed, none averaged a score below “A Great Extent” of ability. Every respondent indicates that they can, “To A Very Great Extent,” use their critical thinking skills effectively and configure desktop operating systems for use in a networked environment.

Figure 2: Post-Program Ability to Engage with Program Skills & Concepts



Post-test respondents show statistically significant growth in all ten of the skills and concepts measured, compared to their pretest results. The effect size for each of these differences is very large, further demonstrating the impact the program has had on students. Critically, however, these tests have violated the assumption of independent observations, thus these results should be treated with caution (see Table 3, next page).

<i>Table 3: Significant Growth in Ability to Engage with Program Skills & Concepts²</i>	Group Means		Test Statistics	
	Pre-Test (n = 11)	Post-Test (n = 6)	Sig.	Hedge's g ³
<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
<i>Configure firewalls and servers for a network environment</i>	2.64	4.83	***	1.49
<i>Understand open source materials, including tools, software and operating systems</i>	3.64	4.83	***	1.44
<i>Code, debug basic programs, and test applications</i>	2.91	4.67	**	1.10
<i>Confidently communicate service skills related to the computer support environment to others</i>	3.55	4.67	**	1.10
<i>Use acronyms/terminology associated with computer and networking technology with ease</i>	2.45	4.67	***	2.03
<i>Build virtual machines</i>	2.73	4.50	**	1.12
<i>Manage your time effectively</i>	3.64	4.50	*	0.92

Note: All significance testing is one-tailed.

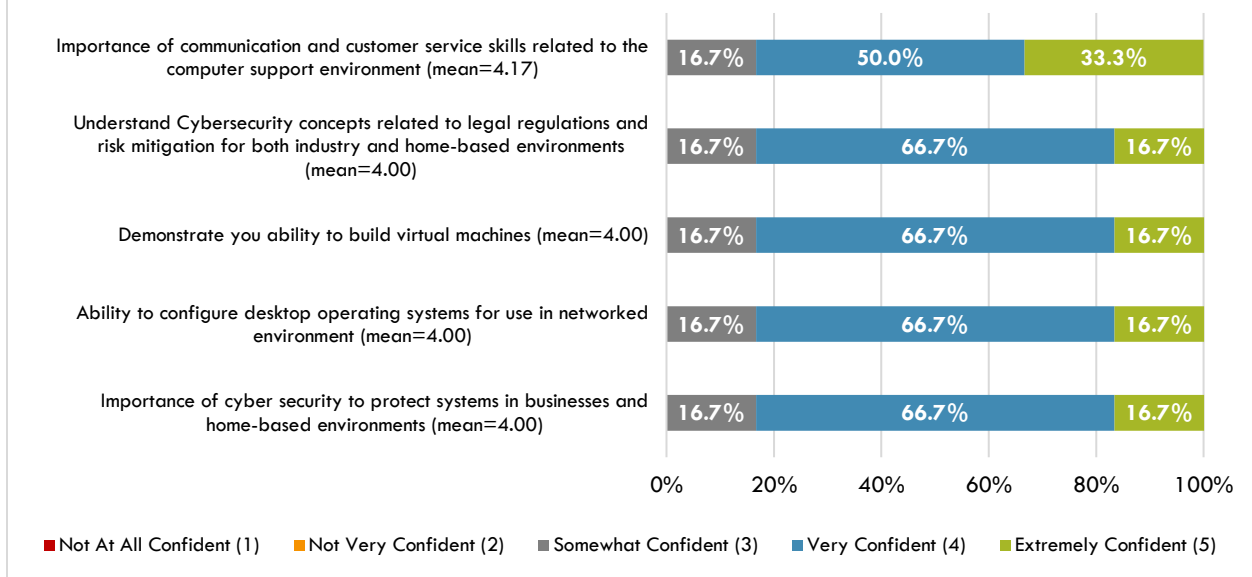
Sig.: *p<.05; **p<.01; ***p≤.001

The 2022 satisfaction survey results indicate that students are very confident in their abilities with all skills and concepts covered, including communication and customer service skills in a computer support environment (mean=4.17), understand cybersecurity concepts in business and home-based environments (mean=4.00), build virtual machines (mean=4.00), configure desktop operating systems in a networked environment (mean=4.00), and using cyber security to protect business and home environments (mean=4.00) (see Figure 3, next page).

² These tests violate the independent-samples *t*-test assumption of independent observations. Use caution when reviewing results.

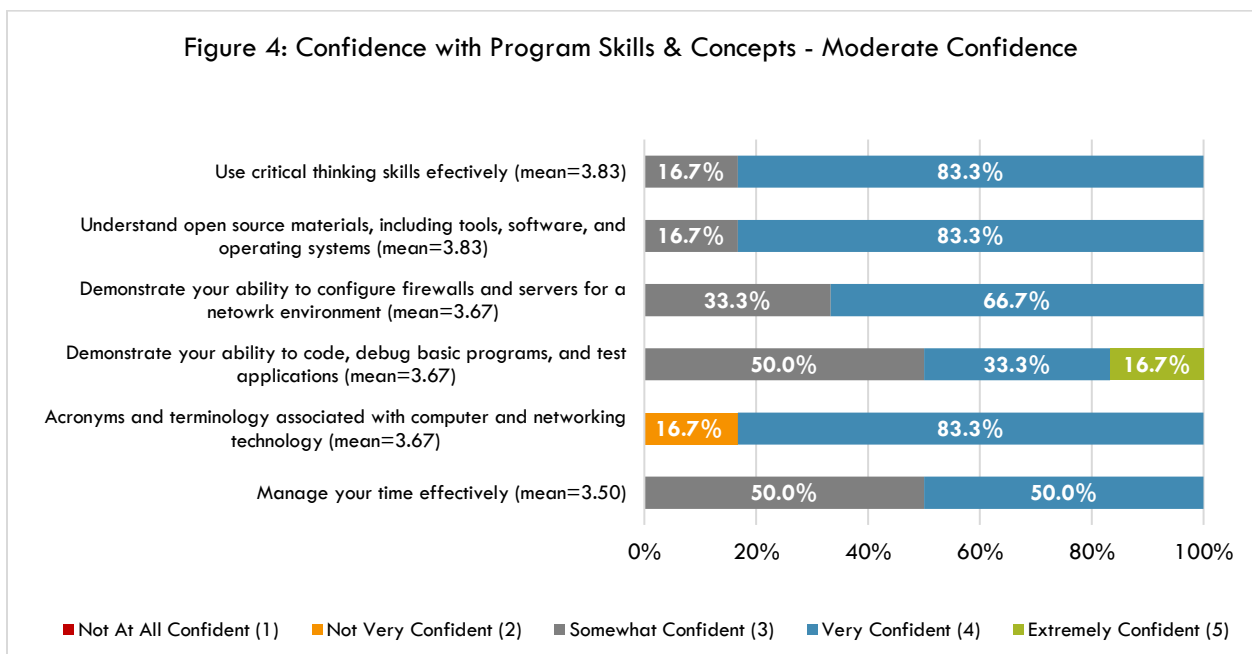
³ Hedge's *g* is a measure of effect size, which provides a standardized way of assessing the magnitude of the differences observed in the data. Hedge's *g* is interpreted as "no effect" when $g < 0.20$, "small" when $g < .50$, "moderate" when $g < 0.80$, "large" when $g < 1.00$, and "very large" when $g \geq 1.00$.

Figure 3: Confidence with Program Skills & Concepts - High Confidence



Students' satisfaction survey results indicate that they are less confident in their ability to manage their time effectively (mean=3.50), use acronyms and terminology associated with computers and networking (mean=3.67), demonstrate their coding, debugging, and application testing abilities (mean=3.67), and configuring firewalls and servers in a networked environment (mean=3.67).

Figure 4: Confidence with Program Skills & Concepts - Moderate Confidence



When asked to identify something they have learned in the program that is helpful as they prepare for their career, students completing the student satisfaction survey identify the technical skills gained in the program, their growth in team-skills, and their learning through NetLab.

Verbatim Comments:

- “I would say I learned a lot about cyber security and what to do.” (Graduating Student)
- “I’ve learned more about cyber security skills.” (Graduating Student)
- “The labs give you realistic experience of what to expect when X-thing happens. As much as you can read a book, find out, what videos, or however, the ability to sit down and look at it and say, ‘Okay, this is realistically what you can expect.’” (Stuttgart Student)
- “How to get along with your coworkers and delegate.” (Stuttgart Student)

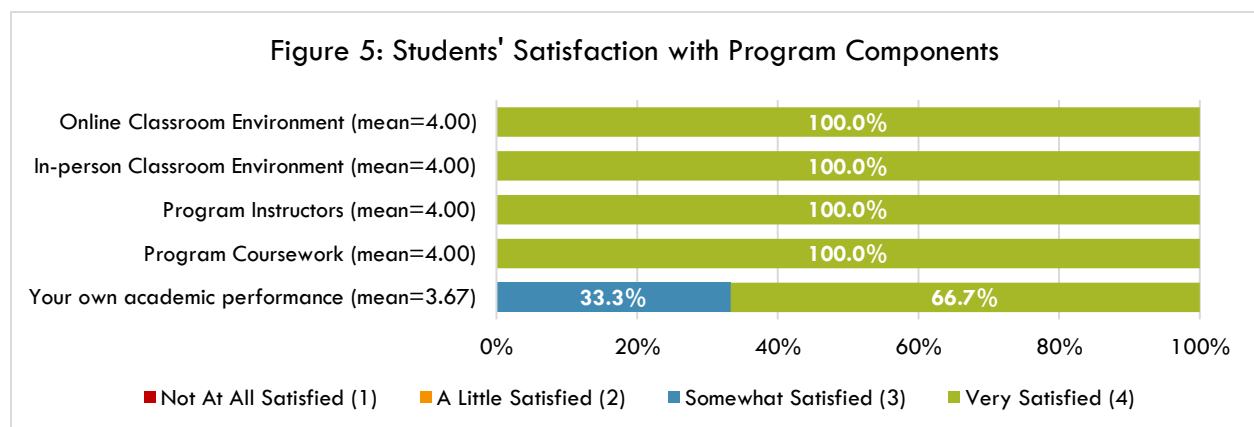
Year 3 focus group results also demonstrate student acquisition of professionalization skills through program activities. When asked about what other professional skills they are learning, students note communicating (specifically about technology), teamwork, networking, and punctuality/time management skills. Networking and punctuality/time-management were exclusively discussed by graduating students.

Verbatim Comments:

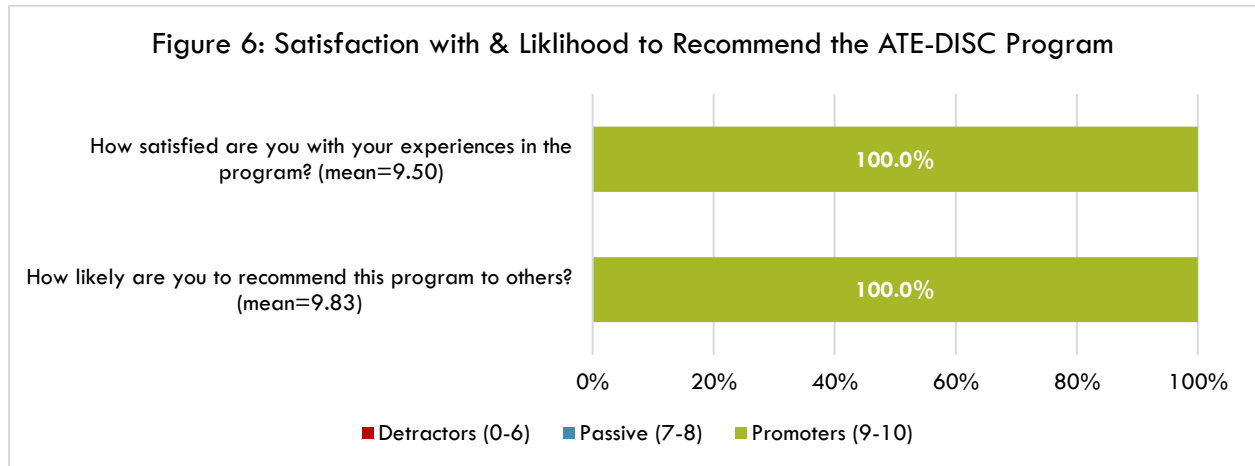
- “Presenting myself or talking in front of a whole group of people, telling them what I am doing.... That is what helped me most, the networking.” (Graduating Student)
- “You’ve got to put yourself out there, that’s the key point of any career. Networking people, network and getting yourself out there. That’s the most important thing that this program has taught me.” (Graduating Student)
- “Always show up on time.” (Graduating Student)
- “Being able to work with other colleagues, not just within your specific realm of job duties, but maybe from a work group adjacent to yours, to try to solve a problem.” (Stuttgart Student)
- “The program has helped me be better at communicating technology-wise.” (Helena-West Helena Student)

Satisfaction with Program

These results are informed by data collected from the student satisfaction survey and Year 3 student focus groups. Students rated their satisfaction with five program components on a scale from “Not At All Satisfied” (1) to “Very Satisfied” (4). Respondents in the 2022 satisfaction survey register unanimous maximum satisfaction with four of these components, with all “Very Satisfied.” A few are less satisfied with their own academic performance (see Figure 5, next page).



To measure overall satisfaction with the program, students completing the 2022 satisfaction survey were asked to rate their satisfaction on a scale from “Extremely” dissatisfied/unlikely (0) to “Extremely” satisfied/likely (10). All respondents provide either a 9 or 10 rating for both their overall satisfaction and how likely they are to recommend the program to others. This provides a strong statement on the positive impact this program is having on its students.



Focus group participants also report that the program is very helpful, with quality instructors. The only changes envisioned by these students are for additional support finding employment after they complete their program at PCCUA.

Verbatim Comments:

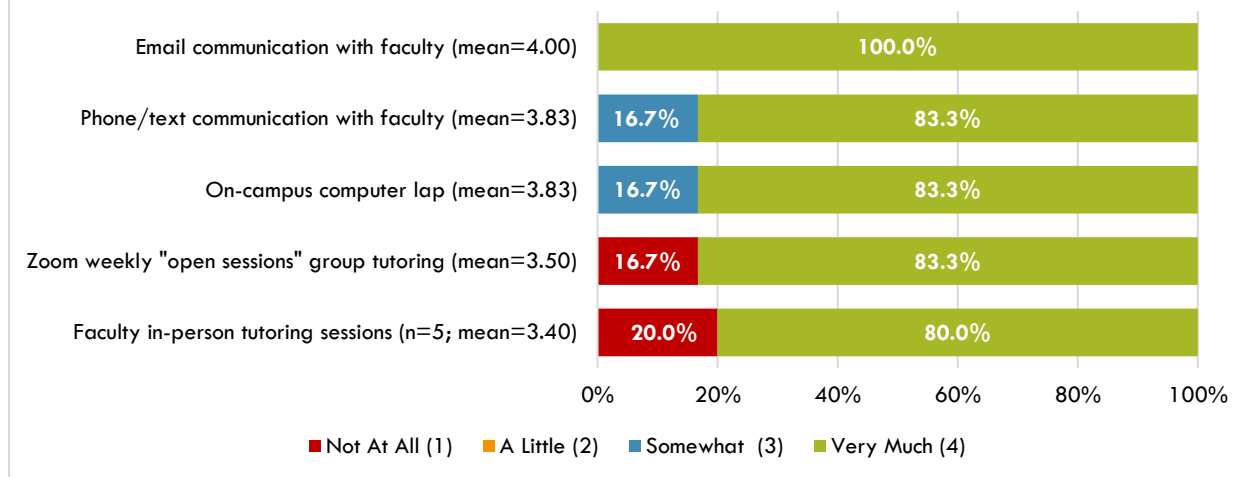
- *“Everything right now is great. The instructors are great, courses are great, labs are great resources.”* (Stuttgart Student)
- *“I love this program. It is a very helpful program and is making me better.”* (Helena-West Helena Student)
- *“I know they can’t really be doing all the jobs and support, but it would be nice if the school would have somebody designated for employment support.”* (Stuttgart Student)
- *“I would say internships, and it should be internship and job fairs. That’s really what would help us out the most... Why do only four-year colleges get them? I think two-year colleges should do the same thing.”* (Graduating 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 program year.

To better document both resources used and resources needed by students, respondents were asked to provide the extent to which they utilize resources for their program assignments. The 2022 satisfaction survey results indicate that students found email communication with faculty to be “Very Much” helpful, with nearly all finding the remaining resources “Very Much” helpful as well.

Figure 7: Helpfulness of Program Resources Utilized



When asked in the satisfaction survey what additional resources they need to be successful in the program, three respondents provided feedback. Two respondents suggest more hands-on experience, with one suggesting internships to help in this area. The remaining comment explains that the program is doing all it can to benefit student learning.

Verbatim Comments:

- *"Internship or some kind of entry level job placement would be recommended."*
- *"Maybe more hands-on programs if not able to make it to the campus."*
- *"I think, at this moment, everything that can be done is being done to optimize learning in the program."*

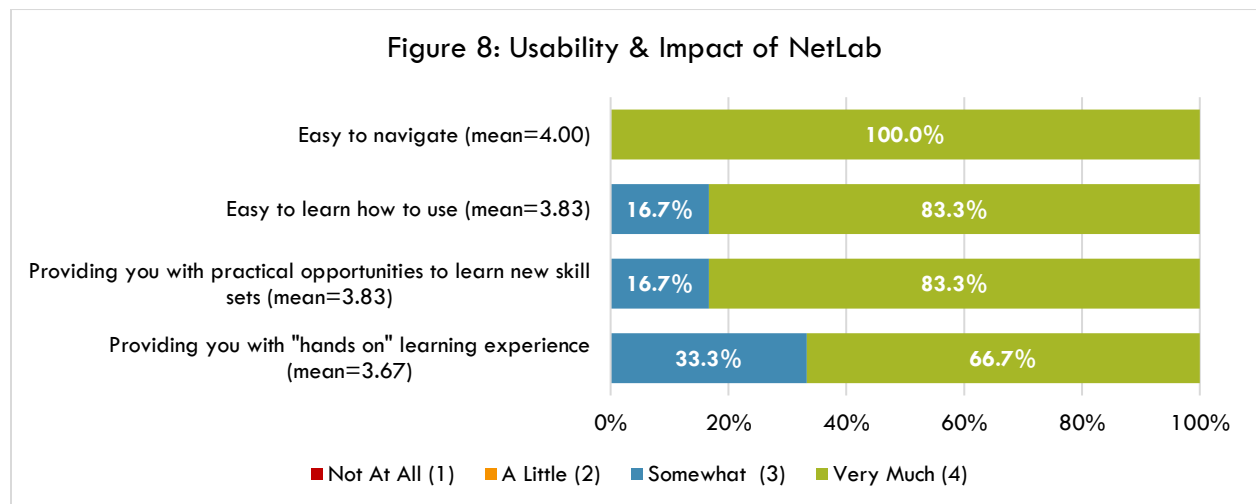
Focus group participants suggest program improvements to better support current as well as future students and, in doing so, highlight general needs and challenges. Specifically, participants predominately state that they are satisfied with things as they are, with some noting that they would like increased support and direction toward employment opportunities. One participant suggests more hands-on learning opportunities for program students.

Verbatim Comments:

- “Nothing at all.” (Graduating Student)
- “Not particularly, because I would probably venture to say that, for the resources they have, this is probably one of the best programs you could hope for.” (Stuttgart Student)
- “It is more of a lack of certain things than anything. A lack of internships or sources for that sort of thing. The labs are doing pretty great, the actual work pretty alright. It is just that there is nowhere to apply the skills that we learn, at least anywhere near here.” (Stuttgart Student)
- “A work-study or job-shadow project to fill in some time. I think that would be really helpful, especially for people who are hands-on learners.” (Stuttgart Student)
- “If there was one thing that would make things a little easier, it’s just to have a closer certification testing center other than a two-to-three-hour drive away.” (Stuttgart Student)
- “More hands-on work. Most of the work is online, so it could probably use more hands-on work for students, more hands-on activities instead of online work.” (Helena-West Helena Student)

NetLab+ User Experiences

The satisfaction survey and focus groups also allowed space for students to provide specific feedback on their NetLab user experience. In the 2022 satisfaction survey, students were asked to respond to four items about NetLab using a scale from “Not At All” (1) to “Very Much” (4). All respondents find NetLab to be “Very Much” easy to use, and most find it easy to learn how to use, that it provides practical opportunities to learn new skill sets, and that it provides “hands-on” learning experience “Very Much.” These results continue the trend observed from years 1 to 2, as functionality and comfort with NetLab continue to increase among students.



The 2022 satisfaction survey respondents were given the opportunity to provide feedback on how to improve the NetLab user experience. Two respondents indicate that they are not sure of what improvements to make, while another explains that time limits on the lab sessions makes the lessons more difficult to complete in their home environment.

Verbatim Comments:

- *“Well due to some unforeseen circumstances we were not able to use NetLab, but I did enjoy net lab system the past semester and hope it is up and going again soon. I don’t like it being timed sessions though because I have to rush through and having newborn baby doesn’t help with time restrictions.”*
- *“I don’t know because when I was getting used to it, we had problems out of it.”*

Participants in this year’s focus groups were asked to discuss the impact of NetLab on their program experience. While one student did say they found NetLab to be confusing, the remaining focused on how much they enjoy it, particularly how it gives them a hands-on experience with tasks they might encounter in the workforce. This is a sharp change from last year’s results, where students expressed confusion and, subsequently, dissatisfaction with the resource.

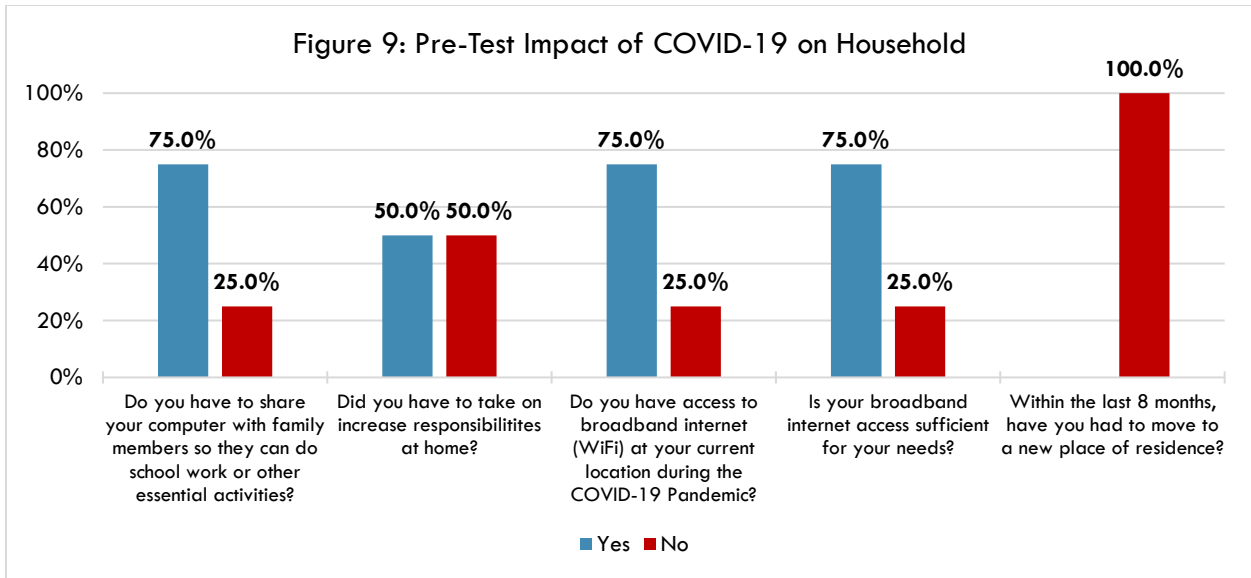
Verbatim Quotes:

- *“I love NetLab... I can build my own website on there and stuff like that.” (Helena-West Helena Student)*
- *“It gives us hands-on [experience]. You know, we’ll have a book, and it could be on the networking cloud, for example, and the networking class will have a chapter that may be 80 to 100 pages long, and you can go through it, and it tells you about two different concepts. Then you get into the lab, and it goes into detail about, ‘Okay, here is how you actually use it.’ And then I can get it done in like five minutes.” (Stuttgart Student)*
- *“I like the labs and the virtual machines, because if I tear them, at least I don’t tear up my own CPU. Well, you can always go back, restart it, and take over it in the virtual machines, which helps because then you are able to make a mistake, learn from it, and go back and figure it out, correct it. It lets you see what all is going on.” (Stuttgart Student)*
- *“NetLab has helped me problem-solve with computers. That’s one thing I like about NetLab. It helps you get inside the computer and see what’s going on.” (Graduating Student)*
- *“For me, NetLab was kind of confusing, but basically it was simple for me because I liked problem solving and all that, so it wasn’t hard for me. I just followed the direction, and I learned a whole lot about what to do about computers. I learned a whole lot about the security side and what to do.” (Graduating Student)*

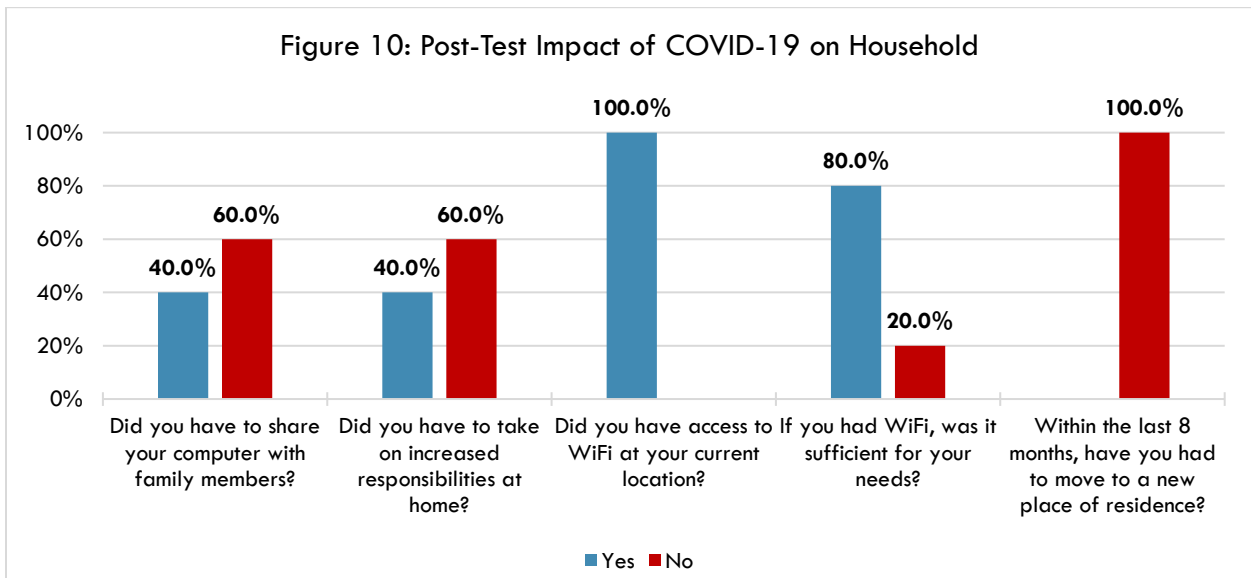
COVID-19 Challenges

COVID-19 caused both PCCUA campuses to close early Spring 2020 and greatly impacted program functioning through these programming years. While students were eventually able to move to a hybrid model of instruction in year 2, and return to campus in year 3, students still struggled to adapt. Further, the impact of the pandemic penetrates beyond academia in ways that can have a significant impact on students ability to learn (e.g., housing and food security). Results summarized here are pulled from the student pre-test survey and student post-test survey results.

Students taking the pre-test survey were asked a series of questions gauging their ability to adapt to education during the pandemic. More specifically, they were asked about Internet accessibility and food access challenges. Three of four pre-test respondents indicate that they have access to broadband internet at their current location, that this internet access is sufficient for their needs, and that they use a shared computer for schoolwork. Respondents were also asked if they mainly access the internet at home or only through their phone; all four respondents indicate accessing the internet at home. Further, pre-test respondents provide that they have not had recent residential instability, with none having to move in the past eight months.

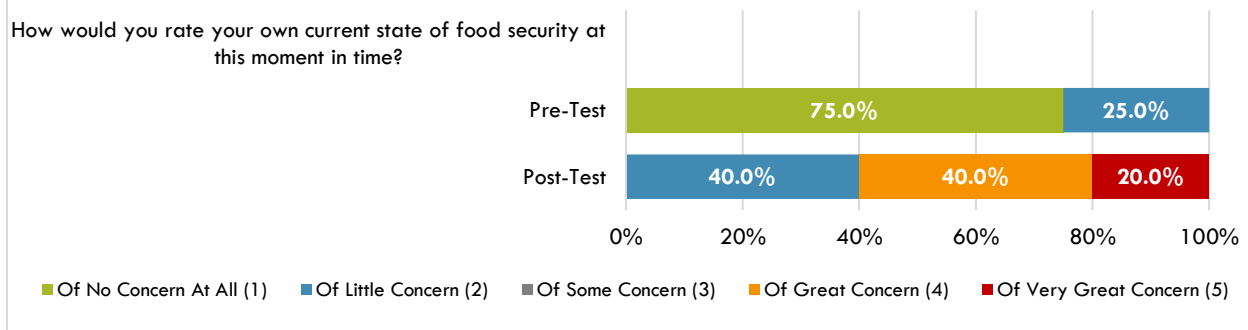


In their post-test responses, 40% indicate having to share their computer with household members and having to take on increased responsibility in the home due to pandemic related changes. All of these respondents indicate maintaining WiFi access at their current location. One-fifth indicate that the WiFi access in their home was not sufficient for their needs, however. All respondents indicate that their primary source of internet access is through a household paid subscription through an internet service provider, and none indicate that they had to move in the past eight months (see Figure 10, next page).



Additionally, students were asked about their food security during the COVID-19 pandemic in both the pre- and post-test surveys. Asked to rate how concerned they are about their current state of food security, pre-test respondents provide that they are relatively unconcerned about their food security, but post-test respondents tend to be more highly concerned about their current food security.

Figure 11: Students' Current State of Food Security



Toward the Future

In this third 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 is on track in achieving its anticipated outcomes. Despite challenges to enrollment and certification processes, the new curriculum is being implemented, the program has hired new faculty to teach the curriculum, the classroom has adopted hybrid and in-person formats, and the program has begun to offer certification “boot camps” to students in order to continue to grow their technical skills and professional certifications.

Additional recommendations for DISC program leadership to consider from Year 3 evaluation activities, as previously reported and reiterated in this formative report are to:

- Continue to emphasize hands-on learning opportunities for students in the program. Students mention the benefits of these experiences and ask for more like them. NetLab has provided key experiences in virtual environments and is helping students gain hands-on experience, but more physically interactive opportunities should be sought as well.
- Provide additional resources and support for career planning within the program. Students are learning important skills and concepts in the program and feel confident in their abilities, but they express less certainty about their job prospects after the program. This is true even as post-program responses show graduates are more aware of local opportunities. This suggests that a more official effort to connect students with employers could boost satisfaction, increase recognition of program efforts to guide students into the workforce, and, subsequently, promote graduate job placement.
 - Many in the program indicate their intent is to transfer to earn a higher degree, thus providing students with resources on how to select programs, market themselves to competitive programs, and ensure student confidence in their ability to succeed beyond PCCUA should be viewed as a related piece of this recommendation.
- Find ways to identify need and provide assistance for students who are lacking key resources, particularly those that are in a state of food insecurity. While the incoming students do not convey a concerning state of food insecurity, those in the post-test have. Such a condition could have negative impacts on students' health, academic performance, and, less importantly, their retention in the program.

The next step in planned evaluation activities is to gather summative data on student retention, program completion, and career success, in order to complete the requirements of the evaluation design and write the summative report. Additionally, the evaluation team will continue to support PIs in their extension year to the extent to which the evaluation activities are needed to improve processes and continue to detail program impacts.