Eastern Shore Community College Creating Technical Scholars Project: Interim Evaluation Report

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EXECUTIVE SUMMARY

In 2017, Eastern Shore Community College (ESCC) established the project Creating Technical Scholars (CTS): A Model for Structured Pathways to develop a transition pathway from secondary to postsecondary education and to employment in the fields of science, technology, engineering, and math (STEM). To reach this goal, the CTS project seeks to achieve four objectives between Fall 2017 and Summer 2020:

1. **Design dual enrollment technical tracks** in specific career and technical education (CTE) programs for the region's high school students.
2. **Create a Technical Studies Associate of Applied Science (AAS) degree with tracks** in cybersecurity, industrial technology, HVAC, welding, and electricity.
3. **Establish articulation agreements** with regional four-year colleges and universities for students wishing to pursue further education in technical studies fields.
4. **Devise career tracks** with business partners for students wishing to begin careers in technical studies fields after receiving postsecondary credentials.

This interim report details findings from the formative evaluation of the project after its second year of implementation and preliminary findings from the summative evaluation. The report also provides recommendations to guide project implementation moving forward.

The CTS project evaluation incorporates a mixed-methods approach and includes formative and summative questions to address program development, implementation, and preliminary outcomes. For this interim report, evaluators collaborated with the project team (which is overseeing the implementation of the CTS project) to distribute a personnel and partner survey and a student survey in Spring 2019. Evaluators also examined project-related documents.

The next section summarizes the evaluation findings for each of the four objectives and provides recommendations to guide project development moving forward.

1 DESIGN DUAL ENROLLMENT TECHNICAL TRACKS

The CTS project aims to collaborate with local high schools to develop and initiate new dual enrollment technical studies offerings and conduct outreach to high school students.

KEY FINDING: Despite several challenges, the CTS project had 46 high school students enrolled in six dual enrollment technical courses. Respondents tended to perceive these courses as high quality and relevant with some suggestions for improvement.

RECOMMENDATIONS:

– *To meet proposed enrollment benchmarks, focus promotional activities more on individuals at the high school level who can inform potential students about the dual enrollment technical courses.*

– *Continue to work with local high schools to develop new dual enrollment technical courses.*

– *Have well-trained instructors teach the dual enrollment technical courses, as instructor quality likely impacts the quality of coursework.*

- *Be mindful of instructors' teaching loads to avoid staff burnout and turnover.*

2 CREATE A TECHNICAL STUDIES ASSOCIATE OF APPLIED SCIENCE (AAS) DEGREE WITH TRACKS

The CTS project aims to develop and obtain approval of five new Technical Studies AAS degree tracks, in industrial technology, cybersecurity, HVAC, welding, and electricity.

KEY FINDING: Four degree tracks have been developed but were not approved by the end of Year 2. All have the potential to be high quality and relevant to students' goals. Student respondents were not very aware of these degree tracks but showed some interest after learning about the degree tracks on the survey.

RECOMMENDATIONS:

– *Keep stakeholders updated on the approval process for the degree tracks.*

– *Ensure that well-trained instructors teach the technical studies courses as instructor quality likely impacts the quality of coursework. Be mindful of instructors' teaching loads to avoid staff burnout and turnover.*

– *Provide the technical studies courses with more modern equipment to improve the quality of these courses.*

– *Ramp up promotional and recruitment activities in Year 3. Students showed interest in the degree tracks once they learned about them, but only a third of student respondents were aware of them prior to the survey. Focus recruitment efforts on building word of mouth.*

– *Meet with the new chief academic officer as soon as possible to discuss the CTS project and gain buy-in.*

3 ESTABLISH ARTICULATION AGREEMENTS

The CTS project aims to establish articulation agreements with regional four-year colleges and universities to extend the pathway for students who wish to pursue further education in technical studies fields.

KEY FINDING: There is awareness and interest in the articulation agreements, but these will remain in progress until the degree tracks are approved.

RECOMMENDATIONS:

– *Maintain communication with regional four-year college and university partners about the articulation agreements to ensure partners' continued interest.*

– *Anticipate challenges that may hinder the development of articulation agreements to speed up the process once the degree tracks are approved.*

4 DEVISE CAREER TRACKS

The CTS project aims to devise career tracks in partnership with local businesses to help students who have postsecondary credentials move into careers in technical studies fields.

KEY FINDING: In Year 2, students participated primarily in three types of WBL opportunities. Personnel and partner respondents perceived these opportunities as high quality and relevant while student responses varied slightly more.

RECOMMENDATIONS:

– *Continue to engage partners in the development of new experiences and support for students.*

– *Diversify work-based learning (WBL) opportunities beyond the three main types of WBL (internships, jobs, and competitions).*

– *Find ways to improve the quality and relevance of WBL opportunities for students.*

PRELIMINARY IMPACTS ON STUDENTS

The CTS project aims to increase students' vocational self-efficacy, technical knowledge, and STEM skills and raise the likelihood students will pursue additional education opportunities in the future

KEY FINDING: The perceived impact of the CTS project on students' vocational self-efficacy, technical knowledge, and STEM skills varied; and there is considerable room to further increase students' confidence and knowledge in several areas. Some students also indicated that the project positively influenced their educational plans. Caution is advised with these findings, as the project is in the early stages of development.

RECOMMENDATIONS:

– *Continue to seek official program approval for the degree tracks. The internship opportunities and additional required coursework embedded in these programs will provide more opportunities for students to build vocational self-efficacy, STEM skills, and technical knowledge.*

– *Consider revisiting best practices in dual enrollment to identify ways to further improve the courses.*

– *Consider ways to further increase dual enrollment students' interest in STEM after high school.*

ACKNOWLEDGMENTS

We would like to acknowledge the many project partners and survey respondents who contributed to the evaluation. Thanks to the project team at Eastern Shore Community College (ESCC), including John Floyd, Janet Rieben, Teresa Guy, Eve Belote, and Deborah Daniels, for support for and coordination of evaluation activities, involvement in instrument development, and data collection. Special thanks to all the ESCC personnel, partners, and students who provided valuable feedback on the Spring 2019 surveys. Finally, we are grateful to the members of the Magnolia team who supported this work.

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PROJECT DESCRIPTION

Eastern Shore Community College (ESCC) is located in an area with higher diversity and poverty and lower educational attainment than the rest of Virginia and the United States as a whole. However, there is local workforce demand for qualified employees in science, technology, engineering, and math (STEM) fields (ESCC NSF-ATE Proposal, 2016, p. 6). With funding from the National Science Foundation's Advanced Technological Education (NSF-ATE) program, ESCC developed a new project, Creating Technical Scholars (CTS): A Model for Structured Pathways, to bridge this gap. The CTS project aims to develop a transition pathway from secondary to postsecondary education and to employment in STEM fields. The project's overarching goal is:

> "to increase student success and completion by establishing pathways for students to earn postsecondary credentials leading to employment or baccalaureate degrees."

To reach this goal, the CTS project seeks to achieve four objectives:

Objective 1. Design dual enrollment technical tracks in specific career and technical education (CTE) programs for the region's high school students.

Objective 2. Create a Technical Studies Associate of Applied Science (AAS) degree with tracks in cybersecurity, industrial technology, heating, ventilation, and air conditioning (HVAC), welding, and electricity.

Objective 3. Establish articulation agreements with regional four-year colleges and universities for students wishing to pursue further education in technical studies fields.

Objective 4. Devise career tracks with business partners for students wishing to begin careers in technical studies fields after receiving postsecondary credentials.

The project team is overseeing the implementation of the CTS project. As part of the implementation, the team developed a logic model that shows the outcomes targeted by CTS objectives and activities, including increasing high school student awareness of STEM offerings, increasing enrollment in dual enrollment technical courses, and increasing the number of high school students entering STEM fields at ESCC. (See Appendix A.) The project is also intended to increase the number of students enrolled in technical studies and the number of students who complete the Technical Studies AAS degree. Finally, the project aims to increase access to internships and the number of students employed with industry partners, with the goals of expanding economic development, meeting employer needs, and improving job opportunities for ESCC graduates.

INTRODUCTION

Overview: This report describes the second-year formative evaluation of the CTS project.

Report Purpose: This interim report is designed to provide preliminary findings and recommendations for the project moving forward.

Intended Audience: The project team at ESCC and NSF-ATE.

Intended Beneficiaries: Local high school students, ESCC students, and local employers.

Report Structure: This interim report provides descriptions of the project and its evaluation. It then outlines the findings after the project's second year for each of the four objectives. The final section summarizes the findings and provides recommendations.

Evaluation Dates: August 2017–September 2020

LIST OF ABBREVIATIONS:

AAS	Associate of Applied Science
CTE	Career and Technical Education
CTS	Creating Technical Scholars project
ESCC	Eastern Shore Community College
STEM	Science, Technology, Engineering, and Math
WBL	Work-based learning

EVALUATION BACKGROUND

This study's evaluation aligns with the four objectives of the CTS project and provides formative and summative information. This interim report details findings from the formative evaluation of the CTS project after its second year of implementation. This report also provides preliminary summative findings regarding student gains in 1) vocational self-efficacy (students' confidence in identifying a career and finding and succeeding in a job), 2) technical knowledge (the knowledge and skills students need to be able to perform tasks in their program), and 3) STEM skills (the skills all students should have after enrolling in a STEM program).

Below are sample evaluation questions for each objective; see Appendix B for all evaluation questions. The findings presented in this report inform recommendations designed to help guide implementation moving forward.

1

Design Dual Enrollment Technical Tracks

How is the project developing and progressing regarding the intended number and nature of high school student participants in the dual enrollment technical tracks?

Do personnel and students perceive the dual enrollment technical tracks as high quality and relevant to their educational and vocational goals?

2

Create a Technical Studies Associate of Applied Science (AAS) degree with tracks

Is a Technical Studies AAS degree program developed and implemented that offers tracks in cybersecurity, electricity, HVAC, industrial technology, and welding?

Do personnel and students perceive the AAS program as high quality and relevant to students' educational and vocational goals?

3

Establish Articulation Agreements

Are articulation agreements established with regional four-year colleges and universities for students seeking to pursue further education in technical studies fields? What four-year institutions participate?

Do personnel and students perceive the articulation agreements as useful in helping students achieve their educational and vocational goals?

4

Devise Career Tracks

Are career tracks with business partners developed for students seeking to begin careers in technical studies fields after receiving postsecondary credentials? What types of experiences and support are offered?

Do personnel and students perceive the work-based learning (WBL) experiences as high quality and relevant to students' vocational goals?

Magnolia Consulting, the external evaluator for this project, is collaborating with the project team on instrument design and data collection. The evaluation period for the CTS project extends from August 2017 to September 2020.

METHODS

The CTS project evaluation incorporates a mixed-methods approach and includes formative and summative questions to address program development, implementation, and preliminary outcomes. Primary data collection methods for this interim report include:

Personnel & Partner Survey

Evaluators distributed the personnel and partner survey to individuals who were involved in the development and implementation of project activities. The Spring 2019 personnel and partner survey contained questions about the four program objectives. Survey questions pertained to various aspects of the project activities, including personnel/partner respondents' perceptions of program quality and relevance, and the extent to which participating students showed gains. Personnel/partner respondents used a 5-point Likert scale (ranging from 1, *to no extent*, to 5, *to a great extent*) to indicate their responses to items asking about students' vocational self-efficacy, technical knowledge, and STEM skills. Evaluators will distribute the personnel and partner survey again in Spring 2020.

Student Survey

Evaluators distributed the student survey to several groups: high school students enrolled in the new dual enrollment technical courses who had passive parental consent, ESCC students currently enrolled in relevant certificate and career studies certificate programs, ESCC alumni recently graduated from relevant programs, and recent noncompleters who dropped from relevant programs prior to the 2018–2019 academic year. The Spring 2019 student survey contained questions about dual enrollment technical courses, the new degree tracks, and WBL. This survey did not include questions about articulation agreements because this project objective is still in the early stages of development. Survey questions pertained to various aspects of project activities, including student respondents' awareness of the degree tracks and perceptions of program quality and relevance.

This survey used a retrospective pretest approach to measure student gains in confidence and knowledge in three areas. Using 5-point Likert scales, student respondents rated 1) items aligned to vocational self-efficacy, 2) items aligned to technical knowledge from the program outcomes for the Technical Studies AAS degree tracks, and 3) items aligned to STEM skills in three areas (critical thinking, quantitative reasoning, and scientific reasoning) from ESCC's General Education Outcomes. This interim report presents these findings as the percentage of student respondents who indicated a positive change from before to after participating in technical courses or WBL opportunities or both. Appendix C provides the means for all items. Readers should view these findings with some caution because the CTS project is in the very early stages of development. Students are likely not yet receiving all the materials and supports that will eventually be part of the fully developed programs. Evaluators will distribute the student survey again in Spring 2020.

Document Review

Evaluators worked collaboratively with the project team to access and examine project-related documents, including:

- Notes from calls with the project team,
- A data collection tool (documenting enrollment numbers and outreach activities),
- College materials (e.g., website, dual enrollment handbook, and course catalog),
- Proposals (e.g., State Council of Higher Education for Virginia (SCHEV) and Creating Excellence Award), and
- Other relevant documents.

See Appendix D for a more detailed discussion of methods and instruments.

EVALUATION FINDINGS OVERVIEW

This section describes evaluation findings after the second year of implementation for each of the CTS project's four objectives. Each subsection focuses on one objective and describes the relevant findings. This section uses data from relevant ESCC documents collected between August 2018 and May 2019. Evaluators also used data from two spring 2019 surveys.

Personnel/partner respondents. Thirty personnel/partner respondents completed the personnel and partner survey in April 2019, yielding a response rate of 81%. Of these respondents, 10 were business, industry, or government partners (33%); 6 were ESCC employees (20%); 6 were secondary-education partners (20%); 4 were on the project team (13%); 3 were high school career coaches (10%); and 2 were university partners (7%).[1]

Student respondents. Thirty-five dual enrollment respondents and 11 ESCC respondents (8 current ESCC students, 1 recent alumnus, and 2 recent noncompleters) completed the student survey in April and May 2019, yielding response rates of 85%[2] and 9%, respectively.

The sample size for each item varies because the surveys were tailored to different groups of respondents; respondents were only asked to respond to items relevant to their experiences with the project.

[1] Total is greater than 100% because respondents could select more than one role.
[2] Evaluators had emails addresses for 41 dual enrollment students; 5 students did not receive the survey.

YEAR 2 MAIN FINDINGS

Although the project team has been making progress toward the project objectives, much of the work hinges on the approval of the industrial technology degree track. Gaining this approval has taken longer than expected, but it is still likely to occur. Below are the main findings for each objective and the perceived impacts of the project on students.

Design Dual Enrollment Technical Tracks. Despite several challenges, the CTS project had 46 high school students enrolled in six dual enrollment technical courses. Respondents tended to perceive these courses as high quality and relevant with some suggestions for improvement.

Create a Technical Studies Associate of AAS Degree with Tracks. Four degree tracks have been developed but were not approved by the end of Year 2. All have the potential to be high quality and relevant to students' goals. Student respondents were not very aware of these degree tracks but showed some interest after learning about the degree tracks on the survey.

Establish Articulation Agreements. There is awareness and interest in the articulation agreements, but these will remain in progress until the degree tracks are approved.

Devise Career Tracks. In Year 2, students participated primarily in three types of WBL opportunities. Personnel and partner respondents perceived these opportunities as high quality and relevant while student responses varied slightly more.

Preliminary Impacts on Students. The perceived impact of the CTS project on students' vocational self-efficacy, technical knowledge, and STEM skills varied; and there is considerable room to further increase students' confidence and knowledge in several areas. Some students also indicated that the project positively influenced their educational plans. Caution is advised with these findings, as the project is in the early stages of development.

1 FINDINGS: DESIGN DUALENROLLMENT TECHNICAL TRACKS

The CTS project aims to collaborate with local high schools to develop and initiate new dual enrollment technical studies offerings and conduct outreach to high school students. Dual enrollment programs offer local high school students the opportunity to enroll early in rigorous college courses taught by credentialed faculty and simultaneously earn both college and high school credit. Dual enrollment provides high school students a pathway to postsecondary education with the support of high school and college staff. This section describes the progress toward this objective at the end of Year 2. It includes data from ESCC documents, 18 personnel/partner respondents (secondary-education partners, high school career coaches, ESCC employees, and project team members), and 35 dual enrollment respondents who completed a 2019 survey.

The project offered six dual enrollment technical courses.

By the end of Year 2, the CTS project offered six dual enrollment technical courses (HVAC II, Engineering Drawing/Design or Architectural Drawing/Design, Building Trades II, Computer Systems Technology II, Welding II, and WEL 123) at two local high schools, all of which aligned to one of the pending Technical Studies AAS degree tracks.

Offering these courses continues to be challenging.

The project team noted several challenges in offering these courses, including:

- **Nontraditional courses**. Since the dual enrollment technical courses are not core courses (e.g., English or math), enrollment numbers tend to be lower.
- **Tuition costs.** Since the high schools pay the ESCC tuition for their students, these courses incur more expenses for the high schools.
- **Placement tests.** There continues to be internal confusion about what placement testing needs to measure.
- **Instructor issues.** Challenges with instructors included 1) lack of an HVAC instructor, which threatened the HVAC program's existence, 2) behavior of one instructor that negatively impacted the welding and industrial technology programs, and 3) potential instructor burnout.
- **Personnel changes.** Personnel changes (e.g., new staff or maternity leave) have slowed the development process for dual enrollment technical courses.

The project team used various strategies to respond to these challenges. It developed relationships with the local high schools; introduced dual enrollment more incrementally, as individual courses rather than full tracks; hired an HVAC instructor and did not rehire a problematic instructor; and instituted monitoring of instructors' schedules.

46 students participated in these courses in Year 2.

Forty-six high school students enrolled in the dual enrollment technical courses in Year 2. All of these students were in public high school, and most were male (89%). More than half the students were White (59%), and the remaining students were Black or African American (20%), Hispanic (17%), or Asian (4%). The 35 dual enrollment survey respondents provided additional demographic information, which indicated that 37% received free or reduced-priced lunch and 83% were seniors. The project team shared that although ESCC enrollment decreased by 4% overall, dual enrollment increased by 4%, likely because of the CTS project.

Students heard about these courses from individuals at their high schools.

Dual enrollment respondents indicated that they heard about the dual enrollment technical courses through high school guidance counselors (66%), teachers (54%), and career coaches (29%), peers (23%), parents (17%), and social media (6%). No one indicated hearing about the courses through the newspaper, radio, or ESCC website.

ESCC documents showed the CTS project held some high school outreach activities, including 1) dissemination efforts through a partnership with local schools, 2) two presentation sessions (one by high school career coaches and one by the project team) at a statewide conference with public school teachers and administrators, and 3) a plan to connect with teachers and counselors during in-service sessions.

These courses are perceived as high quality.

Ninety-four percent of personnel/partner respondents who shared a response[3] and 77% of all dual enrollment respondents rated the dual enrollment technical courses as *high quality* or *very high quality*.

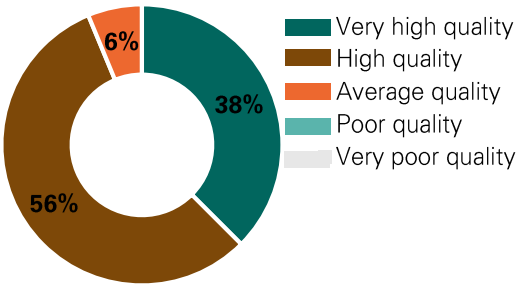

Figure 1. Personnel/partner respondents' perceptions of the quality of the dual enrollment technical courses (n=16).

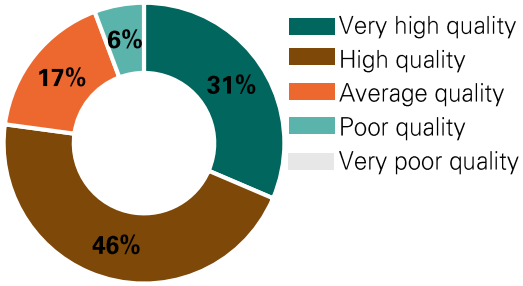

Figure 2. Dual enrollment respondents' perceptions of the quality of the dual enrollment technical courses (n=35).

Two of the dual enrollment respondents who rated the quality of the dual enrollment technical courses as *average* or *poor* noted that the quality could be improved by ensuring that instructors are better trained in the curriculum or by securing funds for more equipment.

[3] Findings do not include two personnel/partner respondents who chose "I don't know," likely because this item was not applicable.

These courses are perceived as relevant, with some areas for improvement.

Personnel/partner respondents who shared a response[4] indicated that the dual enrollment technical courses are *relevant* to students' educational (94%) and career (100%) goals. Dual enrollment respondents were more mixed in their assessments, with 74% and 63% indicating that these courses were *relevant* to their educational and career goals, respectively. Three dual enrollment respondents who rated these courses as *not relevant* or *somewhat relevant* indicated that courses could be made more relevant if they focused more on student interests and career choices or added field trips.

The CTS project's reported impact on dual enrollment students' gains in vocational self-efficacy, technical knowledge, and STEM skills varied.

Five personnel/partner respondents (high school career coaches and dual enrollment instructors) rated the extent to which dual enrollment students showed gains in vocational self-efficacy, technical knowledge, and STEM skills. Thirty-five dual enrollment respondents rated their confidence and knowledge on items in these areas before and after participating in technical courses or WBL opportunities.

- **Vocational self-efficacy:** Eighty percent of personnel/partner respondents indicated that dual enrollment students showed gains in their vocational self-efficacy *to much extent* or greater. More than half of dual enrollment respondents indicated their self-efficacy had increased on all four items.
- **Technical knowledge:** All personnel/partner respondents indicated that dual enrollment students showed gains in their technical knowledge *to much extent* or greater. For dual enrollment students, 60% of welding respondents, more than half of industrial technology respondents, and one-third of HVAC respondents indicated their technical knowledge had increased. Electricity respondents had the highest percentage of students indicating their technical knowledge increased on most items.
- **STEM skills:** Personnel/partner respondents who shared a response[5] offered mixed responses regarding dual enrollment students' gains in STEM skills. About half of dual enrollment respondents indicated their knowledge in items related to critical thinking and quantitative reasoning had increased and around a third indicated their knowledge had increased in three of the four items related to scientific reasoning.

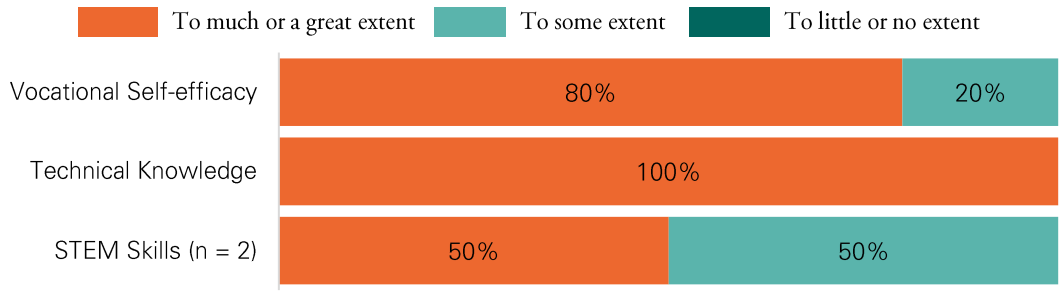

Figure 3. Personnel/partners' ratings of the extent to which dual enrollment students showed gains in three areas (n = 5).

[4] Findings do not include two personnel/partner respondents who chose "I don't know," likely because this item was not applicable.
[5] Findings do not include three personnel/partner respondents who chose "I don't know" for STEM skills, likely because these items were not applicable.

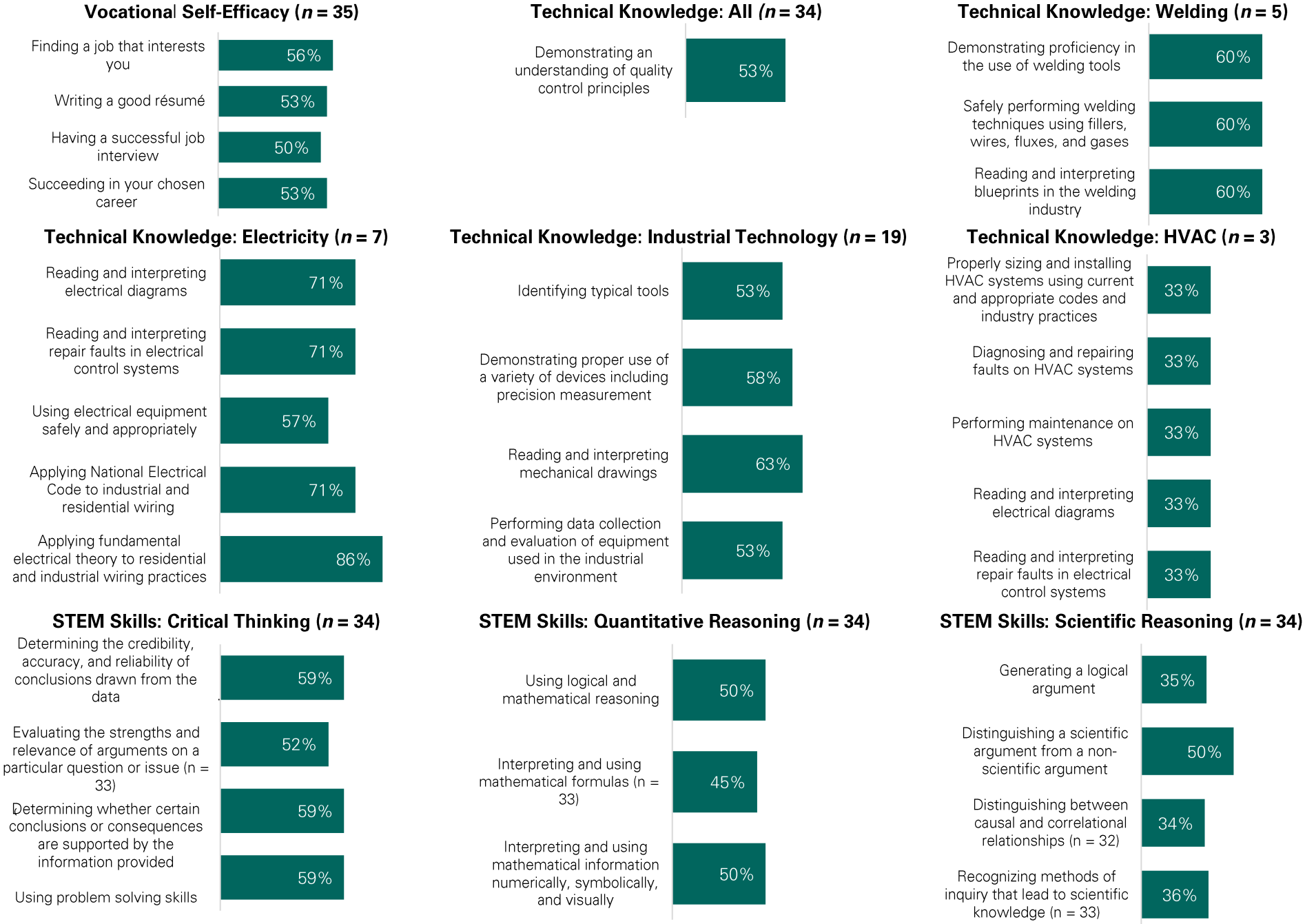

Figure 4. Percentage of student respondents who increased vocational self-efficacy, technical knowledge, and STEM skills after participating in technical studies classes or WBL experiences during the 2018–2019 academic year.

Dual enrollment students plan to pursue further education opportunities, but only 23%, plan to major in a STEM field.

Eighty percent of dual enrollment respondents indicated that they plan to pursue further education, 3% did not plan to, and 17% did not know. Of the dual enrollment respondents who plan to pursue further education, 29% planned to major in a STEM field after high school, 43% did not plan to major in STEM, and 29% did not know.

Student respondents rated the effect that participating in dual enrollment technical courses or WBL experiences had on their education plans. Fifty-three percent of dual enrollment respondents indicated they are *to much extent* or *to a great extent* more likely to pursue a certificate as a result of participating in technical studies courses or WBL experiences (see Figure 5).

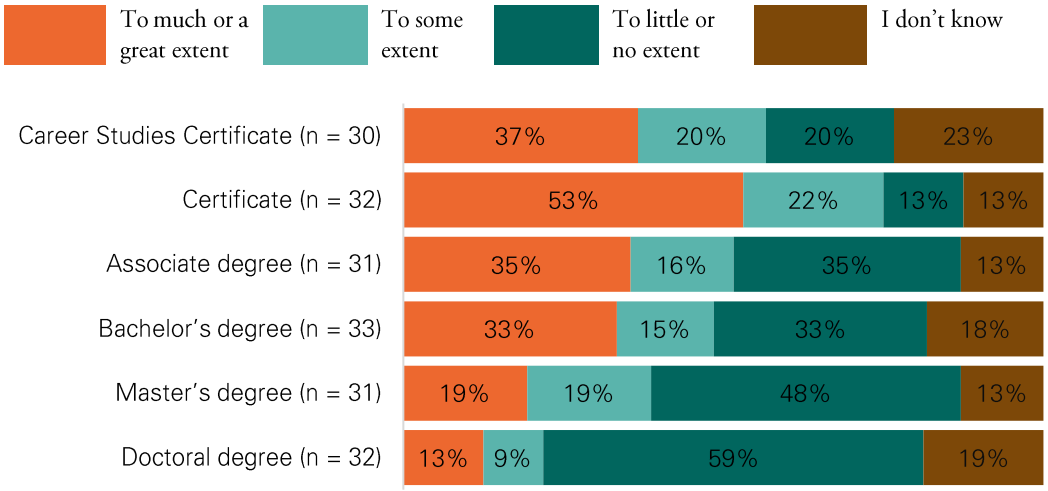

Figure 5. Extent to which dual enrollment respondents indicated they were more likely to pursue future educational opportunities as a result of participating in dual enrollment technical classes or WBL experiences.

2 FINDINGS: CREATE A TECHNICAL STUDIES ASSOCIATE OF AAS DEGREE WITH TRACKS

The CTS project aims to develop and obtain approval for five new Technical Studies AAS degree tracks, in industrial technology, cybersecurity, HVAC, welding, and electricity. This section discusses the progress toward offering these degree tracks at the end of Year 2. It also discusses perceptions of the future degree tracks and existing feeder certificate programs. The findings below are based on ESCC documents and the Spring 2019 surveys.

Four of the five degree tracks have been developed.

The project team developed four degree tracks in Year 1. These tracks stack onto existing certificate programs and create a logical progression to an associate degree and to employment. The degree tracks will be face to face; students will complete 64–68 credits over five semesters (or longer, for part-time students). The first cohort of students will likely graduate in Spring 2021. The cybersecurity track has been on hold since Year 1, when the project team learned of a statewide initiative to standardize cybersecurity programs. The project team discussed this degree track in Year 2 and considered distributing a student interest survey.

The industrial technology degree track has not been approved.

The project team focused on obtaining approval for the industrial technology degree track first to expedite the approval process. This process continued to experience setbacks in Year 2. As of June 2019, the project team is tweaking the proposal for resubmission to Virginia Community College System (VCCS) for approval before it is submitted to State Council of Higher Education for Virginia (SCHEV) for review. The project team is optimistic that the industrial technology degree track will be approved, but it is unclear whether it will be approved in time for the Fall 2019 semester. The industrial technology degree track remains in the catalog with a note that it is pending approval. Once the degree track is approved, credits can be applied to it, and the project team can get the other three degree tracks approved through a simplified notification process.

The process of developing the degree tracks brought out several strengths and challenges for the project team.

The project team has experienced several strengths and challenges in developing the degree tracks, including:

- **Strong teamwork:** Teamwork among project team members has been strong, and the team has built strong relationships with partners.
- **Supervisor turnover:** Although the turnover in the chief academic officer position (the project team's immediate supervisor) could have delayed the approval process, this supervisor helped get the proposal submitted to VCCS earlier, anticipated follow-up requests from VCCS (e.g., for a

student interest survey), and is pushing to get approval before their scheduled replacement in July.

- **Unclear expectations:** It was not clear how the project team could adequately demonstrate employer demand to VCCS. Thus, the team had to submit the proposal several times with minor changes in this area each time.
- **Competing priorities:** ESCC had two campus-wide audits in Year 2 that required a lot of staff time and slowed the degree-track approval process. Political reasons might also have contributed to the approval setbacks, but these have likely been resolved.

The degree tracks will likely be of high quality and relevance to students' goals.

Using a 5-point scale, personnel/partner respondents rated the quality of the pending electricity (100%), industrial technology (95%), HVAC (95%), and welding (95%) degree tracks as *high* or *very high*.[6] All of the personnel/partner respondents indicated that the degree tracks were *relevant* to students' educational and career goals.[7]

Perceptions of feeder certificate programs suggest that the degree tracks have potential to be high quality and relevant to student goals, especially when they involve quality instructors.

At this time, ESCC students cannot rate the quality or relevance of the pending degree tracks. Thus, evaluators solicited their perceptions of the feeder certificate programs, which will make up a portion of the future degree-track credits. Of the eight ESCC respondents who were enrolled in feeder certificate programs (see appendix B for demographic data), 63% rated the existing courses as *high quality* (25%) or *very high quality* (38%). Of these respondents, three shared that instructors contributed to the high quality despite a lack of equipment or insufficient budget. Thirty-eight percent of these students rated these courses as *average quality,* with one ESCC respondent explaining that access to more modern devices would improve the quality.

> *"Even when we didn't have any budget, our teachers always had a way to give us practical work instead of just theory."*

Additionally, of the eight ESCC respondents, 63% and 75% indicated that the technical studies courses in their programs were *relevant* to their educational and career goals, respectively. One ESCC respondent suggested that the college could improve the program's relevance by consistently hiring certified instructors who are qualified to teach at the college level.

Promotional, recruitment, and dissemination activities occurred in Year 2.

Although the degree tracks are pending approval, the project team promoted the degree tracks, recruited students, and disseminated information in Year 2.

- **Promotional activities:** ESCC documents indicated that a newsletter, flyers, the radio, hallway monitors, and a permanent billboard were used to promote the new degree tracks.
- **Recruitment activities:** Six personnel/partner respondents shared that ESCC engaged in various student recruitment efforts, including word-of-mouth and media efforts (e.g., ESCC website, social media, radio, print

[6] Findings do not include personnel/partner respondents who chose "I don't know," likely because these items were not applicable (10 each for industrial technology, HVAC, and electricity and 8 for welding).
[7] Findings do not include personnel/partner respondents who chose "I don't know," likely because these items were not applicable (3 each for industrial technology, HVAC, and electricity and 2 for welding).

publications). These efforts targeted recent high school graduates and CTE students, graduates of feeder certificate programs (who were potentially already employed), and individuals looking to start or advance in a career in these fields.

- **Dissemination activities:** Presentations at the HI-TECH conference (poster) and at the ATE Principal Investigators Conference disseminated information about the CTS project. The project team also encouraged faculty members to disseminate project information.

34% of student respondents were aware of the degree tracks, which they primarily learned about through individuals.

Of the 44 ESCC respondents and dual enrollment respondents who provided responses, 34% were aware of the pending degree tracks primarily through individuals, including high school guidance counselors (40%), high school career coaches (33%), ESCC faculty members (33%), high school teachers (27%), and peers (20%), or through the website (20%). None of these student respondents heard about the degree tracks through parents, the newspaper, the radio, or social media.

There is student interest in the degree tracks, but interest levels varied across student respondents.

Once students learned about the degree tracks, findings suggest that there is student interest, but interest levels varied across student respondents. Of the student respondents who indicated their interest levels,[8] the highest percentage were interested or maybe interested in the industrial technology degree track (56%; n = 39) and electricity (56%; n = 41), followed by electricity (61%; n = 38), welding (51%; n = 39), and HVAC (44%; n = 36). The remaining students were either not interested or unsure. ESCC documents also provided insight into student interest:

- An ESCC survey to gauge student interest showed that 74% of the 19 students who responded indicated they agreed (47%) or strongly agreed (26%) that they are interested in earning a Technical Studies AAS degree from ESCC.
- Twenty-six students from two local high schools communicated interest in the degree tracks to their career coaches, attended a presentation and received information about the degree tracks, and toured the facilities.
- Nine students expressed interest in the degree tracks through emailed letters of student support. For example, one letter read, "I have toured your campus and I fully support your associate degree program in technical studies." The project team expected at least 15 letters of support, but they found that students did not follow through or provided letters of poor quality (e.g., grammar issues).

The degree tracks will likely benefit partner businesses.

Of the 10 business, industry, and government partner personnel/partner respondents, 7 indicated that their business will benefit from the degree tracks primarily because they will provide qualified employees and interns. Three of these personnel/partner respondents were unsure whether the degree tracks would be a benefit.

"This will help provide a more focused and specialized applicant pool for technical positions."

[8] Some students did not rate their interest and were not included in these percentages.

The degree tracks likely will not greatly impact faculty courses or schedules.

> *"They wish to take OSHA, electrical, welding, etc., but they can't get off from work to attend classes during the day."*

Two-thirds of the ESCC employee personnel/partner respondents were faculty who teach a variety of courses in HVAC, electronics, business and information systems. Two of these faculty members indicated that the pending degree tracks have not or will not impact their courses or teaching schedule, and two were unsure. Two faculty members noted additional information or resources to help make the degree tracks successful, including a need for final approval and scheduling of these degree tracks, and how offering day classes is problematic for students with full-time jobs.

Findings suggest that students need more support in developing vocational self-efficacy and STEM skills.

Nine personnel/partner respondents (ESCC employees and CTE project team) rated the extent to which current ESCC students showed gains in vocational self-efficacy, technical knowledge, and STEM skills.[9] Eight current ESCC respondents rated their confidence and knowledge in these areas before and after participating in technical courses or WBL opportunities.

- **Vocational self-efficacy:** Eighty-three percent of personnel/partner respondents indicated that current ESCC students showed gains in their vocational self-efficacy *to much extent* or greater. Current ESCC respondents shared a mix of responses, with 63% indicating increased confidence in their ability to write a good resume but only 13% indicating increased confidence in their ability to have a successful job interview.
- **Technical knowledge:** Eighty percent of personnel/partner respondents indicated that current ESCC students showed gains in their technical knowledge *to much extent* or greater. Findings for current ESCC respondents in this area are not presented because sample sizes were generally low.
- **STEM skills:** Eighty-three percent of personnel/partner respondents indicated that current ESCC students showed gains in their STEM skills *to much extent* or greater. Current ESCC respondents shared a mix of responses, with less than half indicating an increase in quantitative reasoning and scientific reasoning knowledge and about half indicating an increase in critical thinking knowledge.

Students plan to pursue further educational opportunities, especially an associate degree, as a result of their participation in the project.

Student respondents rated the effect that participating in technical courses and WBL experiences had on their education plans. Thirty-eight percent of current ESCC respondents indicated they are *to much extent* or *to a great extent* more likely to pursue an associate degree as a result of participating in technical studies courses or WBL experiences (see Figure 9).

[9] Findings do not include personnel/partner respondents who chose "I don't know" because these items were likely not applicable (4 for technical knowledge and 3 for STEM skills and vocational self-efficacy).

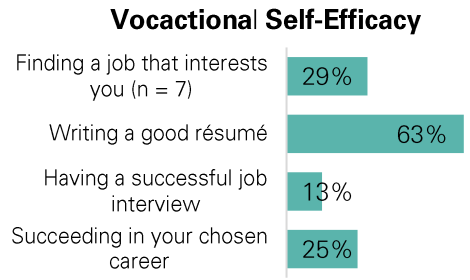

Figure 6. Percentage of student respondents who showed an increase in vocational self-efficacy (n = 8).

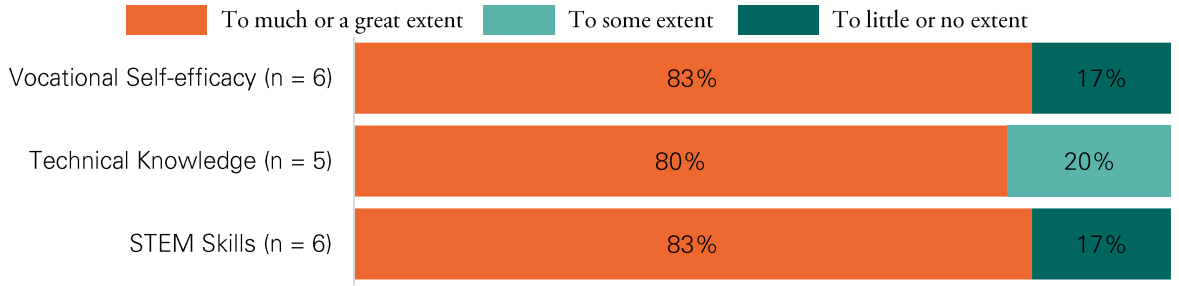

Figure 7. Personnel/partners' ratings of the extent to which ESCC students showed gains in three areas (n = 9).

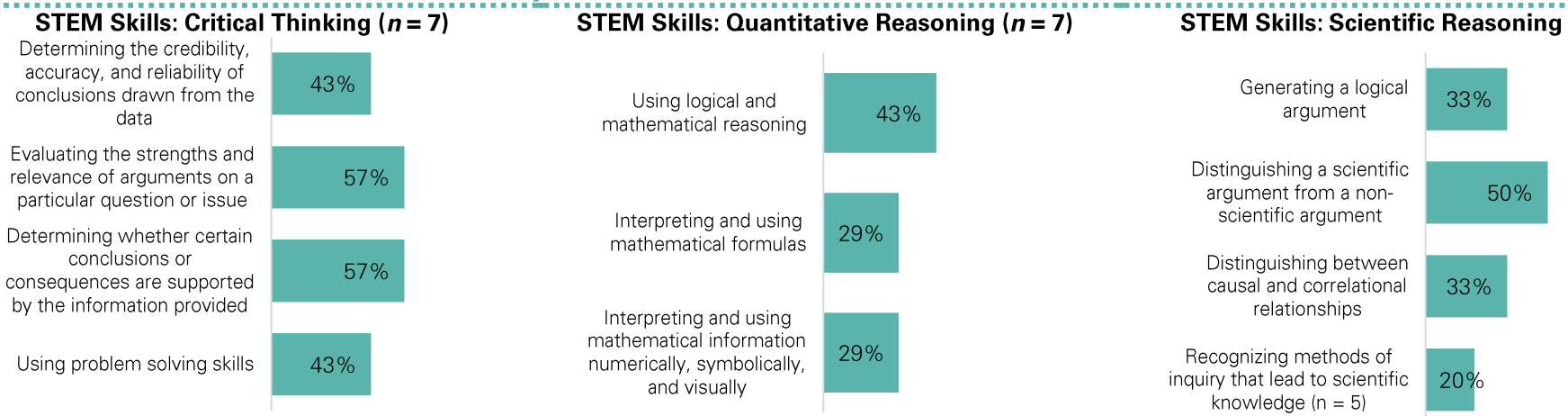

Figure 8. Current ESCC respondents' self-reported ratings of STEM skills before and after participating in technical studies classes or WBL experiences during the 2018–2019 academic year.

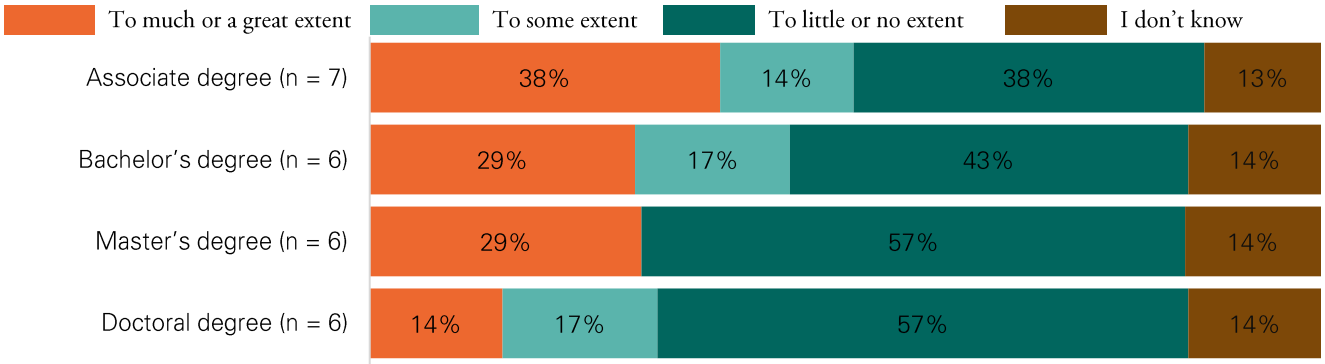

Figure 9. Extent to which current ESCC respondents are more likely to pursue future educational opportunities as a result of participating in technical classes or WBL experiences.

3 FINDINGS: ESTABLISH ARTICULATION AGREEMENTS

Although most graduates from the degree tracks are expected to transition into employment opportunities, the CTS project aims to establish and promote articulation agreements with regional four-year universities to extend the pathway for students who wish to pursue further education in technical studies fields. The following section describes the progress of the CTS project toward this objective using data from ESCC documents and the Spring 2019 personnel and partner survey.[10]

Articulation agreements are still in progress in Year 2; two four-year universities have shown interest.

Development of articulation agreements was still in progress at the end of Year 2, primarily because the degree tracks were still pending approval. The project team has been in conversations with the closest four-year universities, two of which—University of Maryland Eastern Shore and Old Dominion University—showed interest in developing articulation agreements (e.g., by providing letters of support or including an agreement on their agendas). Once the degree tracks are approved, there will likely be other challenges (e.g., hiring freezes, slow approval processes, and staff changes) to finalizing these articulation agreements.

70% of personnel/partner respondents were aware of articulation agreements.

Seventy percent of personnel/partner respondents indicated that they were aware that ESCC is developing articulation agreements, 27% were not aware, and 3% preferred not to answer. Of the respondents who were aware, 12 indicated that they first heard about the articulation agreements through meetings and discussions (e.g., advisory board or planning meetings), and the rest indicated that they first heard about them through other channels (e.g., staff communications or the grant proposal).

Articulation agreements will likely be relevant to students' educational and career goals.

The personnel/partner respondents who were aware of the articulation agreements indicated that they are relevant to students' educational (100%) and career (100%) goals. One of these personnel/partner respondents was unsure of the relevance of these agreements.

All degree tracks will create pathways to upper-division credits.

Additionally, all of the project team and university partner respondents who answered indicated that all of the degree tracks would create pathways to upper-division credits (100%).[11]

[10] The Spring 2019 student survey did not include any items about articulation agreements because these agreements are still in progress and as a result the project team did not think students would be able to provide information.

[11] Findings do not include one personnel/partner respondent who chose "I don't know," likely because these items were not applicable.

4 FINDINGS: DEVISE CAREER TRACKS

The CTS project aims to devise career tracks in partnership with local businesses. These tracks will offer a formalized path for students who have postsecondary credentials to move into careers in technical studies fields. The CTS project intends to identify and engage potential employers, provide students with résumé assistance and mock interview experiences, support career exploration opportunities, identify cocurricular activities, and pilot rotating internship placements. This section discusses the project's progress in Year 2 in developing formal career tracks and more informal WBL opportunities. These findings are based on ESCC documents and the Spring 2019 surveys.

Career tracks were developed and expanded in Year 2.

Career tracks were developed and expanded in Year 2. For example, ESCC noted the following accomplishments: 1) Four business partners provided placement opportunities (e.g., Aerospace and Tyson poultry plant); 2) The team continues to work with the Rocket Lab at Wallops Island to provide more internship opportunities; and 3) The team has built awareness of the industry credentials that will help build student résumés. However, the career tracks are less formalized than planned in Year 2; they primarily offer internships to students in the existing feeder certificate programs.

Students participated in WBL opportunities in Year 2.

Students participated in WBL opportunities during Year 2. Of the 10 personnel/partner respondents whose role was serving as a business, industry, or government partner, three shared that their organizations offered a combined total of eight WBL opportunities, three provided no WBL opportunities, three did not know, and one provided no data. Seventeen student respondents (37%) indicated that they participated in WBL opportunities. ESCC documents showed that six students participated in internships (one of which turned into an offer of employment). The project team also described how one company interviewed four candidates for two apprenticeship positions and ultimately decided to offer opportunities to all four.

Many types of WBL experiences and support are offered, mainly internships, jobs, and competitions.

All 10 personnel/partner respondents whose role was serving as a business, industry, or government partner will offer or have offered students WBL opportunities, primarily through internships (90%) or jobs (90%). ESCC documents also show that most WBL opportunities are in the form of internships or apprenticeships. For instance, in Fall 2018, the project team announced internships through multiple medias and supported students in the hiring process. ESCC also noted two additional opportunities (RockOn! workshop and MARS) offered this summer. Only about a quarter of the student respondents who participated in WBL opportunities in Year 2 indicated that they participated in internships; 65% participated in competitions. Other WBL opportunities included workplace tours, resume writing assistance, job shadowing, and field trips.

WBL opportunities are perceived by personnel and partners as high quality, but student responses varied more.

Eleven personnel/partner respondents and 16 student respondents rated the quality of the WBL opportunities in Year 2.[12] All personnel/partner respondents rated the quality *highly* (27%) or *very highly* (73%). Student respondents' ratings were more evenly divided between *average quality* (38%), *high quality* (31%), and *very high quality* (31%). One student suggestion to improve the quality of the WBL opportunities was to better prepare the judges for competitions.

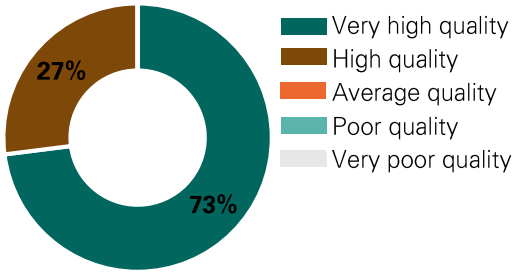

Figure 10. Personnel/partner respondents' perceptions of the quality of WBL opportunities (n=11).

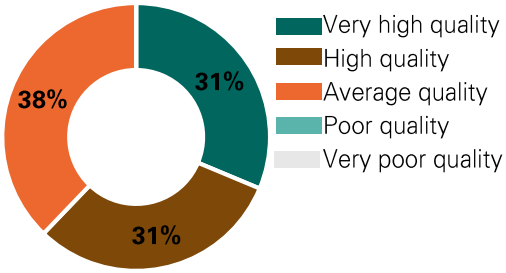

Figure 11. Student respondents' perceptions of the quality of WBL opportunities (n=16).

ESCC won a statewide CTE award for its Linking Employers and Academic Needs Internship Project. Although that is a separate project, its success speaks to the quality of the internships developed by the project team.

Respondents generally perceived WBL opportunities as relevant with more variations in student responses.

One hundred percent of the personnel/partner respondents who responded to the question indicated that the WBL opportunities were relevant to students' educational and career goals.[13] Student respondents' ratings varied, with 65% of student respondents indicating WBL opportunities were relevant to their educational and career goals, 29% indicating they were somewhat relevant, and 6% indicating they were not relevant (n = 16).

WBL opportunities had a perceived positive effect on students' vocational self-efficacy.

Twelve personnel/partner respondents who either offered a WBL opportunity or knew a student participating in a WBL opportunity in Year 2 and offered a response rated the extent to which these students showed gains in vocational self-efficacy, technical knowledge, and STEM skills.[14] Sixteen student respondents who participated in WBL opportunities rated their confidence and knowledge on items in these areas before and after participating in technical courses or WBL opportunities.[15]

- **Vocational self-efficacy:** Eighty percent of personnel/partner respondents indicated that WBL students showed gains in their vocational self-efficacy to

[12] Findings do not include one personnel/partner respondents who chose "I don't know," likely because this item was not applicable.
[13] Findings do not include one personnel/partner respondents who chose "I don't know," likely because these items were not applicable.
[14] Findings do not include personnel/partner respondents who chose "I don't know," likely because these items were not applicable (2 for technical knowledge and vocational self-efficacy and 3 for STEM skills).
[15] These students also rated their gains in technical knowledge and STEM skills, but these ratings are aggregated with the dual enrollment and current ESCC student findings.

much extent or greater. Over 60% of WBL respondents indicated that their self-efficacy had increased.

Figure 12. Percentage of student respondents who showed an increase in vocational self-efficacy (n = 16).

- **Technical knowledge:** Eighty percent of personnel/partner respondents indicated that WBL students showed gains in technical knowledge to much extent or greater.
- **STEM skills:** Seventy-eight percent of personnel/partner respondents indicated that WBL students showed gains in STEM skills to much extent or greater.

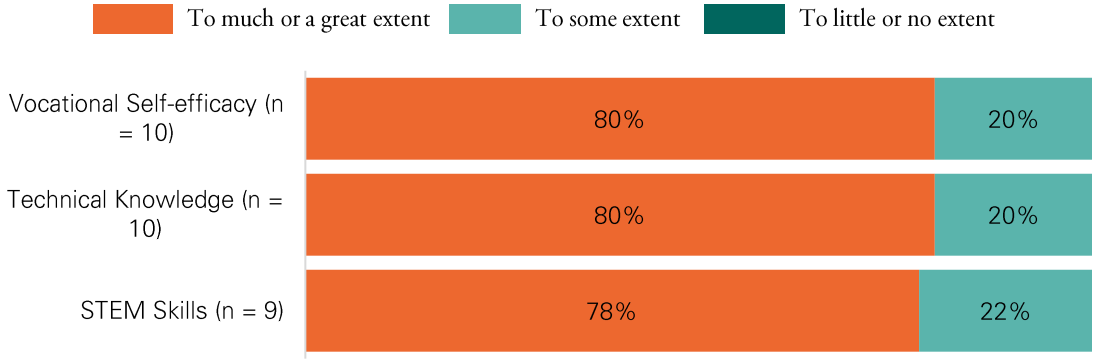

Figure 13. Personnel/partners' ratings of the extent to which WBL students showed gains in three areas (n = 12).

SUMMARY & RECOMMENDATIONS

The CTS project aims to develop a transition pathway from secondary to postsecondary education and employment in technical studies fields. To achieve this outcome, the CTS project has four objectives: 1) design dual enrollment technical tracks in specific CTE programs for the region's high school students; 2) Create a Technical Studies AAS degree with tracks in industrial technology, cybersecurity, HVAC, welding, and electricity; 3) establish articulation agreements with regional four-year colleges and universities for students wishing to pursue further education in technical studies fields; and 4) devise career tracks with business partners for students wishing to begin careers in technical studies fields after receiving postsecondary credentials. This section summarizes the evaluation findings for each of the four objectives and the perceived impacts on students and offers recommendations to help guide project implementation based on these findings.

1 DESIGN DUAL ENROLLMENT TECHNICAL TRACKS

The CTS project aims to collaborate with local high schools to develop and initiate new dual enrollment technical studies offerings and conduct outreach to high school students. Despite several challenges, the CTS project enrolled 46 high school students in six dual enrollment technical courses at two high schools in Year 2. The project team decided to roll out dual enrollment incrementally, as courses rather than tracks. High school students primarily heard about these dual enrollment technical courses through individuals at their school. The CTS project's dual enrollment technical courses are generally perceived by personnel and partners to be of high quality and relevance to students' educational and career goals. Students shared their thoughts about areas for improvement in terms of quality (better-trained instructors and additional equipment funds) and relevance (field trips and more focus on student interests and career choices). Almost all dual enrollment students plan to pursue further education, but only 29% of these students plan to major in a STEM field. Based on these findings, evaluators make the following recommendations:

- To meet proposed enrollment benchmarks, focus promotional activities toward individuals at the high school level who can inform potential students about the dual enrollment technical courses.
- Continue to work with high schools to develop new dual enrollment technical courses.
- Have well-trained instructors teach the dual enrollment technical courses, as instructor quality likely impacts the quality of coursework.
- Be mindful of instructors' teaching loads to avoid staff burnout and turnover. A number of resources can help guide assessment and response to faculty burnout; for example:
    - The Burnout Cycle Inventory (Mintor, 2009)
    - Strategies to attain faculty work-life balance (Owens, Tiedt, & Ramirez, 2018)
    - *Education Leadership* Special Issue: Fighting Educator Burnout (ASCD, 2018)

2 CREATE TECHNICAL STUDIES AAS DEGREE TRACKS

The CTS project aims to develop and obtain approval of five new Technical Studies AAS degree programs in the following areas: industrial technology, cybersecurity, HVAC, welding, and electricity. The project team developed four of the five degree tracks in Year 1, but none of them had been officially approved by the end of Year 2. The industrial technology track will likely be approved soon, and the three other tracks will be added shortly after without a lengthy approval process. Findings suggest the degree tracks have potential to be of high quality and relevant to student goals, especially if they include high-quality instructors. There have been some promotional, recruitment, and dissemination activities in Year 2, but only a third of student respondents were aware of the degree tracks. There is student interest in the degree tracks, but interest levels varied across student respondents. Based on these findings, evaluators offer the following recommendations:

- Keep stakeholders updated on the approval process for the degree tracks. Stakeholders appear to have continued interest, and business, industry, and government partners stand to benefit from these future degree tracks.
- Ensure that well-trained instructors teach the technical studies courses, as instructor quality likely impacts the quality of coursework. Be mindful of instructors' teaching loads to avoid staff burnout and turnover.
- Provide the technical studies courses with more modern equipment to improve their quality.
- Ramp up promotional and recruitment activities in Year 3. Students showed interest in the degree tracks once they learned about them, but only a third of student respondents were aware of them prior to the survey.
- Most student respondents thus far have heard about the degree tracks from other individuals. Focus recruitment efforts on word-of-mouth channels. Clover Park Technical College (2015) has developed a program marketing toolkit that offers relevant strategies and information.
- Meet with the new chief academic officer as soon as possible to discuss the CTS project and gain buy-in.

3 ESTABLISH ARTICULATION AGREEMENTS

The CTS project aims to establish articulation agreements with regional four-year colleges and universities to extend the pathway for students who wish to pursue further education in technical studies fields. Although this objective is still in the early stages of development, the project did make progress in Year 2. Most notably, two four-year universities are aware of and potentially interested in developing articulation agreements once the degree tracks are approved. Based on these findings, evaluators recommend the following:

- Maintain communication with prospective four-year college and university partners about the articulation agreements to ensure partners' continued interest.
- Anticipate challenges that may hinder the development of articulation agreements to speed up the process once the degree tracks are approved.

4 DEVISE CAREER TRACKS

The CTS project aims to devise career tracks with business partners for students who have earned postsecondary credentials and are seeking to begin careers in technical studies fields. The CTS project is developing and expanding the career tracks. Students are mainly participating in three types of WBL experiences in Year 2: internships, jobs, and competitions. The WBL opportunities were generally perceived as high quality and relevant to students' educational and career goals, although partners and personnel rated the quality and relevance of the programs higher than students did. Based on these findings, evaluators recommend that the project team:

- Continue to engage partners in the development of new experiences and support for students.
- Diversify WBL opportunities beyond the three main types (internships, jobs, and competitions) of opportunities currently available.
- Find ways to improve the quality and relevance of WBL opportunities for students. One student suggested better preparing judges for competitions.

PRELIMINARY IMPACTS ON STUDENTS

The perceived impact of the CTS project on students' vocational self-efficacy, technical knowledge, and STEM skills varied; there is considerable room to further increase students' confidence and knowledge in several areas, particularly quantitative reasoning and scientific reasoning. Some students indicated that the project positively influenced their educational plans. Readers should view these findings with some caution because the CTS project is in the very early stages of development and students are likely not receiving all of the materials and supports that will eventually be part of the programs. For example, ESCC respondents were in feeder certificate programs, not full degree tracks which will have embedded opportunities for internships and additional coursework to improve STEM knowledge. Based on these findings, evaluators recommend that the project team:

- Continue to seek official approval for the degree tracks. The embedded internship opportunities and additional required coursework included in the degree tracks will provide more opportunities to build students' vocational self-efficacy, STEM skills, and technical knowledge.
- Although personnel/partner respondents tended to hold the dual enrollment technical courses in high regard, some student responses indicated that there is room to improve the courses' quality, relevance, and impact on student outcomes. Consider revisiting best practices in dual enrollment to identify ways to further improve the courses. For example, Hanover Research provides *Best Practices of Dual Credit Programs* (2012), which discusses, among other elements, placement test requirements and faculty requirements, two areas that were discussed in this evaluation.
- Consider ways to further increase dual enrollment students' interest in STEM after high school, as only 29% of dual enrollment respondents who indicated they plan to pursue further education opportunities said they planned to major in a STEM field. Hanover Research (2014) provides best practices in recruitment and retention for STEM programs.

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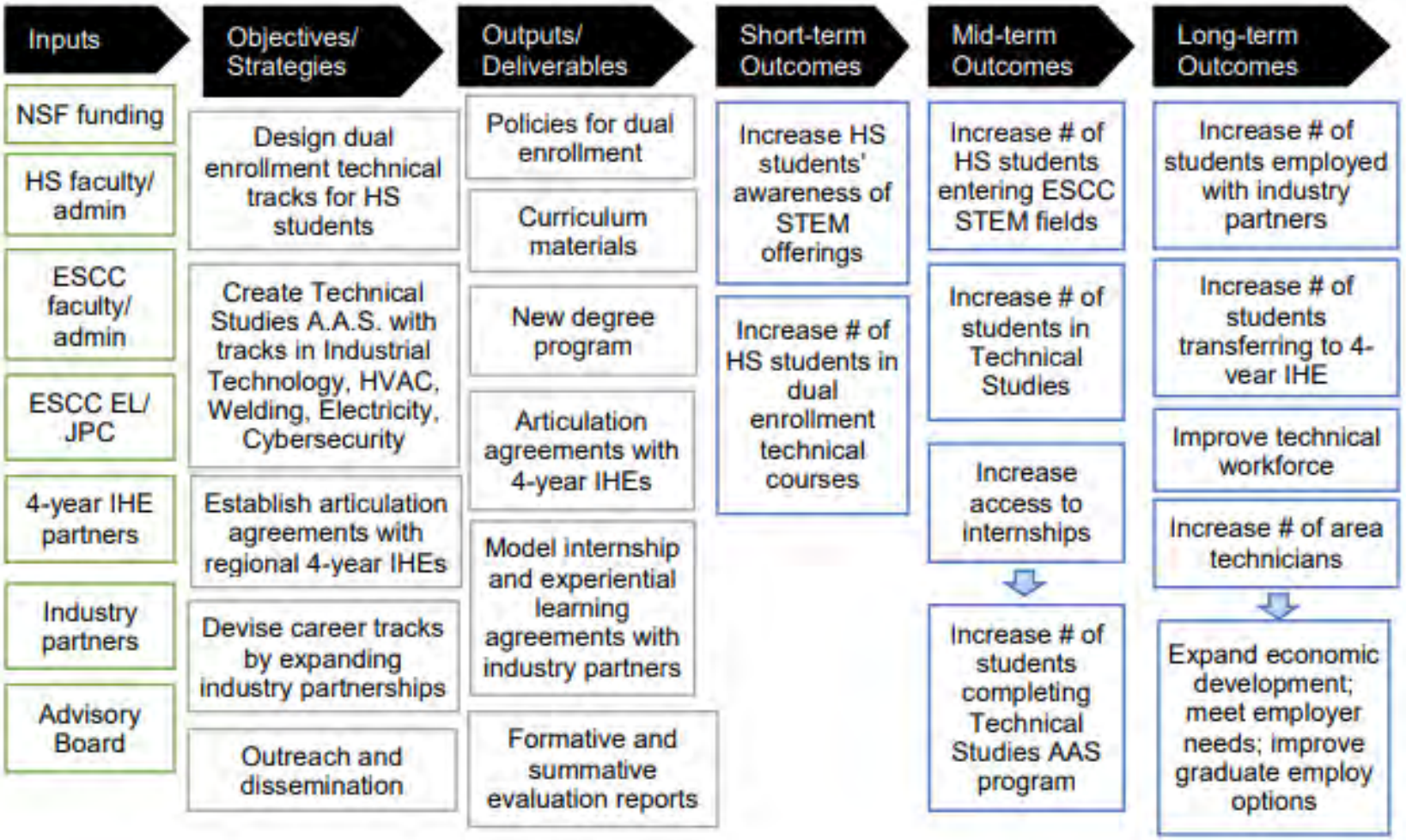
APPENDIX A. LOGIC MODEL



APPENDIX B. EVALUATION QUESTIONS

The evaluation of the CTS project focuses on the project's four main objectives. The following table summarizes the key formative and summative evaluation questions for each objective, as well as the relevant indicators and data sources and the timing of data collection.

Objective 1: Design dual enrollment technical tracks in specific career and technical education programs for the region's high school students.

Evaluation Questions	Indicator	Data Source	Timing
Formative Evaluation Questions			
Are outreach programming, workshops, and other activities offered to share information about the project?	# of outreach programs, workshops, and activities Descriptions of outreach programs, workshops, and activities	ESCC documents	Semester
How is the project developing and progressing regarding the intended number and nature of high school student participants in the dual enrollment technical tracks?	# of high school students Description of high school students	Personnel & partner survey ESCC documents	Semester/Annually
Do personnel and students perceive the dual enrollment technical tracks as high quality and relevant to students' educational and vocational goals?	Quality item bank Goals item bank	Personnel & partner survey Student survey	Annually
Summative Evaluation Questions			
Throughout the course of the project, does high school student participation in dual enrollment technical tracks increase?	# of high school students	ESCC documents Student lists	Annually
Does the percentage of matriculating students from area high schools who major in STEM fields increase throughout the project?	# of matriculating students # of students in STEM	ESCC documents	Annually

Evaluation Questions	Indicator	Data Source	Timing
Do dual enrollment technical track participants report gains in technical knowledge, STEM skills, and vocational self-efficacy?	Knowledge & skills item bank	Student survey	Annually
Do dual enrollment technical track participants report increases in the likelihood that they will pursue additional educational opportunities in the future?	Future aspirations item bank	Student survey	Annually

Objective 2: Create a Technical Studies associate degree with tracks in cybersecurity, industrial technology, HVAC, welding, and electricity.

Evaluation Questions	Indicator	Data Source	Timing
Formative Evaluation Questions			
Is a Technical Studies AAS degree program developed and implemented that offers tracks in cybersecurity, electricity, HVAC, industrial technology, and welding?	Yes/No	ESCC documents	Annually
Does the program target students who have completed ESCC's current programs and high school students who have received advanced placement in technical studies fields?	Description of target students % of target students who have received advanced placement in technical studies fields	Personnel & partner survey ESCC documents	Annually
How is the AAS program promoted?	Descriptions of promotional campaigns and recruitment efforts	Personnel & partner survey ESCC documents	Semester/Annually
How do students learn about it?	How did you hear about the program?	Student survey	Annually
How does the project develop and progress regarding the intended number and nature of participants in the AAS program?	# of students in AAS program Description of participants in AAS program	Personnel & partner survey ESCC documents	Semester/Annually

Evaluation Questions	Indicator	Data Source	Timing
Does the program create a pathway to upper-division studies?	Yes/No	Personnel & partner survey	Semester/Annually
What are the number and nature of participants in upper-division studies?	# of students in upper-division studies Description of participants in upper-division studies	ESCC documents	Semester/Annually
Do personnel and students perceive the AAS program as high quality and relevant to students' educational and vocational goals?	Quality item bank Goals item bank	Student survey	Annually
Summative Evaluation Questions			
Throughout the course of the project, does student participation in the AAS program increase?	# of participants	ESCC documents	Annually
Do participants in the AAS program report gains in technical knowledge, STEM skills, and vocational self-efficacy?	Knowledge & skills item bank	Student survey	Annually
Do participants in the AAS program report increases in the likelihood that they will pursue additional educational opportunities in the future?	Future aspirations item bank	Student survey	Annually

Objective 3: Establish articulation agreements with regional four-year colleges and universities for students wishing to pursue further education in technical studies fields.

Evaluation Questions	Indicator	Data Source	Timing
Formative Evaluation Questions			
Are articulation agreements established with regional four-year colleges and universities for students seeking to pursue further education in technical studies fields?	Yes/No	ESCC documents	Annually
What four-year institutions participate?	Names of four-year institutions	ESCC documents	Annually

Evaluation Questions	Indicator	Data Source	Timing
How are these agreements and transfer opportunities communicated to educators and students?	Description of communications	ESCC documents Personnel & partner survey	Annually
Do personnel and students perceive the articulation agreements as useful in helping students achieve their educational and vocational goals?	Goals item bank	Personnel & partner survey Student survey	Annually
Summative Evaluation Questions			
How many AAS graduates transfer into baccalaureate programs?	# of AAS graduates who transfer	ESCC documents	Annually
Does this number increase throughout the project?	# of AAS graduates who transfer	ESCC documents	Annually

Objective 4: Devise career tracks with business partners for students wishing to begin careers in technical studies fields after receiving postsecondary credentials.

Evaluation Questions	Indicator	Data Source	Timing
Formative Evaluation Questions			
Are career tracks with business partners developed for students seeking to begin careers in technical studies fields after receiving postsecondary credentials?	Yes/No	ESCC documents	Semester/Annually
What types of experiences and support are offered?	# of internships, # of workplace tours, # of job shadow opportunities, # of conferences, # of RockOn! workshops, # of other career track experiences Descriptions of these experiences and support offered	Personnel & partner survey Student survey ESCC documents	Semester/Annually

Evaluation Questions	Indicator	Data Source	Timing
How does the project develop and progress regarding the intended number and nature of business partners that provide placement opportunities to ESCC students?	# of business partners with placement opportunities Description of business partners	Personnel & partner survey ESCC documents	Semester/Annually
How does the project develop and progress regarding the intended number and nature of students who participate in work-based learning (WBL) experiences?	# of students participating in WBL opportunities Description of students (e.g., have postsecondary credential)	Student survey ESCC documents	Semester/Annually
Do personnel and students perceive the WBL experiences as high quality and relevant to students' vocational goals?	Quality item bank	Student survey Personnel & partner survey	Annually
Summative Evaluation Questions			
Do students who participate in career track, WBL opportunities (internships, conferences, competitions, résumé and interview support opportunities, etc.) report gains in technical knowledge and STEM skills, future educational aspirations, and vocational self-efficacy?	Knowledge & skills item bank, goal item bank, and self-efficacy item bank	Student survey	Annually
Over the course of the project, is there an increase in placement opportunities for ESCC students?	# of placement opportunities	ESCC documents	Semester/Annually

APPENDIX C. QUANTITATIVE SURVEY DATA

This appendix presents data from the Spring 2019 personnel and partner survey and the Spring 2019 student survey, organized by the four objectives.

What is your role in the project?

	n
Business, Industry, or Government Partner	10
Secondary Education Partner	6
High School Career Coach	3
ESCC Employee	6
ESCC CTE Project Team	4
University Partner	2

1 DESIGN DUAL ENROLLMENT TECHNICAL TRACKS

Items regarding the dual enrollment technical courses were available to the following respondents on the Spring 2019 personnel and partner and student surveys: secondary education partners, high school career coaches, ESCC employees and the CTE project team, and dual enrollment students.

2019 Personnel and Partner Survey

Please rate the quality of these dual enrollment technical classes. (n = 18)

	n
Very high quality	6
High quality	9
Average quality	1
Poor quality	0
Very poor quality	0
I don't know	2

Please indicate if these dual enrollment technical classes are relevant to students' goals in the following areas: (n = 18)

	No	Somewhat	Yes	I don't know
	n	*n*	*n*	*n*
Educational goals	0	1	15	2
Career goals	0	0	16	2

Do you teach any of these dual enrollment technical classes? (n = 6)

	n
Yes	2
No	4

To what extent have students who were enrolled in these dual enrollment technical classes shown gains in the following areas: (n = 5)

	To no extent *n*	To little extent *n*	To some extent *n*	To much extent *n*	To a great extent *n*	I don't know *n*
Technical knowledge	0	0	0	1	4	0
STEM skills	0	0	1	1	0	3
Vocational self-efficacy	0	0	1	1	3	0

2019 Student Survey

Did you receive free or reduced-price lunch for the 2018–2019 academic year? (n = 35)

	n
Yes	13
No	22
I don't know	0
I prefer not to answer	0

What is your class level during the 2018–2019 academic year? (n = 35)

	n
Freshman	0
Sophomore	2
Junior	4
Senior	29
I prefer not to answer	0

How did you hear about these dual enrollment technical classes? (n = 35)

	n
High School Teacher	19
High School Guidance Counselor	23
High School Career Coach	10
Peer	8
Parent	6
Newspaper	0
Radio	0
ESCC Website	0
Social Media	2
Other	0

Which dual enrollment technical studies classes are you enrolled in during the 2018–2019 academic year? Check all that apply. (n = 35)

	n
HVAC II	3
Engineering Drawing/Design or Architectural Drawing/Design	14
Building Trades II	7
Computer Systems Technology II	7
Welding II	5
WEL 123	0

Please rate the quality of these dual enrollment technical classes: (n = 35)

	n
Very high quality	11
High quality	16
Average quality	6
Poor quality	2
Very poor quality	0
I prefer not to answer	0

Please indicate if these dual enrollment technical classes are relevant to your goals in the following areas: (n = 35)

	No *n*	Somewhat *n*	Yes *n*	I don't know *n*
Educational goals	0	9	26	0
Career goals	2	10	22	1

Do you plan to pursue further education opportunities after high school? (n = 35)

	n
Yes	28
No	1
I don’t know	6

Are you planning on majoring in a science, technology, engineering, or math (STEM) field after high school? (n = 28)

	n
Yes	8
No	12
I don’t know	8

To what extent are you more likely to pursue the following educational opportunities in the future as a result of participating in technical class(es) and/or work-based learning experiences? (n = 35)

	To no extent	To little extent	To some extent	To much extent	To a great extent	I don't know
	n	*n*	*n*	*n*	*n*	*n*
Career Studies Certificate	3	3	6	6	5	7
Certificate	2	2	7	8	9	4
Associate degree	7	4	5	3	8	4
Bachelor's degree	7	4	5	3	8	6
Master's degree	10	5	6	1	5	4
Doctoral degree (e.g., PhD, MD, or EdD)	12	7	3	2	2	6

*Using a 5-point scale, please rate your **confidence** in the following areas **before** and **after** participating in your technical studies classes or work-based learning experiences during the 2018–2019 academic year. The 5-point scale ranges from 1,* No confidence at all*, to 5,* Complete confidence. *(n = 35)*

	Before			After		
	n	*Mean*	*SD*	*n*	*Mean*	*SD*
Finding a job that interests you	35	2.97	1.38	34	4.09	1.00
Writing a good résumé	35	2.57	1.33	34	3.44	1.05
Having a successful job interview	35	2.89	1.18	34	3.74	1.02
Succeeding in your chosen career	35	3.00	1.11	34	4.03	0.97

Using a 5-point scale, please rate your level of knowledge *in the following topic areas* before *and* after *participating in your technical studies classes or work-based learning experiences during the 2018–2019 academic year. The scale ranges from 1,* No Knowledge*, to 5,* Very Knowledgeable. *(n = 35)*

	Before			After		
	n	*Mean*	*SD*	*n*	*Mean*	*SD*
HVAC						
Demonstrating an understanding of quality control principles	3	3.00	0.00	3	3.33	1.53
Properly sizing and installing HVAC systems using current and appropriate codes and industry practices	3	2.33	1.15	3	3.33	0.58
Diagnosing and repairing faults on HVAC systems	3	2.33	1.15	3	3.33	0.58
Performing maintenance on HVAC systems	3	2.33	1.15	3	3.33	0.58
Reading and interpreting electrical diagrams	3	2.33	1.15	3	3.00	0.00
Reading and interpreting repair faults in electrical control systems	3	2.33	1.15	3	3.33	0.58
Welding						
Demonstrating an understanding of quality control principles	5	2.00	0.71	5	3.60	1.34

Demonstrating proficiency in the use of welding tools	5	2.40	1.52	5	4.20	1.30
Safely performing welding techniques using fillers, wires, fluxes, and gases	5	2.60	1.52	5	4.40	1.34
Reading and interpreting blueprints in the welding industry	5	2.60	1.34	5	4.00	1.22
Electricity						
Demonstrating an understanding of quality control principles	7	2.71	1.38	7	3.71	1.25
Reading and interpreting electrical diagrams	7	2.29	1.11	7	4.00	0.58
Reading and interpreting repair faults in electrical control systems	7	2.14	1.35	7	4.14	1.07
Using electrical equipment safely and appropriately	7	3.57	1.27	7	4.71	0.49
Applying National Electrical Code to industrial and residential wiring	7	1.71	1.25	7	3.86	0.90
Applying fundamental electrical theory to residential and industrial wiring practices	7	2.00	1.15	7	3.43	0.79
Industrial Technology						
Demonstrating an understanding of quality control principles	20	2.65	1.23	19	3.53	1.12
Identifying typical tools	20	2.80	1.32	19	3.53	1.12
Demonstrating proper use of a variety of devices including precision measurement	20	2.70	1.26	19	3.47	1.02
Reading and interpreting mechanical drawings	20	2.20	1.47	19	3.74	1.28
Performing data collection and evaluation of equipment used in the industrial environment	20	2.35	1.39	19	3.21	1.27

*Using a 5-point scale, please rate your level of **knowledge** in the following topic areas **before** and **after** participating in your technical studies classes or work-based learning experiences during the 2018–2019 academic year. The scale ranges from 1,* No Knowledge*, to 5,* Very Knowledgeable. *(n = 35)*

	Before			After		
	n	*Mean*	*SD*	*n*	*Mean*	*SD*
Determining the credibility, accuracy, and reliability of conclusions drawn from the data	35	2.51	1.25	34	3.47	1.02
Evaluating the strengths and relevance of arguments on a particular question or issue	34	2.59	1.13	33	3.39	0.93
Determining whether certain conclusions or consequences are supported by the information provided	35	2.69	1.08	34	3.50	0.79
Using problem-solving skills	35	3.03	1.04	34	3.85	1.02
Using logical and mathematical reasoning	35	2.91	1.12	34	3.62	0.99
Interpreting and using mathematical formulas	35	2.97	1.12	33	3.48	0.97
Interpreting and using mathematical information numerically, symbolically, and visually (e.g., graphs, tables, and charts)	35	3.03	1.15	34	3.68	1.04

	Before			After		
	n	*Mean*	*SD*	*n*	*Mean*	*SD*
Generating a logical argument	35	2.89	1.05	34	3.41	0.82
Distinguishing a scientific argument from a non-scientific argument	35	2.91	1.17	34	3.56	0.86
Distinguishing between causal and correlational relationships	34	2.97	1.17	32	3.47	0.95
Recognizing methods of inquiry (i.e., ways information is collected) that lead to scientific knowledge	35	2.71	1.15	33	3.36	0.99

2 CREATE TECHNICAL STUDIES AAS DEGREE TRACKS

Items regarding the degree tracks were available to the following respondents to the Spring 2019 personnel and partner and student surveys:

- Business, industry, and government partners; secondary education partners; high school career coaches; ESCC employees; the CTE project team; and university partners;
- Dual enrollment students; and
- Current ESCC students, recent ESCC alumni, and recent ESCC noncompleters.

2019 Personnel and Partner Survey

Please rate the quality of these Technical Studies A.A.S. degree tracks: (n = 30)

	Very poor quality	Poor quality	Average quality	High quality	Very high quality	I don't know
	n	*n*	*n*	*n*	*n*	*n*
Industrial Technology	0	0	1	7	12	9
HVAC	0	0	1	9	10	10
Welding	0	1	0	13	8	8
Electricity	0	0	0	8	12	10

*Are these Technical Studies A.A.S. degree tracks relevant to students' **educational goals**? (n = 19)*

	No	Somewhat	Yes	I don't know
	n	*n*	*n*	*n*
Industrial Technology	0	0	16	3
HVAC	0	0	16	3
Welding	0	0	17	2
Electricity	0	0	16	3

*Are these Technical Studies A.A.S. degree tracks relevant to students' **career goals**? (n = 20)*

	No	Somewhat	Yes	I don't know
	n	*n*	*n*	*n*
Industrial Technology	0	0	17	3
HVAC	0	0	17	3
Welding	0	0	18	2
Electricity	0	0	17	3

Do you teach any courses at ESCC? (n = 6)

	n
Yes	4
No	2

Have the pending Technical Studies A.A.S. degree tracks impacted (or will they impact) your courses or teaching schedule? (n = 4)

	n
Yes	0
No	2
I don't know	2

To what extent have students who were enrolled in any of the following programs during the 2018–2019 academic year—Industrial Technology Certificate, HVAC Career Studies Certificate, Welding Certificate or Career Studies Certificate, or Electricity Career Studies Certificate—shown gains in the following areas: (n = 9)

	To no extent	To little extent	To some extent	To much extent	To a great extent	I don't know
	n	*n*	*n*	*n*	*n*	*n*
Technical knowledge	0	0	1	3	1	4
STEM skills	0	0	1	2	3	3
Vocational self-efficacy	0	1	0	2	3	3

2019 Student Survey

Prior to this survey, were you aware of any of these Technical Studies A.A.S. degree tracks at ESCC? (n = 46)

	n
Yes	15
No	29
I prefer not to answer	2

How did you hear about these Technical Studies A.A.S. degree tracks? Check all that apply. (n = 15)

	n
High School Teacher	4
High School Guidance Counselor	6
High School Career Coach	5
ESCC Faculty	5
Peer	3
Parent	0
Newspaper	0
Radio	0
ESCC Website	3
Social Media	0
Other	0

Are you interested in pursuing any of the four Technical Studies A.A.S. degree tracks? (n = 46)

	No	Maybe	Yes	I don't know
	n	*n*	*n*	*n*
Industrial technology	12	16	6	5
HVAC	20	7	9	4
Welding	19	11	9	3
Electricity	15	10	13	3

What is your gender? (n = 8)

	n
Male	7
Female	2
I prefer not to answer	2

What is your race/ethnicity? (n = 8)

	n
White	5
Black or African American	2
American Indian or Alaska Native	0
Asian	0
Native Hawaiian or Other Pacific Islander	0
Two or more races	0
Hispanic or Latino	2
I prefer not to answer	2

Did you receive financial aid from any of these sources: PELL, WIOA, RHVI, or other for the 2018–2019 academic year? (n = 8)

	n
Yes	4
No	4
I don't know	0
I prefer not to answer	0

*Which of the following programs of study were you enrolled in **during the 2018–2019 academic year**? Check all that apply. (n = 11)*

	n
Industrial Technology Certificate	3
HVAC Career Studies Certificate	1
Welding Certificate or Career Studies Certificate	3
Electricity Career Studies Certificate	2
None of the above	3

Please rate the quality of the technical studies courses in your program. (n = 8)

	n
Very high quality	3
High quality	2
Average quality	3
Poor quality	0
Very poor quality	0
I don't know	0

Please indicate if the technical studies courses in your program are relevant to your goals in the following areas: (n = 8)

	No *n*	Somewhat *n*	Yes *n*	I don't know *n*
Educational goals	0	2	5	1
Career goals	0	1	6	1

To what extent are you more likely to pursue the following educational opportunities in the future as a result of participating in technical studies courses or work-based learning experiences? (n = 8)

	To no extent *n*	To little extent *n*	To some extent *n*	To much extent *n*	To a great extent *n*	I don't know *n*
Associate degree	2	1	1	0	3	1
Bachelor's degree	2	1	1	1	1	1
Master's degree	3	1	0	2	0	1
Doctoral degree (e.g., PhD, MD, or EdD)	3	1	1	1	0	1

*Using a 5-point scale, please rate your **confidence** in the following areas **before** and **after** participating in your technical studies classes or work-based learning experiences during the 2018–2019 academic year. The 5-point scale ranges from 1,* No confidence at all*, to 5,* Complete confidence. *(n = 8)*

	Before			After		
	n	*Mean*	*SD*	*n*	*Mean*	*SD*
Finding a job that interests you	7	3.00	1.00	8	3.50	0.93
Writing a good résumé	8	3.00	0.53	8	3.88	0.83
Having a successful job interview	8	3.50	0.76	8	3.63	0.74
Succeeding in your chosen career	8	2.75	0.89	8	3.25	0.89

*Using a 5-point scale, please rate your level of **knowledge** in the following topic areas **before** and **after** participating in your technical studies classes or work-based learning experiences during the 2018–2019 academic year. The scale ranges from 1,* No Knowledge*, to 5,* Very Knowledgeable. *(n = 7).*

	Before			After		
	n	*Mean*	*SD*	*n*	*Mean*	*SD*
Determining the credibility, accuracy, and reliability of conclusions drawn from data	7	2.57	1.27	7	3.71	0.95
Evaluating the strengths and relevance of arguments on a particular question or issue	7	3.14	0.69	7	3.86	0.69
Determining whether certain conclusions or consequences are supported by the information provided	7	3.00	0.82	7	4.00	0.58
Using problem-solving skills	7	3.57	0.53	7	4.14	0.69
Using logical and mathematical reasoning	7	3.29	0.49	7	3.86	0.69
Interpreting and using mathematical formulas	7	3.29	0.49	7	3.43	0.98
Interpreting and using mathematical information numerically, symbolically, and visually (e.g., graphs, tables, and charts)	7	3.14	0.69	7	3.71	0.76
Generating a logical argument	6	3.33	0.52	6	3.83	0.98
Distinguishing a scientific argument from a non-scientific argument	6	3.17	0.41	6	3.83	0.75
Distinguishing between causal and correlational relationships	6	3.33	0.52	6	4.00	0.89
Recognizing methods of inquiry (i.e., ways information is collected) that lead to scientific knowledge	6	3.33	0.52	5	3.80	0.84

3 ESTABLISH ARTICULATION AGREEMENTS

Items regarding the articulation agreements were available to all respondents to the Spring 2019 personnel and partner survey.

Prior to this survey, were you aware that ESCC is developing these articulation agreements? (n = 30)

	n
Yes	21
No	8
I prefer not to answer	1

Please indicate if these articulation agreements will be relevant to students' goals in the following areas: (n = 21)

	No *n*	Somewhat *n*	Yes *n*	I don't know *n*
Educational goals	0	0	20	1
Career goals	0	0	20	1

Do the Technical Studies A.A.S. degree tracks create a pathway to upper-division studies? (n = 6)

	No *n*	Somewhat *n*	Yes *n*	I don't know *n*
Industrial Technology	0	0	6	0
HVAC	0	0	6	0
Welding	0	0	6	0
Electricity	0	0	6	0

4 DEVISE CAREER TRACKS

Items regarding WBL opportunities were available to the following respondents on the Spring 2019 personnel and partner and student surveys:

- Business, industry, and government partners
- Secondary education partners, high school career coaches, ESCC employees, and members of the CTE project team who knew students who participated in WBL opportunities, and
- Students who participated in WBL opportunities.

2019 Personnel and Partner Survey

What types of experiences and support have you or your business offered (or will you or your business offer) to students? (Check all that apply) (n = 10)

	n
Internships	9
Jobs	9
Workplace tours	4
Job shadowing	3

	n
Field trips	2
Opportunities to conduct classroom presentations	2
Opportunities to attend career fairs or events	3
Internship stipends	4
Donations of training equipment and supplies	1
Other	0
None	0

How many work-based learning opportunities did you or your business offer to students during the 2018–2019 academic year? (n = 9)

	n
Number of responses*	6
I don't know	3

**These respondents provided the following responses: 0, 0, 0, 1, 3, 4.*

How many work-based learning opportunities will you or your business offer to students during the 2019–2020 academic year? (n = 9)

	n
Number of responses*	4
I don't know	5

**These respondents provided the following responses: 0, 0, 2, 4.*

Are you aware of any students who participated in these work-based learning opportunities during the 2018–2019 academic year? (n = 18)

	n
Yes	9
No	5
I don't know	4

Please rate the quality of the work-based learning opportunities offered during the 2018–2019 academic year. (n = 12)

	n
Very high quality	8
High quality	3
Average quality	0
Poor quality	0
Very poor quality	0
I don't know	1

Please indicate if the work-based learning opportunities offered during the 2018–2019 academic year are relevant to students' goals in the following areas: (n = 12)

	No *n*	Somewhat *n*	Yes *n*	I don't know *n*
Educational goals	0	0	11	1
Career goals	0	0	11	1

To what extent have students who participated in work-based learning opportunities during the 2018–2019 academic year shown gains in the following areas: (n = 12)

	To no extent *n*	To little extent *n*	To some extent *n*	To much extent *n*	To a great extent *n*	I don't know *n*
Technical knowledge	0	0	2	3	5	2
STEM skills	0	0	2	2	5	3
Vocational self-efficacy	0	0	2	3	5	2

2019 Student Survey

Did you participate in any of the following work-based learning opportunities during the 2018–2019 academic year? Check all that apply. (n = 46)

	n
Internships	4
Workplace tours	3
Job shadowing	2
Conferences	0
RockOn! Workshops	1
Competitions	11
Résumé writing	6
Interview support	1
Other	0
I did not participate in any of these work-based learning opportunities during the 2018–2019 academic year.	29

Please rate the quality of your work-based learning experiences. (n = 16)

	n
Very high quality	5
High quality	5
Average quality	6
Poor quality	0
Very poor quality	0
I don't know	0

Please indicate if your work-based learning experiences were relevant to your goals in the following areas: (n = 17)

	No	Somewhat	Yes	I don't know
	n	*n*	*n*	*n*
Educational goals	1	5	11	0
Career goals	1	5	11	0

*Using a 5-point scale, please rate your **confidence** in the following areas **before** and **after** participating in your technical studies classes or work-based learning experiences during the 2018–2019 academic year. The 5-point scale ranges from 1,* No confidence at all*, to 5,* Complete confidence. *(n = 8)*

	Before			After		
	n	*Mean*	*SD*	*n*	*Mean*	*SD*
Finding a job that interests you	17	3.00	1.46	16	4.50	0.73
Writing a good résumé	17	2.65	1.54	16	3.75	0.86
Having a successful job interview	17	2.88	1.27	16	4.00	0.89
Succeeding in your chosen career	17	3.00	1.12	16	4.50	0.82

APPENDIX D. METHODS AND INSTRUMENTS

EVALUATION APPROACH

Magnolia Consulting evaluators are conducting a formative and summative evaluation to address program development, implementation, and preliminary outcomes. The evaluation incorporates a mixed-methods approach to allow evaluators to triangulate findings from qualitative and quantitative data sources. Data triangulation will offer a more comprehensive understanding of program implementation, delivery, and outcomes than either quantitative or qualitative methods alone could provide (Creswell & Plano Clark, 2007; Patton, 2002).

DATA COLLECTION

This section describes the data sources, data collection methods, data collection procedures, and data collection timelines.

Review of project documents and records (collected on an ongoing basis): Evaluators are working collaboratively with the project team to access and examine project documents, including ESCC work plans; meeting minutes and agendas; marketing materials; program activities logs and reports; data related to student enrollment, course completion, credentials, degree completion, and transfer to four-year institutions; and other relevant documents.

For this interim report, evaluators used the following documents:

- Notes from calls with the project team,
- A data collection tool (documenting enrollment numbers and outreach activities),
- College materials (e.g., website, dual enrollment handbook, and course catalog),
- Proposals (e.g., SCHEV and Creating Excellence Award),
- CTS activity timeline,
- Meeting agendas and minutes,
- Internship schedule,
- Press releases, and
- Student interest evaluation sheets.

Personnel and partner surveys (collected annually): In Spring 2018, evaluators used SurveyGizmo to administer online surveys to personnel and partners who were involved in the development and implementation of the project activities. The project team contributed to instrument design and data collection. This survey included questions pertaining to various aspects of the project activities and programs, including respondents' perceptions regarding program quality and utility. Similar surveys will be designed and distributed in Spring 2019 and Spring 2020.

Student surveys (collected annually): In Spring 2019 and Spring 2020, evaluators will use SurveyGizmo to administer online surveys to students who participated in the project activities. The project team will contribute to instrument design and data collection. This survey will include questions regarding the extent to which the students participated in specific program components; how they learned about various aspects of the programs; and whether

participation contributed positively to their technical knowledge and STEM skills, future educational aspirations, and vocational self-efficacy. The survey will also address other issues related to program delivery, quality, and utility.

DATA MANAGEMENT & ANALYSES

Evaluators follow specific quality control processes and protocols in collecting, cleaning, and preparing data. By following precise practices, we ensure data accuracy, so that our clients can have confidence in the study's findings. Additionally, participants' data are kept confidential, and evaluators combine all results to prevent identification of individual participants.

The evaluation includes qualitative and quantitative analyses, as well as triangulation of data collected through program artifacts, records, and surveys. Quantitative data analyses include calculation of descriptive statistics (such as frequency counts, ranges, means, and standard deviations) and other analyses, as appropriate. Qualitative data analyses include content analyses to identify themes based on the evaluation questions.

LIMITATIONS

The CTS project is in the early stages of implementation. Therefore, evaluators were unable to examine the objectives in much depth or to address all of the formative evaluation questions. Additionally, because none of the four degree tracks have been approved, ESCC students who received the survey provided feedback about existing technical studies courses in the feeder certificate programs and not the actual degree tracks. Moreover, the outcomes of this evaluation cannot conclusively be attributed to the project itself, because the study does not use an experimental or quasi-experimental design. These more rigorous designs are not deemed necessary or appropriate given the current stage of this project's development, but this limitation should be considered when interpreting results.

EVALUATION INSTRUMENTS

The following data collection instruments were used in this interim report.

SPRING 2019 PERSONNEL AND PARTNER SURVEY

The purpose of this survey is to gather information about planning and implementation of Eastern Shore Community College's (ESCC) Creating Technical Scholars (CTS) Project. Your feedback will help us better understand how the CTS project is being implemented during its second year. It should take about 5-10 minutes to complete.

Thank you for your participation!

What is your role in the project? (Check all that apply)*
[ ] Business, Industry, or Government Partner
[ ] Secondary Education Partner
[ ] High School Career Coach
[ ] ESCC Employee
[ ] ESCC CTE Project Team
[ ] University Partner

Through the Creating Technical Scholars (CTS) Project, ESCC offered dual enrollment technical classes during the 2018-2019 academic year. The following questions pertain to these dual enrollment technical classes:

ESCC Course Designation	***VDOE/School Division Designation***
AIR 121	*HVAC II*
AIR 276	*HVAC II*
AIR 134	*HVAC II*
CAD 201	*Engineering Drawing/Design or Architectural Drawing/Design*
ELE 118	*Building Trades II*
ETR 228	*Computer Systems Technology II*
WEL 123	*Welding II*
WEL 123	*WEL 123*

Please rate the quality of these dual enrollment technical classes?
( ) Very high quality
( ) High quality
( ) Average quality
( ) Poor quality
( ) Very poor quality
( ) I don't know

How could the quality of these dual enrollment technical classes be improved?

Please indicate if these dual enrollment technical classes are relevant to students' goals in the following areas:

	No	**Somewhat**	**Yes**	**I don't know**
Educational goals	( )	( )	( )	( )
Career goals	( )	( )	( )	( )

How could these dual enrollment technical classes be modified to make them more relevant to students' educational and/or career goals?

Do you teach any of these dual enrollment technical classes?
( ) Yes
( ) No

To what extent have students who were enrolled in these dual enrollment technical classes <u>shown gains</u> in the following areas:

	To no extent	**To little extent**	**To some extent**	**To much extent**	**To a great extent**	**I don't know**
Technical knowledge	( )	( )	( )	( )	( )	( )
STEM skills	( )	( )	( )	( )	( )	( )
Vocational self-efficacy	( )	( )	( )	( )	( )	( )

Through the Creating Technical Scholars (CTS) Project, ESCC has developed four Technical Studies A.A.S. degree tracks– industrial technology, HVAC, welding, and electricity– that are currently pending approval. The following questions pertain to these Technical Studies A.A.S. degree tracks.

Please rate the quality of these Technical Studies A.A.S. degree tracks:

	Very poor quality	**Poor quality**	**Average quality**	**High quality**	**Very high quality**
Industrial Technology	( )	( )	( )	( )	( )
HVAC	( )	( )	( )	( )	( )
Welding	( )	( )	( )	( )	( )
Electricity	( )	( )	( )	( )	( )

How could the quality of the Technical Studies A.A.S. degree track(s) be improved?

Are these Technical Studies A.A.S. degree tracks relevant to students' **<u>educational goals</u>**?

	No	**Somewhat**	**Yes**
Industrial Technology	( )	( )	( )
HVAC	( )	( )	( )
Welding	( )	( )	( )
Electricity	( )	( )	( )

How could the Technical Studies A.A.S. degree track(s) be modified to make them more relevant to students' educational goals?

Are these Technical Studies A.A.S. degree tracks relevant to students' **<u>career goals</u>**?

	No	**Somewhat**	**Yes**	**I don't know**
Industrial Technology	( )	( )	( )	( )
HVAC	( )	( )	( )	( )
Welding	( )	( )	( )	( )
Electricity	( )	( )	( )	( )

How could the Technical Studies A.A.S. degree track(s) be modified to make them more relevant to students' career goals?

Do the Technical Studies A.A.S. degree tracks create a pathway to upper division studies?

	No	**Somewhat**	**Yes**	**I don't know**

Industrial Technology	( )	( )	( )	( )
HVAC	( )	( )	( )	( )
Welding	( )	( )	( )	( )
Electricity	( )	( )	( )	( )

How could the Technical Studies A.A.S. degree track(s) be revised to create a pathway to upper division studies?

What efforts do you have in place to recruit students to the Technical Studies A.A.S. degree tracks?

What types of students are these recruitment efforts targeting?

Do you teach any courses at ESCC?
( ) Yes
( ) No

What courses do you currently teach?

Have the pending Technical Studies A.A.S. degree tracks impacted (or will they impact) your courses or teaching schedule?
( ) Yes
( ) No
( ) I don't know

How were your courses or teaching schedule (or how will they be) impacted? Check all that apply
[ ] I teach (or will teach) a different number of courses
[ ] I teach (or will teach) different courses
[ ] My course curricula changed (or will change)
[ ] I need (or will need) additional industry certifications (i.e. in order to teach these new industry credentials to students)
[ ] Other: _____

What, if any, additional information or resources do you need to help make the Technical Studies A.A.S. degree tracks successful?

To what extent have students who were enrolled in any of the following programs during the 2018-2019 academic year – Industrial Technology Certificate, HVAC Career Studies Certificate, Welding Certificate or Career Studies Certificate and/or Electricity Career Studies Certificate – <u>shown gains</u> in the following areas:

	To no extent	**To little extent**	**To some extent**	**To much extent**	**To a great extent**	**I don't know**
Technical knowledge	( )	( )	( )	( )	( )	( )
STEM skills	( )	( )	( )	( )	( )	( )
Vocational self-efficacy	( )	( )	( )	( )	( )	( )

Will you or your business benefit from the Technical Studies A.A.S. degree tracks?
( ) Yes
( ) No
( ) I don't know

How will you or your business benefit from the Technical Studies A.A.S. degree tracks?

Why would you or your business not benefit from the Technical Studies A.A.S. degree tracks?

Through the Creating Technical Scholars (CTS) Project, ESCC will develop articulation agreements (i.e., formal transfer agreements with 4-year universities) for their pending Technical Studies A.A.S. degree tracks– industrial technology, HVAC, welding, and electricity. The following questions pertain to these articulation agreements.

Prior to this survey, were you aware that ESCC is developing these articulation agreements?
( ) Yes
( ) No
( ) I prefer not to answer

How did you first hear about these articulation agreements?

Please indicate if these articulation agreements will be relevant to students' goals in the following areas:

	No	**Somewhat**	**Yes**	**I don't know**
Educational goals	( )	( )	( )	( )
Career goals	( )	( )	( )	( )

How could these articulation agreements be modified to help students achieve their educational and/or career goals?

The Virginia Department of Education defines work-based learning as "… on-the-job experiences that are related to students' career goals and/or interests; are based on instructional preparation; and are performed in partnership with local businesses, industries, or other organizations in the community." (Giffin, Neloms, Mitchell & Blumenthal, 2018).

The Creating Technical Scholars (CTS) Project offers students work-based learning opportunities. The following questions pertain to these work-based learning opportunities.

What types of experiences and support have you or your business offered (or will you or your business offer) to students? (Check all that apply)
[ ] Internships
[ ] Jobs
[ ] Workplace tours
[ ] Job shadowing
[ ] Field trips
[ ] Opportunities to conduct classroom presentations
[ ] Opportunities to attend career fairs or events
[ ] Internship stipends
[ ] Donations of training equipment and supplies
[ ] Other: _____
[ ] None

How many work-based learning opportunities did you or your business offer to students during the 2018-2019 academic year?
( ) Number of work-based learning opportunities: _____
( ) No work-based learning opportunities
( ) I don't know

How many work-based learning opportunities will you or your business offer to students during the 2019-2020 academic year?
( ) Number of work-based learning opportunities: _____
( ) No work-based learning opportunities

( ) I don't know

Are you aware of any students who participated in these work-based learning opportunities during the 2018-2019 academic year?
( ) Yes
( ) No
( ) I don't know

Please rate the quality of the work-based learning opportunities offered during the 2018-2019 academic year?
( ) Very high quality
( ) High quality
( ) Average quality
( ) Poor quality
( ) Very poor quality
( ) I don't know

How could the quality of these work-based learning opportunities be improved?

Please indicate if the work-based learning opportunities offered during the 2018-2019 academic year are relevant to students' goals in the following areas:

	No	**Somewhat**	**Yes**	**I don't know**
Educational goals	( )	( )	( )	( )
Career goals	( )	( )	( )	( )

How could these work-based learning opportunities be modified to make them more relevant to students' educational and/or career goals?

To what extent have students who participated in work-based learning opportunities during the 2018-2019 academic year shown gains in the following areas:

	To no extent	**To little extent**	**To some extent**	**To much extent**	**To a great extent**	**I don't know**
Technical knowledge	( )	( )	( )	( )	( )	( )
STEM skills	( )	( )	( )	( )	( )	( )
Vocational self-efficacy	( )	( )	( )	( )	( )	( )

SPRING 2019 STUDENT SURVEY

The purpose of this survey is to gather information about students' perceptions of and experiences with the courses and offerings developed as part of the Eastern Shore Community College (ESCC) Creating Technical Scholars (CTS) Project. This survey should take about 5-10 minutes to complete.

What is your gender?
( ) Male
( ) Female
( ) Other: _____
( ) I prefer not to answer

What is your race/ethnicity?
( ) White
( ) Black or African American
( ) American Indian or Alaska Native
( ) Asian
( ) Native Hawaiian or Other Pacific Islander
( ) Two or more races
( ) Hispanic or Latino
( ) I prefer not to answer

Through the Creating Technical Scholars (CTS) Project, ESCC has developed four Technical Studies A.A.S. degree tracks– industrial technology, HVAC, welding, and electricity– that are currently pending approval. The following questions pertain to these Technical Studies A.A.S. degree tracks.

Prior to this survey, were you aware of any of these Technical Studies A.A.S. degree tracks at ESCC?
( ) Yes
( ) No
( ) I prefer not to answer

How did you hear about these Technical Studies A.A.S. degree tracks? Check all that apply.
[ ] High School Teacher
[ ] High School Guidance Counselor
[ ] High School Career Coach
[ ] ESCC Faculty
[ ] Peer
[ ] Parent
[ ] Newspaper
[ ] Radio
[ ] ESCC Website
[ ] Social Media
[ ] Other: _____

Are you interested in pursuing any of the four Technical Studies A.A.S. degree tracks?

	No	**Maybe**	**Yes**	**I don't know**
Industrial technology	( )	( )	( )	( )
HVAC	( )	( )	( )	( )
Welding	( )	( )	( )	( )
Electricity	( )	( )	( )	( )

Which of the following programs of study were you enrolled in **during the 2018-2019 academic year**? Check all that apply.*

[ ] Industrial Technology Certificate
[ ] HVAC Career Studies Certificate
[ ] Welding Certificate or Career Studies Certificate
[ ] Electricity Career Studies Certificate
[ ] None of the above

Did you receive financial aid from any of these sources: PELL, WIOA, RHVI or other for the 2018-2019 academic year?
( ) Yes
( ) No
( ) I don't know
( ) I prefer not to answer

The following questions refer to the technical studies course(s) in your program(s):

Please rate the quality of the technical studies course(s) in your program(s).
( ) Very high quality
( ) High quality
( ) Average quality
( ) Poor quality
( ) Very poor quality
( ) I don't know

What elements or features contributed to the quality of the technical studies course(s) in your program(s)? Please provide details including course name and number, if known, and instructor.

How could the quality of the technical studies course(s) in your program(s) be improved? Please provide details including course name and number, if known, and instructor.

Please indicate if the technical studies course(s) in your program(s) are relevant to your goals in the following areas:

	No	**Somewhat**	**Yes**	**I don't know**
Educational goals	( )	( )	( )	( )
Career goals	( )	( )	( )	( )

How could the technical studies course(s) in your program(s) be modified to make them more relevant to your educational and/or career goals?

Through the Creating Technical Scholars (CTS) Project, ESCC has offered work-based learning opportunities. These questions pertain to these opportunities.

Did you participate in any of the following work-based learning opportunities during the 2018-2019 academic year? Check all that apply.*
[ ] Internships
[ ] Workplace tours
[ ] Job shadowing
[ ] Conferences
[ ] RockOn! Workshops
[ ] Competitions
[ ] Résumé writing
[ ] Interview support
[ ] Other: _____

[ ] I did not participant in any of these work-based learning opportunities during the 2018-2019 academic year.

Please rate the quality of your work-based learning experience(s).
( ) Very high quality
( ) High quality
( ) Average quality
( ) Poor quality
( ) Very poor quality
( ) I don't know

How could the quality of the work-based learning experience(s) be improved?

Please indicate if your work-based learning experience(s) is relevant to your goals in the following areas:

	No	**Somewhat**	**Yes**	**I don't know**
Educational goals	( )	( )	( )	( )
Career goals	( )	( )	( )	( )

How could the work-based learning experience be modified to make it more relevant to your educational and/or career goals?

To what extent are you more likely to pursue the following educational opportunities in the future as a result of participating in technical studies course(s) and/or work-based learning experience(s)?

	To no extent	**To little extent**	**To some extent**	**To much extent**	**To a great extent**	**I don't know**
Certificate	( )	( )	( )	( )	( )	( )
Career Studies Certificate	( )	( )	( )	( )	( )	( )
Associate degree	( )	( )	( )	( )	( )	( )
Bachelor's degree	( )	( )	( )	( )	( )	( )
Master's degree	( )	( )	( )	( )	( )	( )
Doctoral degree (e.g., Ph.D., M.D. or EdD)	( )	( )	( )	( )	( )	( )

*Using a 5-point scale, please rate your **confidence** in the following areas **before** and **after** participating in your technical studies classes or work-based learning experiences during the 2018–2019 academic year. The 5-point scale ranges from 1,* No confidence at all*, to 5,* Complete confidence. *(n = 8).*

1. Finding a job that interests you
2. Writing a good résumé
3. Having a successful job interview
4. Succeeding in your chosen career

*Using a 5-point scale, please rate your **knowledge** in the following areas **before** and **after** participating in your technical studies classes or work-based learning experiences during the 2018–2019 academic year. The 5-point scale ranges from 1,* No knowledge*, to 5,* Very knowledgeable. *(n = 8).*

Electricity Technical Knowledge
1. Using electrical equipment safely and appropriately
2. Applying National Electrical Code to industrial and residential wiring
3. Applying fundamental electrical theory to residential and industrial wiring practices
4. Reading and interpreting electrical diagrams
5. Reading and interpreting repair faults in electrical control systems

Industrial Technology Technical Knowledge

1. Identifying typical tools
2. Demonstrating proper use of a variety of devices including precision measurement
3. Reading and interpreting mechanical drawings
4. Performing data collection and evaluation of equipment used in the industrial environment

HVAC Technical Knowledge

1. Reading and interpreting electrical diagrams
2. Reading and interpreting repair faults in electrical control systems
3. Properly sizing and installing HVAC systems using current and appropriate codes and industry practices.
4. Diagnosing and repairing faults on HVAC systems.
5. Performing maintenance on HVAC systems.

Welding Technical Knowledge

1. Demonstrating proficiency in the use of welding tools
2. Safely performing welding techniques using fillers, wires, fluxes, and gases
3. Reading and interpreting blueprints in the welding industry

All program students

1. Demonstrating an understanding of quality control principles

*Using a 5-point scale, please rate your **knowledge** in the following areas **before** and **after** participating in your technical studies classes or work-based learning experiences during the 2018–2019 academic year. The 5-point scale ranges from 1,* No knowledge*, to 5,* Very knowledgeable. *(n = 8).*

Critical Thinking

1. Determining the credibility, accuracy, and reliability of conclusions drawn from the data.
2. Evaluating the strengths and relevance of arguments on a particular question or issue.
3. Determining whether certain conclusions or consequences are supported by the information provided.
4. Using problem solving skills.

Quantitative Reasoning

5. Using logical and mathematical reasoning.
6. Interpreting and using mathematical formulas.
7. Interpreting and using mathematical information numerically, symbolically, and visually (e.g., graphs, tables, and charts).

Scientific Reasoning

8. Generating a logical argument.
9. Distinguishing a scientific argument from a non-scientific argument.
10. Distinguishing between causal and correlational relationships.
11. Recognizing methods of inquiry (i.e., ways information is collected) that lead to scientific knowledge.