Northern Virginia Community College
DCO Tech Project:
Final Evaluation Report

December 19, 2024

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ACKNOWLEDGEMENTS

Magnolia Consulting appreciates the opportunity to conduct the external evaluation of Northern Virginia Community College's DCO Tech project. We want to thank the project team for their collaborative approach to the evaluation. We also want to thank the students, educators, and industry partners who completed evaluation surveys. Last, we want to thank the Magnolia team members who supported this work.

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EXECUTIVE SUMMARY

Evaluation: Treatment-only design with mixed methods and formative and summative components to determine how the DCO Tech project is implemented and its associated outcomes

Data Collection: Progress tracker, surveys, document review

Participants: Bridge program participants (11th–12th-grade students), externship participants (K–12 professionals), industry partners

See Appendix A for more details.

The DCO Tech project team contracted with Magnolia Consulting to conduct an external evaluation of the project. This final report includes summative evaluation findings through December 2024. Below are some of the key findings and a sample of the lessons learned.

The DCO Tech project aims to improve the pipeline of students prepared to enter the engineering technology (ET) workforce, including data center operations (DCO).

To achieve this goal, the DCO Tech project provides the following:

1. Summer Bridge Program for high school students
2. Internship Preparation Program for ET students to prepare for careers
3. K–12 Externship Program for educators to raise awareness of ET careers
4. Industry Externship Program for industry professionals to engage in ET education
5. Veteran Outreach Program to inform veterans of ET career pathways

Key Findings

Findings suggest that students' understanding of and interest in ET and DCO education and career pathways, understanding of workplace safety, and understanding of college success skills increased after participating in the Summer Bridge Program.

Students' learning and preparedness were also supported through the Internship Preparation Program, although this component of the DCO Tech project was modified. The project team secured supplemental funding to redesign and implement the program.

Industry partners indicated that the tours they provided for the DCO Tech project were effective in providing information about ET and DCO education and career pathways. Additionally, their awareness of ET and DCO programs and careers increased after providing tours for the project.

Findings suggest that educators' awareness of ET and DCO opportunities, understanding of the importance of different skill sets for ET careers, and confidence in guiding secondary students toward ET and DCO careers increased after participating in the K-12 Externship Program.

The project team held an outreach activity with the Virginia Values Veterans Program to share about DCO career and educational pathways.

Lessons Learned

Students rated the hands-on components of the Summer Bridge Program highly throughout the project. Integrating hands-on activities such as tours, networking activities, and group work in similar, future programs could support student engagement.

The internship component of the project was not implemented as intended because of recruitment issues. The project team was still able to support current ET students at Northern Virginia Community College by capitalizing on existing opportunities and focusing on one-off supports such as resume workshops.

Throughout the project, K–12 Externship Program participants rated the networking and group discussion opportunities lower than other components. Including sufficient time for networking activities and structured group discussions might be useful strategies for other projects with a similar focus.

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INTRODUCTION

With funding from the National Science Foundation's Advanced Technological Education (NSF-ATE) program, Northern Virginia Community College (NOVA) developed the Data Center Operations and Engineering Technicians Outreach and Development (DCO Tech) project. The DCO Tech project aims to improve the pipeline of students prepared to enter the workforce as technicians for engineering technology (ET), which includes data center operations (DCO). To achieve this goal, the DCO Tech project provides (1) a Summer Bridge Program for high school students, (2) an Internship Preparation Program for ET students, (3) a K–12 Externship Program for secondary teachers and administrators to develop knowledge of ET, (4) an Industry Externship Program for industry professionals to engage in ET education, and (5) a Veteran Outreach Program to inform veterans of careers in ET. Through these key activities, the DCO Tech project aims to increase the number and depth of partnerships with local industry and education partners to support activities that prepare students to enter the ET and DCO workforce.

The DCO Tech project team contracted with Magnolia Consulting—a certified, woman-owned small business and B Corporation specializing in research and evaluation—to conduct an external evaluation of the project. Magnolia evaluators provided the project team with annual interim reports in June 2022, June 2023, and June 2024. DCO Tech was designed as a three-year project to run from July 1, 2021, to June 30, 2024. The project team obtained a one-year no-cost extension to finish project implementation and requested a final evaluation report at the end of 2024. This final report includes evaluation findings from data collected from July 2021 through December 2024.

MAIN ACTIVITIES

VETERAN OUTREACH PROGRAM

Duration: Discrete events
Dates: Year-round
Participants: Veterans

Develop and implement an outreach program to inform veterans of ET and DCO career pathways.

PARTNERSHIPS

Engage local industry and K–12 education partners to support project activities (e.g., advising).

SUMMER BRIDGE PROGRAM

Duration: 10 days
Dates: Summer
Participants: High school juniors and seniors

Plan and coordinate a two-week summer program to introduce high school students to ET and DCO careers and pathways.

K–12 EXTERNSHIP PROGRAM

Duration: 4 days
Dates: Spring–summer
Participants: Secondary educators

Design and implement an externship for K–12 educators to learn about ET and DCO career pathways and engage with industry partners.

INTERNSHIP PREPARATION PROGRAM

Duration: 4 days
Dates: Spring
Participants: Current NOVA ET students

Incentivize and support current NOVA ET students' participation in career readiness workshops and provide tours of local industry partners.

INDUSTRY EXTERNSHIP

Duration: 4 days
Dates: Summer
Participants: Industry professionals

Design and implement an externship for industry professionals to engage in higher education and connect with students.

Project Evaluation Design, Purpose, and Methods

Magnolia evaluators developed an evaluation plan that aligned with the DCO Tech project's goal to improve the pipeline of students prepared to enter the ET and DCO workforce. The evaluation was a non-experimental, treatment-only design and included mixed-methods approaches (i.e., quantitative and qualitative data collection and analysis) with formative and summative components. The formative components included methods that assessed the extent to which the project was implemented as planned and identified areas of strength and areas for improvement for the project. Formative components were addressed in interim reports in 2022, 2023, and 2024. The summative components included methods that assessed the extent to which the project was achieving its intended outcomes, and are the focus of this final report. The evaluation matrix—which includes the evaluation questions, methods, and data collection timelines—is presented in Appendix A.

Summative Evaluation Questions

This final report addresses the following summative evaluation questions:

1. What audiences does the DCO Tech program reach?
2. Do participating students report improvement in their knowledge and interest with respect to data center operations or engineering technology training and careers?
3. In what ways does DCO Tech improve participating students' preparedness for data center operations or engineering technology careers?
4. How does DCO Tech collaborate with industry partners? What was the impact of this collaboration?
5. Do participating educators report improvements in their awareness of data center operations and engineering technology careers and their preparedness to support students in this field?

Data Collection

Magnolia evaluators utilized mixed methods to evaluate the DCO Tech project, collecting both quantitative and qualitative data. In this report, the data collection measures and participants include:

Project Benchmark Tracker (Quarterly). To benchmark progress toward meeting project outcomes, evaluators used Google Sheets to develop a spreadsheet that tracked project tasks, activities, timelines, and participants. Evaluators and the project team updated the spreadsheet periodically using data from various sources.

Document Review (Annual). To understand project implementation, including project modifications, evaluators reviewed important project documents (e.g., recruitment materials) shared by the project team and meeting minutes.

Summer Bridge Program Surveys (Annual). Following the Summer Bridge Program, evaluators administered a retrospective pre-posttest to assess students' perceived changes in their knowledge and skills in ET and DCO.[1] Twenty students participated in the 2022 program, and 15 responded to the survey (75%). All 25 students who participated in the 2023 program (100%) responded to the survey. Fourteen students participated in the 2024 program, and 10 responded to the survey (71%).

K–12 Externship Program Surveys (Annual). Following the K–12 Externship Program, evaluators administered a retrospective pre-posttest to assess educators' perceived changes in their ability to help guide students to careers in DCO or ET or their capacity to design educational activities in this field. Eighteen educators completed the 2022 externship, and 16 provided survey data (89%). Sixteen educators completed the 2023 externship, and nine provided survey data (56%). Thirty-eight educators completed the 2024 externship, and 21 provided survey data (55%).

Industry Partner Surveys (2023). Industry partners who supported the DCO Tech project by offering tours completed pre- and post-surveys in 2023 regarding their awareness and knowledge of ET and DCO educational pathways (broadly and at NOVA) and their confidence in offering tours before and after they offered tours for the project. The project team sent the surveys to seven organizations. Eight industry partners from four organizations (57%) responded to the pre-survey. Nine industry partners from five organizations (71%) responded to the post-survey.

Data Analysis

Evaluators analyzed quantitative and qualitative data to generate the findings presented in this report. This final report includes data aggregated across all three years of the project.

Quantitative Data. Evaluators analyzed close-ended survey items by calculating frequencies and means for each item. For the Summer Bridge Program and the K–12 Externship Program, outcomes were measured using retrospective pre-posttests. For the industry partner survey, outcomes were measured using a traditional pre-posttest. Raw means were examined to determine the extent to which the outcomes changed from before and after participation. Additionally, paired samples *t*-tests were conducted to determine whether the average mean difference between the two sets of ratings was statistically significant.[2]

Qualitative Data. Evaluators conducted content analyses of the open-ended survey items, using the overall survey purpose and questions to provide context and understand the responses (Forman & Damschroder, 2008; LaDonna et al., 2018).

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[1] In retrospective pre-posttests retrospective pre-posttest designs, respondents provide their "pre" and "post" ratings at the same time (in this case, after participating in the program; Bhanji et al., 2012).
[2] Some research indicates *t*-tests yield more accurate results for Likert-scale data and small samples compared with other nonparametric approaches, such as Wilcoxon Signed-Rank tests (Meek et al., 2007).

SUMMER BRIDGE PROGRAM FINDINGS

What audiences does the DCO Tech program reach?

Do participating students report improvement in their knowledge and interest with respect to data center operations or engineering technology training and careers?

In what ways does DCO Tech improve participating students' preparedness for data center operations or engineering technology careers?

Key Findings

- ⇒ Fifty-nine high school juniors and seniors participated in the Summer Bridge Program. The majority of students were in 11th grade and male. Additionally, most students were Asian, Hispanic or Latino, White, or Black or African American.
- ⇒ Findings suggest that the Summer Bridge Program increased students' understanding of ET and DCO training and careers, as well as their interest in ET and DCO careers.
- ⇒ Students reported increased understanding of workplace safety and college success skills after participating in the Summer Bridge Program relative to before.
- ⇒ Students most commonly reported their greatest learning from the Summer Bridge Program to be about ET and DCO career pathways and opportunities.
- ⇒ Students who participated in the Summer Bridge Program left with a clear understanding of ET as the hands-on application of engineering, contrasting design-oriented roles with applied technical skills.
- ⇒ More than half of students indicated that they were likely to pursue an ET degree after participating in the Summer Bridge Program.

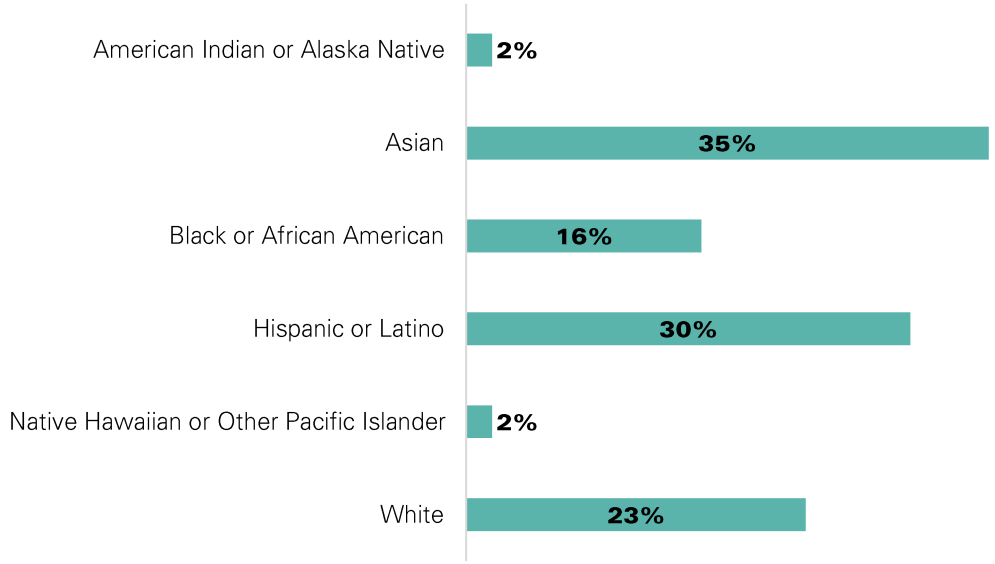
The DCO Tech Summer Bridge Program offered high school juniors and seniors an introduction to ET and DCO by experienced professionals in the field. Current NOVA professors served as instructors. Students participated in a college-accredited course (SDV 101: Orientation to Engineering Technology or SDV 100: College Success Skills), which introduced them to college success skills with an emphasis on ET. Students who earned the Occupational Safety and Health Administration (OSHA) 10 certification received credit for SAF 130: Industrial Safety.

The Summer Bridge Programs were held in summer 2022, 2023, and 2024. All programs included tours of NOVA's Manassas Fab Lab or NOVA's Loudoun Data Center Lab, NOVA campuses (Woodbridge, Loudoun, Annandale, or Manassas), and industry organizations (Micron Technology or STACK Infrastructure). Twenty high school students participated in the 2022 program, 25 in the 2023 program, and 14 in the 2024 program.

Student Participants in the Summer Bridge Program

Overall, 59 students participated in the Summer Bridge Programs. The majority of students who participated were in 11th grade (n = 40, 68%) and the rest were in 12th grade (n = 12, 32%). Most students were Asian, Hispanic or Latino, White, or Black or African American (Figure 1).

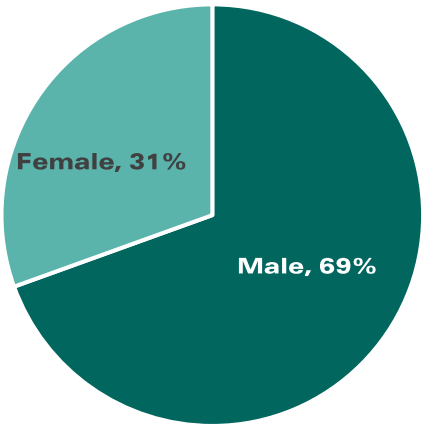
Figure 1. Race/ethnicity of Summer Bridge Program participants (n = 57)



Note. Percentages may sum to more than 100% as students could select more than one race/ethnicity.

Additionally, the Summer Bridge Programs served more male students than female students (Figure 2).

Figure 2. Sex of Summer Bridge Program participants (n = 59)



Student Outcomes of the Summer Bridge Program

The Summer Bridge Program survey included questions to assess students' perceptions regarding the following outcomes:

- Their understanding of and interest in ET and DCO training and careers
- Their understanding of workplace safety and college success skills
- What they learned most from the Summer Bridge Program
- The likelihood they would go on to pursue an ET degree at NOVA

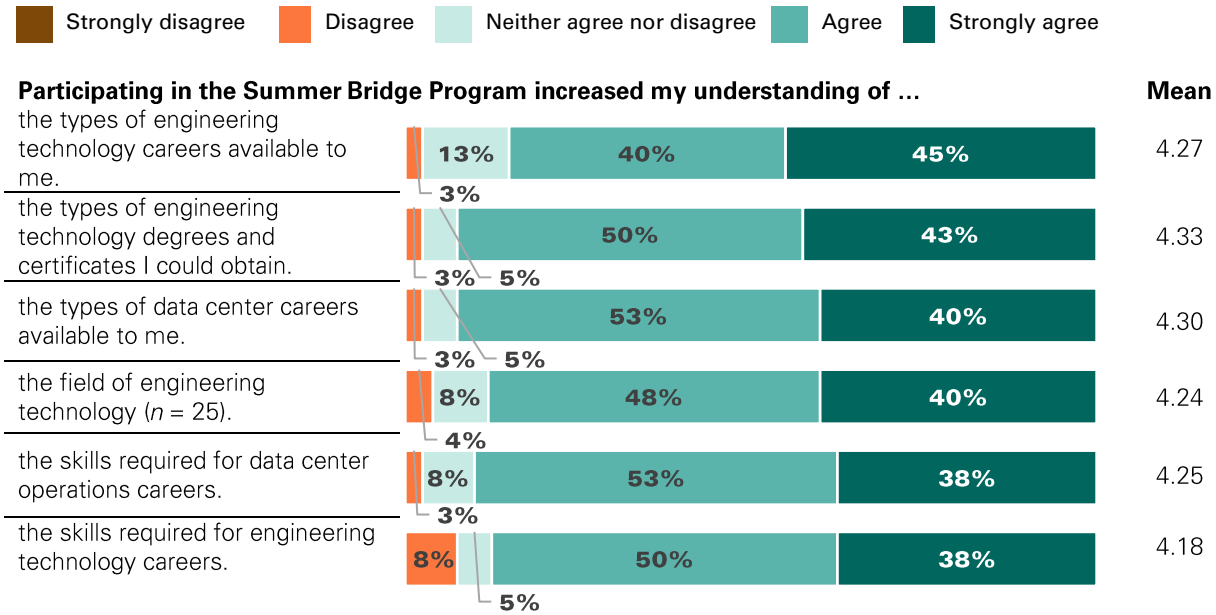
Additionally, the 2023 and 2024 surveys included an open-ended question asking students how they would define ET, which was intended to determine whether students were leaving the program with an accurate understanding of the field.

Most students indicated that the Summer Bridge Program increased their understanding of ET and DCO training and careers

When asked to rate the impact of their participation in the 2022 and 2023 Summer Bridge Program, most students *agreed* or *strongly agreed* that participating in the program increased their understanding of various aspects of ET and DCO careers and programs (Figure 3). However, across all items some students *neither agreed nor disagreed* and a few *disagreed*.

> ***"Learning about the opportunities there are in engineering technologies and how the field is growing."***
>
> **—2023 Summer Bridge participant**

Figure 3. Students' feedback on the impact of the 2022 and 2023 Summer Bridge Program on their understanding of ET and DCO training and careers (n = 40)

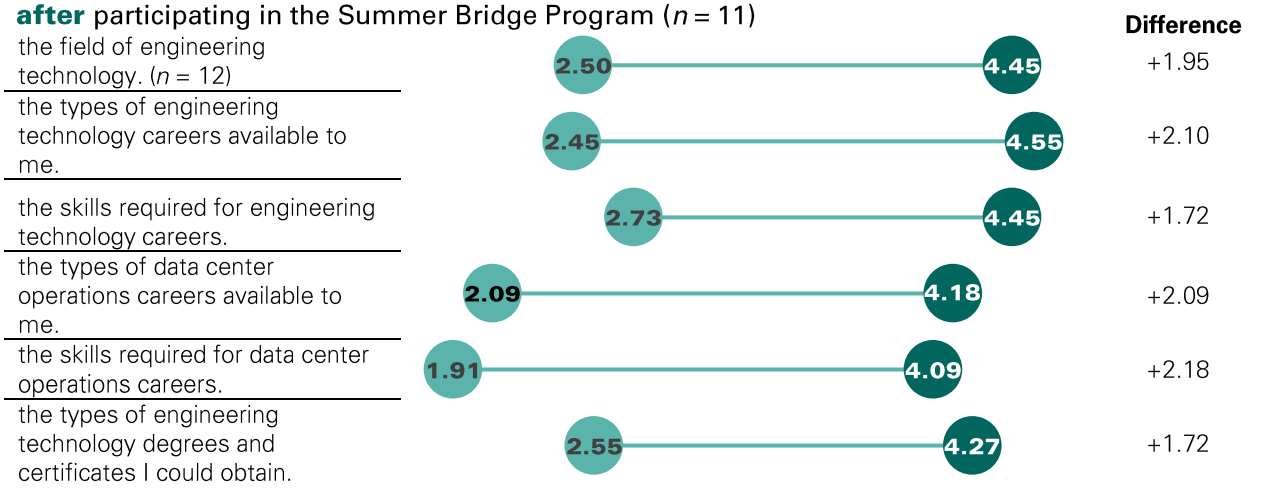


Note. Some items are abbreviated. Percentages for some items do not add to 100% because of rounding.

> *"[I learned] all the information about data centers and the skills needed for the job."*
>
> —2024 Summer Bridge participant

For the 2024 Summer Bridge Program, students completed a retrospective pre-posttest survey to examine the impact of the program on their understanding of ET and DCO training and careers. Similar to the 2022 and 2023 ratings, students' self-reported understanding of ET and DCO careers and programs increased after participating in the program (Figure 4). Students indicated the greatest gains in their understanding of the skills required for DCO careers, followed by the types of ET and DCO careers available.

Figure 4. Students' ratings of their understanding of ET and DCO training and careers **before** and **after** participating in the Summer Bridge Program ($n = 11$)

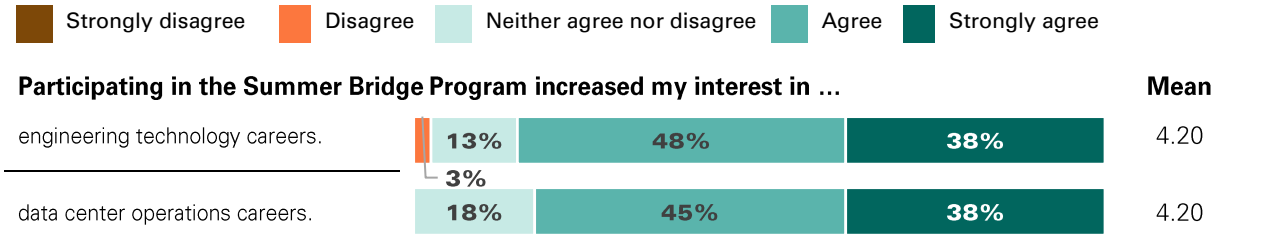


Note. Scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree.

Most students indicated that the Summer Bridge Program increased their interest in ET and DCO careers

When asked to rate the impact of their participation in the 2022 and 2023 Summer Bridge Program on their interest in ET and DCO careers, most students *agreed* or *strongly agreed* that participating in the program increased their interest (Figure 5). Across both items, only one student *disagreed*.

Figure 5. Students' feedback on the impact of the 2022 and 2023 Summer Bridge Program on their interest in ET and DCO careers ($n = 40$)

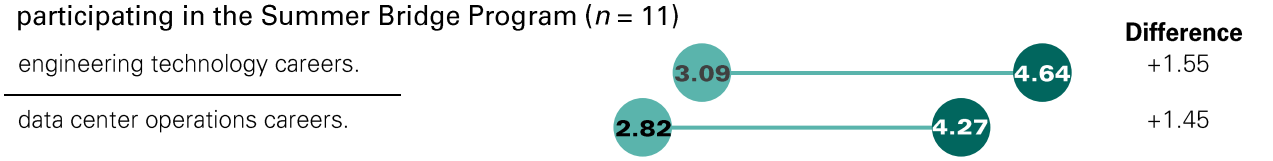


Note. Some items are abbreviated. Percentages do not add to 100% because of rounding.

> *"I am very set on pursuing working in a data center as my career."*
>
> **—2024 Summer Bridge participant**

For the 2024 Summer Bridge Program, students completed a retrospective pre-posttest to examine the impact of the program on their interest in ET and DCO careers. Similar to the 2022 and 2023 ratings, students' interest in ET and DCO careers increased after participating in the program (Figure 6).

Figure 6. Students' ratings of their interest in ET and DCO training and careers **before** and **after** participating in the Summer Bridge Program (*n* = 11)

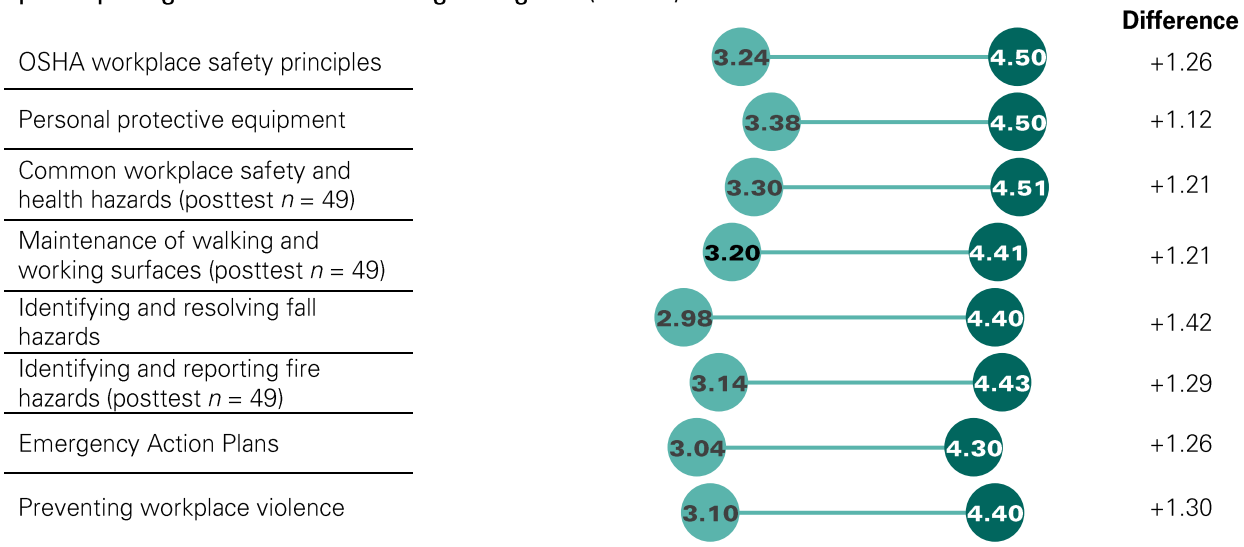


Note. Scale: 1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree.

Students rated their understanding of workplace safety higher after participating in the Summer Bridge Program relative to before

This section summarizes retrospective pre-posttest data collected across all three Summer Bridge Programs regarding students' understanding of different aspects of workplace safety. Students' ratings of their understanding of workplace safety were higher after the Summer Bridge Program relative to before (Figure 7). The largest mean differences in ratings before and after participation were for students' understanding of identifying and resolving fall hazards, preventing workplace violence, and identifying and reporting fire hazards.

Figure 7. Student's ratings of their understanding of workplace safety **before** and **after** participating in the Summer Bridge Program (*n* = 50)

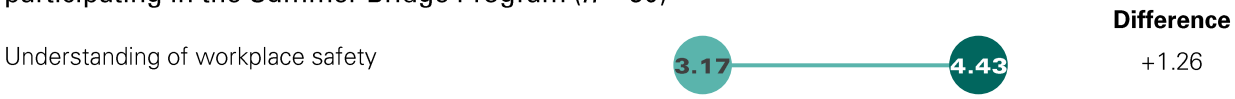


Note. Scale: 1 = No understanding, 2 = A little understanding, 3 = Some understanding, 4 = A good understanding, 5 = A great understanding.

In addition to item-level ratings, students' overall understanding of workplace safety was calculated (Figure 8). Students' ratings were higher after the Summer Bridge Program relative to

before. Further, a paired samples *t*-test indicated that this difference was statistically significant, suggesting that the increase from before (M = 3.17, SD = 1.04) to after (M = 4.43, SD = 0.56) participation was higher than would be expected by chance, $t(49) = 8.26$, $p < .001$, $d = 1.08$.

Figure 8. Students' overall ratings of their understanding of workplace safety **before** and **after** participating in the Summer Bridge Program (n = 50)



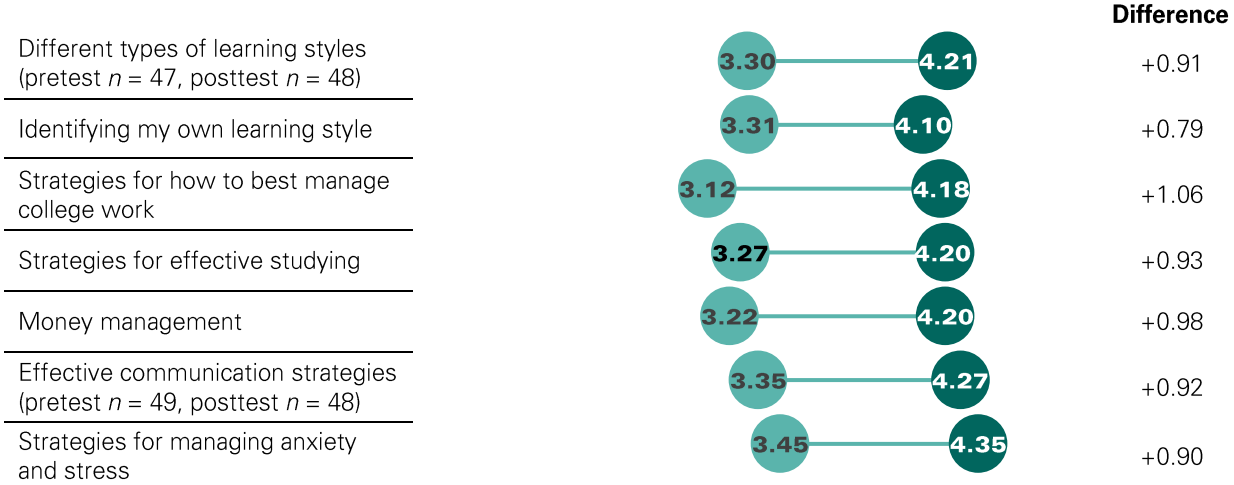
Note. Scale: 1 = No understanding, 2 = A little understanding, 3 = Some understanding, 4 = A good understanding, 5 = A great understanding.

Students rated their understanding of college success skills higher after participating in the Summer Bridge Program relative to before

This section summarizes retrospective pre-posttest data collected across all three Summer Bridge Programs regarding students' understanding of different college success skills. Students' ratings of their understanding of college success skills were higher after the Summer Bridge Program relative to before (Figure 9). The largest mean differences in ratings before and after participation were for students' understanding of strategies for how to best manage college work and money management.

> ***"I got to experience some components that engineering students would have to do, like hands-on activities."***
>
> **—2022 Summer Bridge participant**

Figure 9. Student's ratings of their understanding of college success skills **before** and **after** participating in the Summer Bridge Program (n = 49)



Note. Scale: 1 = No understanding, 2 = A little understanding, 3 = Some understanding, 4 = A good understanding, 5 = A great understanding.

In addition to item-level ratings, students' overall understanding of college success skills was calculated (Figure 10). Students' ratings were higher after the Summer Bridge Program relative to before. Further, a paired samples *t*-test indicated that this difference was statistically significant, suggesting that the increase from before (M = 3.29, SD = 0.85) to after (M = 4.22,

SD = 0.72) participation was higher than would be expected by chance, $t(48) = 6.92$, $p < .001$, $d = 0.95$.

Figure 10. Students' overall ratings of their understanding of college success skills **before** and **after** participating in the Summer Bridge Program ($n = 49$)

Note. Scale: 1 = No understanding, 2 = A little understanding, 3 = Some understanding, 4 = A good understanding, 5 = A great understanding.

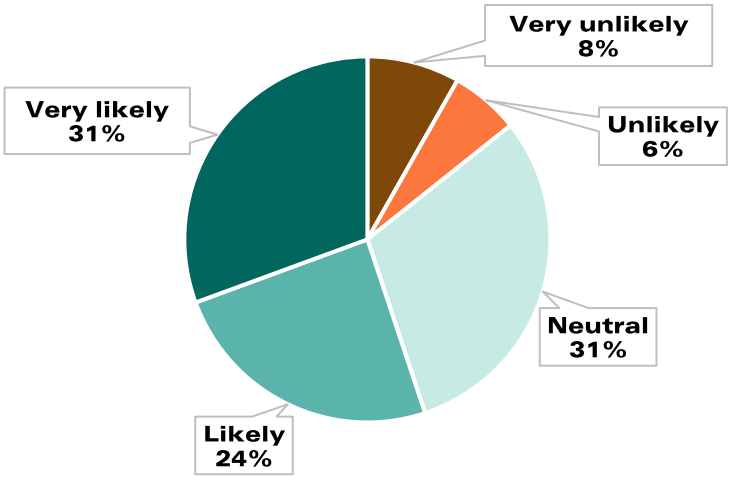
Students reported their greatest learning to be about data center operations and career opportunities

Across all three Summer Bridge Programs, students consistently reported their greatest learning to be about data center operations and career opportunities. Students who participated in the 2022 and 2023 Summer Bridge Programs most commonly described their greatest learning as pertaining to specific skills, activities, and processes related to DCO and ET, such as how DCOs are powered, the refrigeration cycle, and electricity and pneumatics. Students who participated in the 2024 Summer Bridge Program most commonly described their greatest learning to be about career opportunities and pathways. Across all years, students valued both the technical insights they gained and the career development and practical experiences offered by the program.

More than half of students indicated that they would likely pursue an ET degree at NOVA

When asked how likely they were to pursue an ET degree at NOVA, students' responses varied (Figure 11). Just over half (55%) indicated that they were *likely* or *very likely* to do so, whereas about a third (31%) indicated that they were *neutral*. Three students (6%) indicated that they were *unlikely* to pursue an ET degree at NOVA, and four students (8%) indicated that they were *very unlikely* to.

Figure 11. Students' ratings of their likelihood of pursuing an ET degree at NOVA ($n = 49$)



Most students defined ET as the hands-on application of engineering

> ***"I would define Engineering Technology as the learning the technology needed to operate and enhance engineering systems. Engineering, to me, is making and crafting different mechanisms, while Engineering Technology is understanding the components and their functions in the mechanisms themselves."***
>
> **—2023 Summer Bridge participant**

After the 2023 and 2024 Summer Bridge Programs, most students defined ET as the hands-on application of engineering, with 84% (n = 16) of 2023 respondents and 55% (n = 6) of 2024 respondents defining ET in this way. Common themes included understanding ET as the application of engineering skills and contrasting ET with engineering, where engineering focuses on design and ET emphasizes application. Additionally, students noted the focus of ET on applied skills, such as computer work and technical skills related to robotics and machines. A few students in both years expressed uncertainty about defining ET or described it in unique ways, such as describing it as combining engineering and technology or as being a trial-and-error process, or likening the distinction between engineering and ET to the difference between engineers and technicians.

INTERNSHIP PREPARATION PROGRAM FINDINGS

The Internship Preparation Program was designed as a four-day program to prepare current ET students at NOVA for internships by providing support for resumes, interviewing, and networking, as well as knowledge of the ET industry. The DCO Tech project team intended for 16 current NOVA ET students to complete career-readiness workshops and activities in the following categories each year:

- Resume and cover letter writing
- Interview preparation
- LinkedIn profile development
- Internship search strategies
- Networking; professionalism in the workplace
- Career and job expectations
- Communication, teamwork, and problem-solving; salary negotiation
- Diversity in the workplace
- Ethics and organizational culture
- Careers and co-ops
- Industry certifications
- Security clearances

The project team modified the Internship Preparation Program so that the workshops leveraged the existing Career Readiness and Leadership Institute (CLRI) program, with additional industry tours for students in the Internship Preparation Program. To recruit students for the Internship Preparation Program, the DCO Tech project coordinator conducted classroom visits and recruited via the DCO Tech project website.

In spring 2022, the Internship Preparation Program had three ET student participants. In spring 2023, seven ET students participated. Participating students completed the workshop series through CLRI and joined tours of data centers. Upon completion of the Internship Preparation Program components, students received a stipend for their participation. In fall 2024, the project team offered a program for ET students on how to integrate skills into their resumes. Because of the small sample sizes of participants in the program throughout the duration of the project, no external evaluation activities occurred.

The project team noted that a major challenge to recruiting current NOVA ET students was that many applicants to the Internship Preparation Program were not in ET programs. In response to this challenge, the project team applied for and secured supplemental funding to redesign and implement the program. The redesigned program will include similar components as the original program (Table 2), but it will be more focused and have more flexible scheduling options for students.

Table 2. Redesigned Internship Preparation Program

Component	Description
Career Development	Students will have their resumes reviewed and revised by a professional, learn about the norms and standards of professional communication and conduct, and review common interview questions and strategies.
Mock Interviews	Students will conduct mock interviews with recruiters or technical personnel from Micron Technology and/or a data center partner. Students will receive immediate structured feedback after their practice interviews.
ET Skills Workshops	Students will conduct basic refresher workshops on Micron-donated semiconductor manufacturing machinery and at NOVA's data center laboratories. The workshops will focus on specific troubleshooting tasks that are common to the industry.
Mentoring & Industry Networking	Throughout the above activities, industry representatives will be present to provide students with direct, timely, and relevant advice for their industry.
Follow-Up Work-Based Learning	After completing all other program components, students will be placed into a follow-up work-based learning opportunity (e.g., industry tour, job shadowing, short-term internship).

INDUSTRY EXTERNSHIP PROGRAM FINDINGS

How does DCO Tech collaborate with industry partners? What was the impact of this collaboration?

Key Findings

- ⇒ Industry partners provided tours for the DCO Tech project. They maintained a high level of confidence in providing tours of their organizations before and after they provided tours. Partners also indicated that the tours effectively provided tour participants with information about ET and DCO careers.
- ⇒ After providing tours, industry partners reported increased awareness of ET and DCO programs and careers and increased knowledge of ET and DCO educational requirements.
- ⇒ After providing tours, industry partners had a better understanding of the differences between the requirements for a Career Studies Certificate and an Associate of Applied Science degree in ET and DCO. Additionally, following the tours, more than half of the industry partners were able to identify which NOVA campuses have facilities supporting these programs.

The DCO Tech project team intended for the Industry Externship Program to be a four-day program with six industry professionals from the ET and DCO fields. Industry professionals would attend a series of virtual presentations on NOVA's information and engineering technologies (IET) and ET programs, the responsibilities and credentials of NOVA adjunct professors, and the DCO side of NOVA's IET program. Participants would end the program with an in-person tour of the Manassas Fab Lab and teach a brief lesson during the Summer Bridge Program.

Because of a lack of interest in participation, the project team decided to adapt the Industry Externship Program to focus on their current industry partners. Specifically, the team engaged with representatives at organizations that offer tours for the DCO Tech project. Magnolia evaluators developed industry partner surveys that included questions about partners' awareness of educational pathways for ET and DCO careers and their confidence to administer tours. The project team administered the pre- survey in spring 2023 and used the findings to inform one-on-one meetings with these partners to share information related to ET and DCO educational pathways. The team administered the post-survey in summer 2023 after industry partners provided tours to understand their perceptions of the one-on-one meetings and tours.

Industry Partners

Seven individuals provided complete responses to both the pre- and post-surveys. The pre-post comparisons in this Industry Externship Program findings section focus on these seven individuals, who represented QTS Data Center (n = 3), STACK Infrastructure (n = 2), Lockheed Martin (n = 1), and Iron Mountain Data Center (n = 1). The individuals' roles at their organizations varied and included leadership roles (e.g., vice president of operations, site director), management roles (e.g., operations manager, site manager), and marketing or relationship roles (e.g., sales marketing). For open-ended feedback, all responses from the pre-survey (n = 8) and post-survey (n = 9) were included in analysis.

Industry Partner Collaboration Outcomes

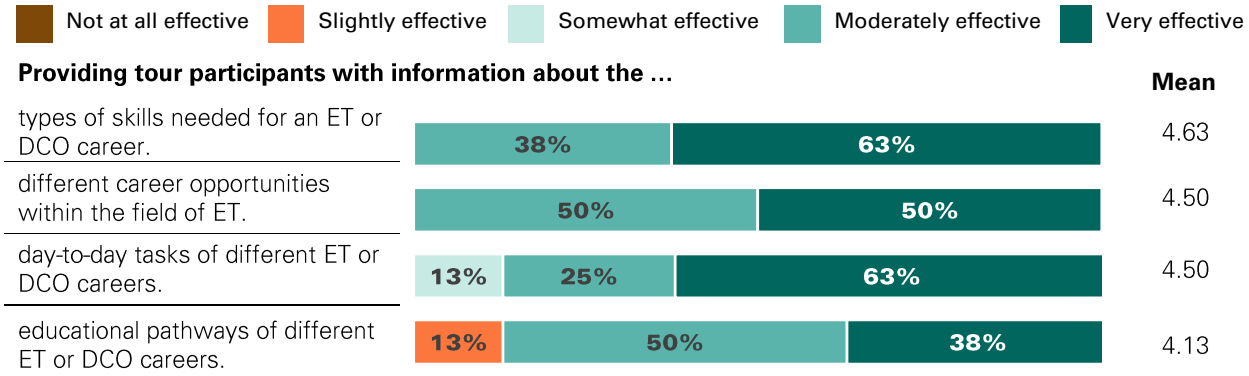
The industry partner survey included questions to assess industry partners' perceptions regarding the following outcomes:

- The effectiveness of the tours in providing information about ET and DCO careers
- Their confidence in providing tours
- Their awareness and understanding of ET and DCO programs, careers, and educational requirements
- Their awareness of which NOVA campuses have facilities supporting ET and DCO programs

Most industry partners indicated that the tours were effective in providing information about ET and DCO careers

Industry partners rated the effectiveness of the tours they provided for the DCO Tech project in meeting four objectives related to providing information about ET and DCO careers (Figure 12). All industry partners rated the tours as *moderately* or *very* effective in providing participants with information about the types of skills needed for and different opportunities for ET or DCO careers. Similarly, all but one industry partner rated the tours as *moderately* or *very* effective in providing information on the day-to-day tasks of and educational pathways of ET or DCO careers.

Figure 12. Industry partners' ratings of the effectiveness of the tours they provided in meeting tour objectives ($n = 8$)



Note. Percentages for some items do not add to 100% because of rounding.

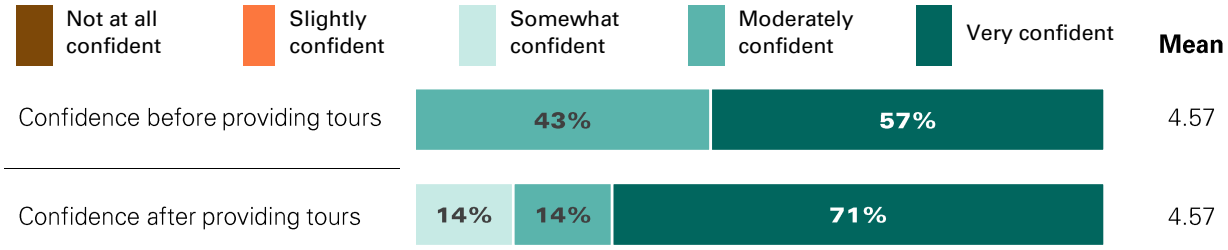
When asked to explain their ratings, industry partners shared information about the content of their tours and other aspects of their tour experiences:

- Tours centered on providing information about ET or DCO career opportunities and pathways ($n = 4$).
    - One partner explained they used testimonials to convey this information.
- Attendees were engaged and asked good questions ($n = 2$).
- Tours ran smoothly ($n = 1$).
- Tours focused on explaining the necessary skill sets for ET or DCO careers ($n = 1$).
- Tours included explanations of what a data center is ($n = 1$).

Most industry partners rated themselves as moderately or very confident in providing tours of their organization both before and after providing tours

When asked to rate their confidence in providing tours to youth and adults who may not know anything about ET or DCO, industry partners rated themselves as similarly confident in providing tours before and after they provided tours for DCO Tech (Figure 13).

Figure 13. Industry partners' ratings of their confidence in providing tours for DCO Tech before and after they provided tours ($n = 7$)



Note. Percentages for some items do not add to 100% because of rounding.

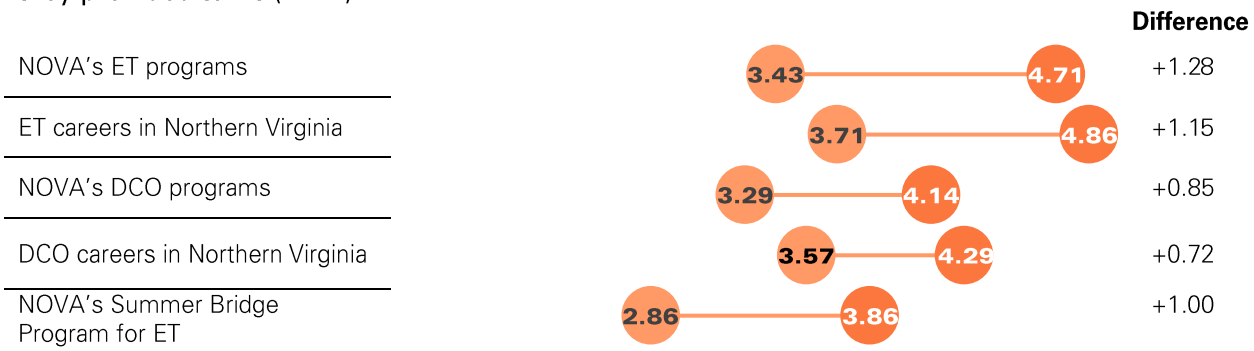
When asked to explain their ratings, industry partners most commonly shared that they or their organizations had extensive experience providing tours to individuals from various backgrounds. In pre-tour feedback, one partner noted that they or their organization had vast knowledge of the field and of mentoring and training recent high school graduates, as well as familiarity with NOVA programs. Another partner mentioned their or their organization's familiarity with data centers in pre-tour feedback. In post-tour feedback, one partner shared that they or their organization enjoyed providing tours, while two others mentioned that they would like to gain more knowledge before providing solo tours.

When asked what, if anything, would help them feel more confident in providing tours, industry partners most commonly shared that it would be beneficial to have additional information on the main goals of the tour for each specific group. In pre-tour feedback, one partner also noted that having sufficient time for questions would be helpful, while another partner expressed the need to learn the specific norms and rules of providing a tour at their site. In post-tour feedback, one industry partner shared that partnering with other team members from different areas would aid their confidence in providing tours.

Industry partners' awareness of NOVA's ET and DCO programs and ET careers in Northern Virginia increased after providing tours

Industry partners ratings of their awareness of ET and DCO programs and careers were higher after they provided tours for the project relative to before (Figure 14). The largest mean differences in ratings before and after were for NOVA's ET programs and ET careers in Northern Virginia.

Figure 14. Industry partners' awareness of ET and DCO programs and careers **before** and **after** they provided tours ($n = 7$)



Note. Scale: 1 = Not at all aware, 2 = Slightly aware, 3 = Somewhat aware, 4 = Moderately aware, 5 = Very aware.

In addition to item-level ratings, industry partners' overall ratings of their awareness of ET and DCO programs and careers were calculated (Figure 15). Industry partners' ratings were higher after they provided tours for the project relative to before, but this difference was not statistically significant. This suggests that the increase from before ($M = 3.50$, $SD = 1.05$) to after ($M = 4.50$, $SD = 0.85$) was not higher than would be expected by chance, $t(6) = 2.26$, $p = .065$, $d = 1.17$.[3]

Figure 15. Industry partners' overall awareness of ET and DCO opportunities **before** and **after** they provided tours ($n = 7$)

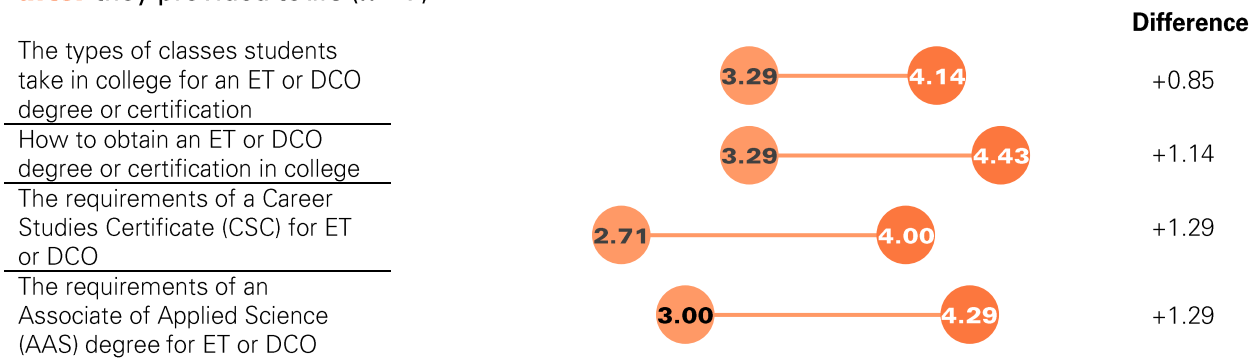
Note. Scale: 1 = Not at all aware, 2 = Slightly aware, 3 = Somewhat aware, 4 = Moderately aware, 5 = Very aware.

Industry partners' knowledge of ET and DCO educational requirements increased after providing tours

Industry partners' ratings of their knowledge of ET and DCO educational requirements were higher after they provided tours for the project relative to before (Figure 16). The largest mean differences in ratings before and afterwere for requirements of an ET or DCO Career Studies Certificate (CSC) and Associate of Applied Science (AAS) degree.

[3] Although previous research suggests that *t*-tests are appropriate for small sample sizes (Meek et al., 2007), the analyses may have been underpowered to detect effects.

Figure 16. Industry partners' knowledge of ET and DCO educational requirements before and after they provided tours ($n = 7$)



Note. Scale: 1 = No understanding, 2 = A little understanding, 3 = Some understanding, 4 = A good understanding, 5 = A great understanding.

In addition to item-level ratings, industry partners' overall ratings of their understanding of ET and DCO educational requirements were calculated (Figure 17). Industry partners' ratings were higher after they provided tours for the project relative to before. Further, a paired samples *t*-test indicated that this difference was statistically significant, suggesting that the increase from before ($M = 3.07$, $SD = 1.62$) to after ($M = 4.21$, $SD = 0.65$) was higher than would be expected by chance, $t(6) = 2.83$, $p = .030$, $d = 1.07$.

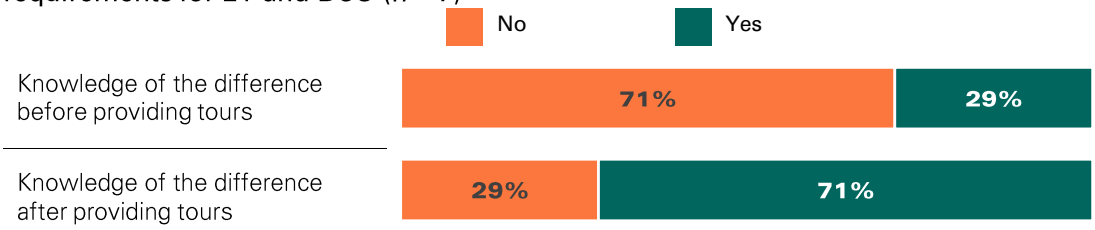
Figure 17. Industry partners' overall knowledge of ET and DCO educational requirements before and after they provided tours ($n = 7$)

Note. Scale: 1 = No understanding, 2 = A little understanding, 3 = Some understanding, 4 = A good understanding, 5 = A great understanding.

More industry partners indicated that they knew the difference between the requirements for a CSC and an AAS degree for ET or DCO after providing tours relative to before

Before completing tours, about three quarters of industry partners indicated that they did not know the difference between the requirements for a CSC and AAS degree for ET or DCO. However, after providing tours, about three quarters of industry partners indicated that they knew the difference between the requirements (Figure 18).

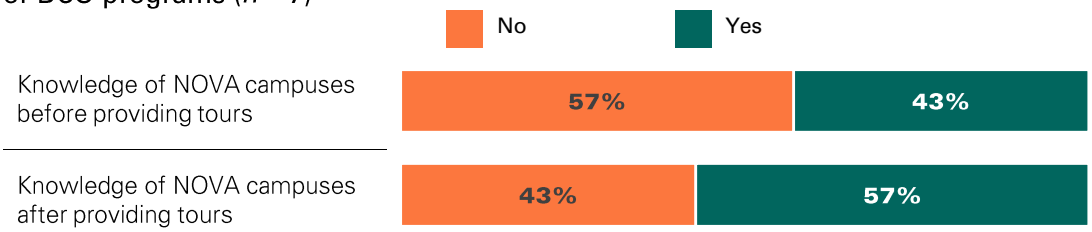
Figure 18. Industry partners' knowledge of the difference between CSC and AAS degree requirements for ET and DCO ($n = 7$)



About half of industry partners indicated that they knew which NOVA campuses have facilities supporting ET or DCO programs before and after providing tours

Before completing tours, three industry partners (43%) indicated that they knew which NOVA campuses have facilities supporting ET or DCO programs. After providing tours, four industry partners (57%) indicated that they knew which campuses have such facilities (Figure 19). Among those who responded *yes* in either survey, the most commonly mentioned campuses were Loudon, Manasses, and Woodbridge.

Figure 19. Industry partners' knowledge of which NOVA campuses have facilities supporting ET or DCO programs ($n = 7$)



K–12 EXTERNSHIP PROGRAM FINDINGS

What audiences does the DCO Tech program reach?

Do participating educators report improvements in their awareness of data center operations and engineering technology careers and their preparedness to support students in this field?

Key Findings

⇒ From 2022 to 2024, 89 educators participated in the K–12 Externship Program. More than half of participants were school counselors, followed by teachers and administrators.

⇒ Educators reported increased awareness of ET and DCO opportunities and confidence in guiding students after participating in the K–12 Externship Program.

⇒ Educators rated the importance of different skill sets for ET careers higher after their participation in the K–12 Externship Program relative to before, except for mathematics skills.

The K–12 Externship Program was designed as a four-day program intended to provide K–12 educators, administrators, and counselors with an in-depth overview of the ET program at NOVA and a greater understanding of the ET career field. The goals of the K–12 Externship Program were to increase:

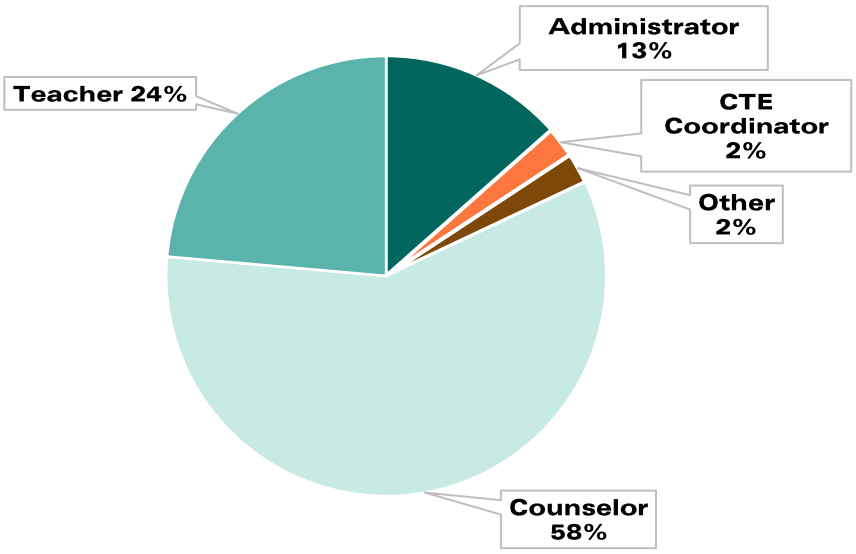
- Participants' awareness of in-demand career and educational pathways in ET within the region
- Their understanding of the skills required to pursue ET careers
- Their ability to connect students with information about college educational pathways and industry opportunities

Each K–12 Externship Program included a welcome session that reviewed NOVA programs, a series of industry tours, and a tour of NOVA's Manassas Fab Lab. The 2022 and 2023 K–12 Externship Programs ran from spring through summer. The 2024 K–12 Externship had two sessions, one in spring and one in summer. Eighteen educators completed the 2022 externship, 16 educators completed the 2023 externship, and 38 educators completed the 2024 externship.

Participants in the K–12 Externship Program

From 2022 to 2024, 89 educators completed the K–12 Externship Program. More than half of participants (n = 52; 58%) were school counselors (Figure 20). A quarter of participants (n = 21, 24%) were teachers, and 12 (13%) were administrators.

Figure 20. K–12 Externship Program participants' roles (*n* = 89)



Educator Outcomes of the K–12 Externship Program

The K–12 Externship Program survey included questions to assess educators' perceptions of the following outcomes:

- Their awareness of ET and DCO opportunities
- The importance of different skill sets required for ET careers
- Their confidence in guiding secondary students toward ET and DCO careers

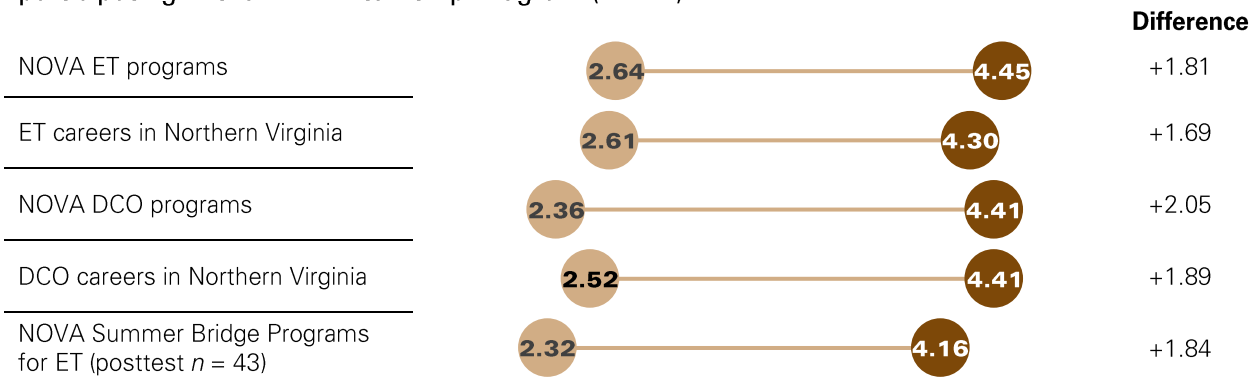
This section includes findings related to educator outcomes during the K–12 Externship Program.

Educators reported greater awareness of ET and DCO opportunities after participating in the K–12 Externship Program relative to before

Educators' ratings of their awareness of ET and DCO education and career opportunities were higher after their participation in the externship relative to before (Figure 21). The largest mean difference in ratings before and after participation was for educators' awareness of NOVA DCO Programs.

> ***"I was somewhat aware of NOVA's programs before the externship, as in, I knew they existed. But after, I know the skill sets, what the programs look like, and the career paths that they will lead to."***
>
> **—2023 K–12 Externship participant**

Figure 21. Educators' ratings of awareness of ET and DCO opportunities **before** and **after** participating in the K–12 Externship Program ($n = 44$)



Note. Scale: 1 = Not at all aware, 2 = Slightly aware, 3 = Somewhat aware, 4 = Moderately aware, 5 = Very aware.

In addition to item-level ratings, educators' overall ratings of their awareness were calculated (Figure 22). Educators' ratings were higher after participating in the K–12 Externship Program relative to before. Further, a paired samples *t*-test indicated that this difference was statistically significant, suggesting that the increase from before ($M = 2.49$, $SD = 1.16$) to after ($M = 4.33$, $SD = 1.07$) participation was higher than would be expected by chance, $t(43) = 8.34$, $p < .001$, $d = 1.47$.

Figure 22. Educators' overall ratings of their awareness of ET and DCO opportunities **before** and **after** participating in the K–12 Externship Program

Note. Scale: 1 = Not at all aware, 2 = Slightly aware, 3 = Somewhat aware, 4 = Moderately aware, 5 = Very aware.

> ***"I had no idea of what the work actually involved. Micron Technology was especially eye-opening. It was also very interesting to understand what type of person both ET and DCO wanted to hire and the benefits of working there."***
>
> **—2024 K–12 Externship participant**

When asked how the K–12 Externship Program impacted their awareness of ET and DCO career pathways and opportunities, educators most commonly shared that exposure to the educational pathways for ET and DCO, broadly and at NOVA, positioned them to promote these pathways to students. Educators also expressed that learning more about the ET and DCO industry and job opportunities increased their understanding of the types of careers available in the field and what skills were necessary for those careers. Some educators also mentioned that their comfortability in sharing with students and families increased, while others expressed that the externship as a whole was informative.

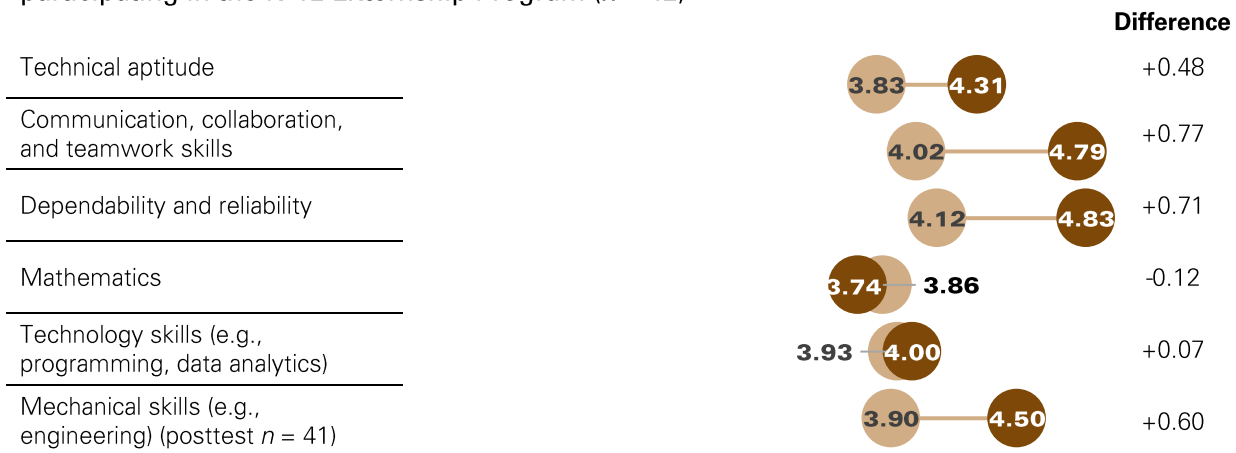
Educators rated the importance of different skill sets for ET careers higher after their participation in the K–12 Externship Program relative to before, except for mathematics skills

The K-12 Externship Program aimed to clarify the importance of different skills for ET careers, such as non-technical skills like communication and collaboration. Educators' ratings of the importance of most of the different skill sets required for ET careers were higher after participating in the externship relative to before (Figure 23). The largest mean difference in ratings before and after participation was for communication, collaboration, and teamwork skills.

Educators' ratings of the importance of mathematics skills decreased after the externship. Because mathematics is critical for the field of engineering, there can be a misconception that it is just as important for ET. During the externship program, the project team and industry partners addressed this misconception. Therefore, the project team anticipated that the importance of mathematics skills for ET careers would decrease after participation.

> ***"I automatically assumed that individuals interested in this career would have to be very strong mathematically. However, I learned that isn't the case. Although you do need some basic math skills, you do not need to be a math wizard."***
>
> **—2022 K–12 Externship participant**

Figure 23. Educators' ratings of the importance of skill sets for ET careers before and after participating in the K–12 Externship Program (n = 42)



Note. Scale: 1 = Not at all important, 2 = Slightly important, 3 = Somewhat important, 4 = Moderately important, 5 = Very important.

In addition to item-level ratings, educators' overall ratings of the importance of skill sets for ET careers were calculated (Figure 24). Educators' ratings were higher after participating in the K–12 Externship Program relative to before. Further, a paired samples t-test indicated that this difference was statistically significant, suggesting that the increase from before (M = 3.94, SD = 0.78) to after (M = 4.36, SD = 0.62) participation was higher than would be expected by chance, $t(41) = 2.86$, $p = .007$, $d = 0.96$.

Figure 24. Educators' overall ratings of of the importance of skill sets for ET careers **before** and **after** participating in the K–12 Externship Program (*n* = 42)

Note. Scale: 1 = Not at all important, 2 = Slightly important, 3 = Somewhat important, 4 = Moderately important, 5 = Very important

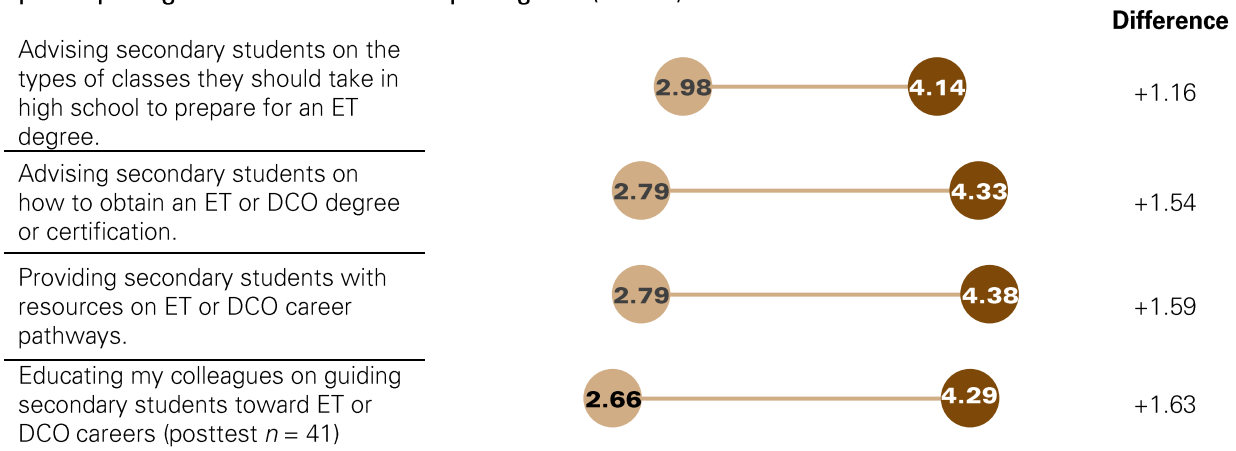
When asked how the K–12 Externship Program impacted their understanding of the skill sets required for ET careers, educators most commonly shared that they learned how skills vary depending on the specific field and what is required in different fields. Further, some educators explained that their exposure to and discussion with industry partners helped them understand that basic mathematics is important, but advanced mathematics skills are not needed for most jobs. Educators also described learning that "soft skills" (e.g., teamwork, collaboration, work ethic) are just as important as technical skills in the field and that many advanced skills can be taught on the job.

> ***"I found this to be a very unique and worthwhile use of my time for the experience and knowledge gained … I would not have gotten the same level of understanding or impact through a webinar. It made me want to share what I saw, heard, and learned with everyone!"***
>
> **—2023 K–12 Externship participant**

Educators reported increased confidence in guiding secondary students toward ET and DCO careers after participating in the K–12 Externship Program relative to before

Educators' ratings of confidence in guiding students toward ET and DCO careers were higher after participating in the externship relative to before (Figure 25). The largest mean difference in ratings before and after participation was for educating colleagues on how to guide secondary students toward ET or DCO careers.

Figure 25. Educators' ratings of their confidence in guiding students **before** and **after** participating in the K–12 Externship Program (*n* = 42)



Note. Scale: 1 = Not at all confidence, 2 = Slightly confident, 3 = Somewhat confident, 4 = Moderately confident, 5 = Very confident.

In addition to item-level ratings, educators' overall ratings of their confidence guiding students were calculated (Figure 26). Educators' ratings were higher after participating in the K–12 Externship Program relative to before. Further, a paired samples *t*-test indicated that this difference was statistically significant, suggesting that the increase from before ($M = 2.79$, $SD = 1.13$) to after ($M = 4.29$, $SD = 0.87$) participation was higher than would be expected by chance, $t(41) = 6.93$, $p < .001$, $d = 1.40$.

Figure 26. Educators' overall ratings of their confidence in guiding students **before** and **after** participating in the K–12 Externship Program ($n = 42$)

Note. Scale: 1 = Not at all confidence, 2 = Slightly confident, 3 = Somewhat confident, 4 = Moderately confident, 5 = Very confident.

> ***"Nothing beats actual experience, and actual experience directly impacts how we relay information to our stakeholders. We are able to provide insight to interested students and adults with a confidence we could not have without having experienced it for ourselves."***
>
> **—2024 K–12 Externship participant**

When asked how the K–12 Externship Program impacted their confidence in guiding secondary students toward ET or DCO careers, educators shared how their improved understanding of ET and DCO educational pathways and careers increased their confidence to guide students to this field. Some educators specifically shared that the firsthand experience of touring facilities and receiving information from industry partners and NOVA facilitated this increase. Additionally, educators shared that the experience increased their understanding of the industry in Northern Virginia as well as resources and supports available to students and their families.

When asked how developing their Plans of Action impacted their confidence in guiding secondary students toward ET or DCO careers, educators shared that developing the plan allowed them to visualize and identify concrete steps and goals to share these opportunities with the community. Some educators further related that the Plans of Action allowed them time to brainstorm, reflect, and critically think about how to best share the information they learned, as well as be more confident and prepared to share the information they learned.

> ***"Developing the Plan of Action helped me identify small steps to make a large impact in guiding students toward in-demand careers."***
>
> **—2022 K–12 Externship participant**

VETERAN OUTREACH PROGRAM FINDINGS

There were no evaluation activities or summative evaluation questions for the Veteran Outreach Program component. Instead, the DCO Tech project team internally tracked and provided updates for this component. The project team put the veteran outreach activities on hold for the first year because of the amount of time and resources required for the other project activities.

During the second year, the project team and project partners reported several activities related to Veteran's Outreach, including the following:

- Conducted virtual presentations with the Office of Military and Veteran Services to promote IET and upcoming opportunities to NOVA students
- Developed a podcast with the Nomad Futurist foundation discussing DCO at NOVA and how Veterans would be a good fit for these opportunities
- Attended the Navy Seal Foundation tribute event in Houston, Texas, and promoted the NOVA DCO program to special forces members
- Oversaw STACK Infrastructure's enrollment into the U.S. Department of Defense's SkillBridge program

During the third year, the project team scheduled an activity with the Virginia Values Veterans (V3) Program to provide information regarding NOVA's ET and DCO education opportunities. The DCO Tech project's Primary Investigator (PI) attended a training to be able to engage with V3. The DCO Tech PI and a representative from STACK Infrastructure co-presented a webinar about an opportunity for veterans, as well as transitioning service members and spouses, to learn about DCO careers. The webinar included information about the data center industry and specific DCO roles. The webinar also included information about available educational pathways at NOVA, specifically the DCO one-year certificate and ET Ready, a hands-on pre-apprenticeship program through NOVA Workforce that helps prepare students for the DCO industry. Sixteen individuals registered and attended the webinar live or received a recording of the webinar.

SUMMARY AND LESSONS LEARNED

This section summarizes key evaluation findings for the DCO Tech project and includes lessons learned to guide similar, future projects.

Summary

Below is a summary of findings pertaining to each summative evaluation question.

What audiences does the DCO Tech program reach?

The DCO Tech project reached a diverse group of students. The Summer Bridge Program was completed by 59 high school juniors and seniors from 2022 to 2024. Over two-thirds of the students who participated were male, and most were Asian, Hispanic or Latino, White, or Black or African American. Additionally, the project reached many educators. The K–12 Externship Program was completed by 89 educators from 2022 to 2024. More than half of participants were school counselors, and the remainder were teachers and administrators.

Do participating students report improvement in their knowledge and interest with respect to data center operations or engineering technology training and careers?

In what ways does DCO Tech improve participating students' preparedness for data center operations or engineering technology careers?

Findings suggest that students who participated in the Summer Bridge Program reported improved knowledge and interest regarding DCO and ET training and careers. Specifically, students reported a higher understanding of and interest in ET and DCO education and career pathways after participating relative to before, particularly their understanding of the different types of careers available. Additionally, students' overall ratings of their understanding of workplace safety and college success skills were statistically significantly higher after the Summer Bridge Program relative to before. Students' open-ended feedback supported these findings, sharing that their greatest learning was about data center operations and career opportunities, as well as specific skills, activities, and processes related to ET and DCO. Additionally, after participation in the program, more than half of students indicated that they were likely to pursue an ET degree at NOVA.

Overall, these findings suggest that DCO Tech improved students' preparedness for DCO and ET careers by increasing their understanding of ET and DCO education requirements and jobs, as well as their understanding of the different skillsets needed to pursue training and careers in this field.

Students' learning and preparedness were also supported through the Internship Preparation Program, although this component of the DCO Tech project was modified. Participating students completed the existing CLRI program and attended additional industry tours. Additionally, in 2024 ET students received further career preparation support through the program. Because of the overall small number of participants, data were not collected for the internship component. However, the DCO Tech project team secured supplemental funding to redesign and implement the program.

How does DCO Tech collaborate with industry partners? What was the impact of this collaboration?

The DCO Tech project team collaborated with industry partners throughout the project. For example, industry partners provided tours of their ET and DCO facilities to students and educators to share information about ET and DCO education and career pathways. Additionally, the project team provided industry partners with information about ET and DCO educational programs and requirements—broadly and at NOVA—to support partners in providing this information during tours.

Overall, findings suggest that these collaborations resulted in effective tours for the DCO Tech Project and new learnings for engaged industry partners. Industry partners indicated that the tours they provided for the DCO Tech project were effective in providing information about ET and DCO education pathways and careers. Most industry partners were moderately or very confident in providing tours of their organizations before and after they provided tours for the project. Industry partners' overall awareness of ET and DCO programs and careers increased after providing tours for the project, particularly their awareness of NOVA's ET programs and of ET careers in Northern Virginia. Further, partners' overall knowledge of ET and DCO educational requirements statistically significantly increased after providing tours for the project, particularly their knowledge of the requirements of a CSC and AAS degree in ET or DCO.

Do participating educators report improvements in their awareness of data center operations and engineering technology careers and their preparedness to support students in this field?

Findings suggest that educators who participated in the K–12 Externship Program reported improved awareness of DCO and ET careers and preparedness to support students in the field. Educators rated their awareness of ET and DCO opportunities, understanding of the importance of different skill sets for ET careers, and confidence in guiding secondary students toward ET and DCO careers statistically significantly higher after participating in the program relative to before.

Educators were asked to describe how the K–12 Externship Program impacted their awareness, understanding, and confidence in these areas. Educators expressed that they learned more about job opportunities in ET and DCO and what skills are required in different fields. Additionally, educators shared that the exposure to the educational pathways for ET and DCO, broadly and at NOVA, positioned them to promote these pathways to students. After the program, educators had an improved understanding of ET and DCO educational pathways and careers, which increased their confidence to guide students to these fields.

Lessons Learned

Below are lessons learned based on the above findings and additional data collected and reported throughout the project. The lessons learned are organized into two areas: project implementation and project outcomes.

Lessons Learned Regarding Project Implementation

- Overall, students who participated in the Summer Bridge Program rated the program highly, particularly the hands-on components. Integrating hands-on activities such as tours, networking activities, and group work in similar, future programs could support student engagement.
- The Internship Preparation Program was not implemented as intended because of a lack of interest and availability on behalf of current ET students at NOVA. The project team was still able to support current ET students by capitalizing on existing opportunities (e.g., the CLRI program) and focusing on one-off supports, such as resume workshops.
- The Industry Externship Program was also not implemented as intended because of a lack of interest and availability on behalf of industry partners. However, the project team was still able to successfully engage with industry partners using less time-intensive strategies (e.g., one-on-one meetings). Conducting a brief needs assessment with industry partners at the beginning of the project to determine what forms of engagement might be most beneficial and feasible for them could have supported the project team in developing this component.
- Throughout the project, K–12 Externship Program participants tended to rate the networking opportunities (with industry representatives and other educators) and opportunities for group discussion as the lowest quality relative to other program components. Ensuring that participants have sufficient time for informal conversation and networking with one another and with industry representatives, and including structured or semi-structured group discussions, might be useful strategies for other projects with a similar focus.

Lessons Learned Regarding Project Outcomes

- Even though the Summer Bridge Programs were only two weeks long, they still achieved the desired outcomes of increasing students' knowledge and interest regarding ET and DCO careers. These short-term programs are a useful approach for engaging high school students in new content areas or exposing them to different career paths.
- Similarly, the K–12 Externship Program achieved the desired outcomes of increasing educators' awareness of DCO careers and their preparedness to support students in this field. This suggests that programs hoping to achieve similar outcomes could benefit from following the externship model.

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APPENDIX A: EVALUATION MATRIX

To assess the extent to which the project achieves its objectives, the DCO Tech project evaluation addresses the formative and summative questions shown in Table A1, which also provides an overview of the evaluation tasks and timelines.

Table A1. DCO Tech project evaluation matrix

EVALUATION MATRIX			
Bridge Program	2-week non-residential program for potential engineering technology (ET) students		
Evaluation Questions	Indicators	Data Collection Sources	Timeline
Formative			
To what extent does the project team implement the DCO Tech bridge program as planned? What factors strengthen or impede the implementation of the bridge program? What modifications were made to the DCO Tech bridge program?	Agenda/curriculum shows all intended offerings	Project calls	Quarterly
	# of products delivered	Progress Tracker	Quarterly
		Document review	Ongoing
How does the project develop and progress regarding the intended number and nature of participants in the DCO Tech bridge program?	16 juniors/seniors participate each year	Project calls	Quarterly
	% of underrepresented minorities	Progress Tracker	Quarterly
What are stakeholder's perceptions of the quality of DCO Tech bridge program in supporting interest and pathways to careers in the data center operations and engineering technology industry?	% of participants and partners indicate positive perceptions of the quality of the bridge program.	Project calls	Quarterly
		Bridge participant surveys	Annual
		Bridge program interviews/focus groups	Annual
		Partner survey	Annual
How can the bridge program be improved to foster interest and engagement?		Bridge participant surveys	Annual
		Bridge program interviews/focus groups	Annual
SHORT TERM OUTCOME #1: Improved student knowledge of engineering technology skills.			
Summative			
To what extent do participating DCO Tech bridge program students report improvement in their knowledge, skills, and interest with respect to data center operations and engineering technology careers?	% of participants report increased their knowledge & skills	Bridge participant surveys	Annual
	% of participants report increased interest in ET and DCO careers	Bridge program interviews/focus groups	Annual
		Progress Tracker	Quarterly
Does the program reach and recruit its intended audiences for participation in the pipeline?	48 juniors/seniors participate each year	Project calls	Quarterly
	% of underrepresented minorities	Progress Tracker	Quarterly
	# of participants show interest in the pipeline	Bridge participant surveys	Annual
	# of participants enroll in ET or DCO program	Bridge program interviews/focus groups	Annual

Internship Program	a 4-day career development program to prepare students to enter workforce		
Evaluation Questions	Indicators	Data Collection Sources	Timeline
Formative			
To what extent does the project team implement the DCO Tech internship program as planned? What factors strengthen or impede the implementation of the internship program? What modifications were made to the DCO Tech internship program?	Agenda/curriculum shows all intended offerings	Project calls	Quarterly
	# of products delivered	Progress Tracker	Quarterly
		Document review	Ongoing
How does the project develop and progress regarding the intended number and nature of participants in the DCO Tech internship program?	16 ET or DCO students participant	Project calls	Quarterly
	% of underrepresented minorities		
	% of first-generation students	Progress Tracker	Quarterly
What are stakeholder's perceptions of the quality of DCO Tech internship program in supporting interest and pathways to careers in the data center operations and engineering technology industry?	% of participants and partners indicate positive perceptions of the quality of the boot camp.	Project calls	Quarterly
		Boot camp participant surveys	Annual
		Partner survey	Annual
How can the internship program be improved to foster interest and engagement?		Boot camp participant surveys	Annual
SHORT TERM OUTCOME #2: Increased student interest in engineering technology careers and internships.			
Summative			
To what extent and in what ways does the DCO Tech boot camp improve preparedness for engineering tech and DCO pathways?	% of students indicate preparedness for ET and DCO pathways	Boot camp participant surveys	Annual
Does the program reach and recruit its intended audiences for participation in the pipeline?	16 ET or DCO students participant	Project calls	Quarterly
	% of underrepresented minorities	Progress Tracker	Quarterly
	% of first-generation students	Boot camp participant surveys	Annual
	# of participants show interest in the ET and DCO careers		
	# of participants apply for an internship		

Industry Externships	structured introductions to DCO education for industry professionals		
Evaluation Questions	Indicators	Data Collection Sources	Timeline
Formative			
To what extent does the project team implement the DCO Tech industry externship as planned? What factors strengthen or impede the implementation of the industry externship? What modifications were made to the DCO Tech industry externship?	Agenda/curriculum shows all intended offerings	Project calls	Quarterly
	# of products delivered	Progress Tracker	Quarterly
		Document review	Ongoing
How does the project develop and progress regarding the intended number and nature of participants in the DCO Tech industry externship?	# of industry externs participating	Project calls	Quarterly
	% of industry externs who provide two lessons in the bridge program	Progress Tracker	Quarterly
What are stakeholder's perceptions of the quality of DCO Tech industry externship in supporting interest and pathways to careers in the data center operations and engineering technology industry?	% of participants and partners indicate positive perceptions of the quality of the externship.	Project calls	Quarterly
		Externship participant survey	Annual
		Partner survey	Annual
How can the industry externship be improved to foster interest and engagement?		Externship participant survey	Annual
SHORT TERM OUTCOME #4: Improved availability of engineering technology and DCO pathways.			
Summative			
To what extent and in what ways does the DCO Tech industry externship improve availability for engineering tech and DCO pathways?	% of industry externs who show interest in becoming a credentialed ET faculty member	Externship participant survey	Annual
	% of industry externs who understand the credentials required to teach ET or DCO courses as an adjunct instructor for NOVA		

K12 Externships	structured introductions to data centers and associated careers for K12 staff (e.g., counselors, administrators)		
Evaluation Questions	Indicators	Data Collection Sources	Timeline
Formative			
To what extent does the project team implement the DCO Tech K12 externship as planned? What factors strengthen or impede the implementation of the K12 externship? What modifications were made to the DCO Tech K12 externship?	Agenda/curriculum shows all intended offerings	Project calls	Quarterly
	# of products delivered	Progress Tracker	Quarterly
		Document review	Ongoing
How does the project develop and progress regarding the intended number and nature of participants in the DCO Tech K12 externship?	# of educators participating	Project calls	Quarterly
		Progress Tracker	Quarterly
What are stakeholder's perceptions of the quality of DCO Tech K12 externship in supporting interest and pathways to careers in the data center operations and engineering technology industry?	% of participants and partners indicate positive perceptions of the quality of the externship.	Project calls	Quarterly
		Externship participant survey	Annual
		Partner survey	Annual
How can the K12 externship be improved to foster interest and engagement?		Externship participant survey	Annual
SHORT TERM OUTCOME #3: Increased awareness of secondary staff awareness of degrees and careers in engineering technology			
Summative			
To what extent does the externship program improve educators' perceptions and awareness of ET and DCO careers and their preparedness to support students in this field?	% of participants indicate increased awareness of ET and DCO careers	Externship participant survey	Annual
	% of participants who feel prepared to support students		
	% of participants who plan to provide information about ET and DCO careers and pathways		

Veteran's Outreach	marketing effort to recruit NOVA-affiliated veterans to engineering tech		
Objective 5: Increase recruitment of veterans into engineering technician and DCO pipeline.			
Evaluation Questions	Indicators	Data Collection Sources	Timeline
Formative			
How does the project develop and progress regarding the intended number and nature of participants in the DCO Tech veteran's outreach activities?	# of events	Project calls	Quarterly
	# of veterans reached	Progress Tracker	Quarterly
SHORT TERM OUTCOME #6: Increased veteran knowledge of DCO.			
INTERMEDIATE OUTCOME: Increased veteran exploration of engineering technology programs.			
Summative			
Does the program reach its intended audiences for participation in the veteran outreach activities?	# of events	Project calls	Quarterly
	# of veterans reached	Progress Tracker	Quarterly
	# of veterans who explore ET programs further		

Partnerships			
Evaluation Questions	Indicators	Data Collection Sources	Timeline
Formative			
In what ways does the program foster partnerships among industry, K-12 educators, and NOVA faculty? How can partnerships be improved?	# of activities completed by the partners each year	Project Calls	Quarterly
	% of partners who completed planned activtities	Progress Tracker	Quarterly
	# of Wilder Factors Inventory above the benchmark	Document review (letters of commitment?)	Ongoing
		Partnership baseline interviews	Year 1
		Partner Survey	Annual
SHORT TERM OUTCOME #5: Increased collaboration/ between secondary, post-secondary and industry.			
Summative			
To what extent did DCO Tech increase collaboration among industry, K-12 educators, and NOVA faculty to support the development of engineering technician and DCO pipeline? What was the collective impact of this collaboration?	# of activities completed by the partners each year	Project Calls	Quarterly
	% of partners indicate impacts on their organizations	Progress Tracker	Quarterly
	# of ways partners benefit the project activities and participants	Partnership interviews	Year 1/Year 3
		Partner Survey	Annual