Evaluation of Richland College's Veterans-Focused Engineering Technology Project

Final Report

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September 2018

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INTRODUCTION

In October 2014, Dallas' Richland College undertook an ambitious new program of reforms to address the skills needs and the projected growth in its local manufacturing and electronics industries with the intent to produce job-ready certificate and degree-holding graduates who will succeed in a high-demand job market. Richland's Veterans-Focused Engineering Technology Project (VFETP) program was built on previous offerings in the college's Engineering Technology program (which is comprised of Advanced Manufacturing Technology and Electronics programs) with the goals of creating new labs with new equipment, reforming and expanding the program's curricula, offering extended student support and advising services, and working to engage local employers with the program and the school. The three-year project was funded through a Round 4 grant from the U.S. Department of Labor's Trade Adjustment Assistance Community College Career and Training (TAACCCT) grant program and ran through March 2018 after receiving a six-month no-cost extension. The grant was accompanied by a supplemental grant to further enhance training materials in advanced manufacturing. In the last year of the grant, its primary focus moved beyond program-building and student engagement to center on sustainability efforts to maintain the grant activities after the end of funding.

The Education and Employment Research Center (EERC) at Rutgers, The State University of New Jersey, worked with Richland College from the beginning to the end of the grant period to conduct a comprehensive evaluation of grant activities. The evaluation team examined the multiple strategies that Richland implemented to promote and develop career pathways in Engineering Technology and to build partnerships with key outside stakeholders. The evaluation utilized a mixed-methods approach to gather data from multiple perspectives about grant implementation and outcomes. Throughout the life of the VFETP project, the evaluation team examined the college's implementation activities, focusing on key issues related to the college's implementation of curriculum development and reform, program design and administration, student assessment, and partnership expansion. In addition, the evaluation studied the use of new equipment and laboratory space and examined its influence on instruction and learning; the strategies used for employer engagement, and how those strategies relate to labor market alignment; and the lessons to be learned from the project's approaches to creating stackable credentials and adopting industry-certification processes.

This report is the final of three evaluation reports, reflecting an evaluation process that evolved alongside the program. The first report discussed the early implementation of grant activities from the start of the grant in September 2014 to June 2016 and identified promising practices and areas for improvement in the initial planning and launch phases. The second report discussed ongoing implementation activities from July 2016 to June 2017 and incorporated expanded student and employer studies and preliminary student outcomes. In this final report, we focus our attention on project activities that occurred from July 2017 to March 2018 with an emphasis on sustainability, and we examine the overall student outcomes resulting from the grant activities.

Our evaluation of the VFETP program actually comprised two separate assessments. First, we conducted a *process evaluation* that examined the implementation activities and organizational structure that undergirded the TAACCCT program at Richland College. This included the assessment of the planned implementation activities and their prospects for sustainability. Second, we conducted an *outcomes analysis* that examined the quantifiable impact of the program on the students affected by the grant. The methods and results of each evaluation are presented separately in this report. The report concludes with reflections on lessons learned from the project across evaluations, with an overall assessment of the long-term goals and sustainability of grant efforts.

Local Context: Motivations for TAACCCT Participation

Richland College is located in the Lake Highlands area in the northeast city of Dallas, Texas. It is situated in Dallas County, between the cities of Richardson and Garland. The college serves the greater metropolitan area known as the Dallas-Fort Worth-Arlington, Texas Metropolitan Area (DFW). It is the largest college in the Dallas County Community College District (DCCCD), a network of seven independently-credentialed colleges sharing a central administration and governance. Together, the DCCCD colleges claim over 123,000 credit, workforce, and community students. Dallas is known as a booming metropolitan area with a high demand for labor. It is at #10 on *Forbes Magazine*'s list, the *Best Places for Business and Careers*[1] and #1 on its list of the *Best Cities for Jobs*[2]; Dallas also ranks #15 in job growth and #48 in education[3]. The area has been adding jobs for years and is currently in an expansion period[4]. (The region's unemployment rate is below 4%.[5]) Not all industries shared in this positive job growth, however; at the same time some industries faced labor shortages, offshoring and foreign trade had a negative impact on the manufacturing labor force being served by Richland. According to Richland's proposal to the Department of Labor, many manufacturing workers were laid off between 2007 and 2013. As one of the main industries negatively impacted during that period, manufacturing/mechatronics had many active petitions for Trade Adjustment Assistance (TAA) grants.

In 2017, the estimated population of Dallas Country was 2,618,148, with 1,341,075 living in Dallas City[6]; the county had a median age of 33.3 in 2015[7]. Table 1 shows estimates of demographic information for the population of the Dallas County as of July 1, 2017 from the US Census Bureau's "Quick Facts" page. The median household income in Dallas County in 2016 was $51,411 ($28,552 per capita), with 16.3 percent of residents living in poverty,[8] in the state of Texas the median household income in 2016 was $54,727 ($27,828 per capita) with 16 percent of residents living in poverty.[9] [10]

TABLE 1. DALLAS CITY DEMOGRAPHIC INFORMATION, 2015

Background Variables	%
Race	
Hispanic	40.2
White	66.9
Black	23.4
Other	9.7
Language Spoken	
English	57.9
Other	42.1

Source: U.S. Census Bureau QuickFacts

Richland College, a small-to-midsize college, primarily serves the DFW region, and all of its first-time degree seekers are Texas residents. According to Richland's enrollment data, the school had 18,106 students in Fall 2016. The college's student body demographics correspond with the racial, age, and gender diversity of the local area. Table 2 shows student characteristics for all Richland students.

TABLE 2. STUDENT CHARACTERISTICS-SPRING 2017 ENROLLMENT DATA

Background Variables	%
Student enrollment Status	
Full-Time	25
Part-Time	75
Gender	
Male	46
Female	54
Age*	
Under 24	65
25 and over	35
Race	
Hispanic	33
White	25
Black	19
Asian	15
Two or more races	2
Unknown	6
Total Number of Students	18,106

Source: National Center for Education Statistics

*Total percent may not add to 100 due to rounding

In the Fall 2016 semester, 66 percent of full-time students who enrolled in Fall 2015 returned to Richland, as well as 52 percent of part-time students. The National Center for Education Statistics (NCES) measures graduation rates by lengths of time spent on completing the degree, divided into three categories: "normal" (when a bachelor's degree takes four years and an associate's degree takes two years to finish), "150% of normal time" (such as taking three years to complete a two-year program), and "200% of normal time" (taking twice as long as "normal" to complete a program). Table 3 shows retention and graduation rates for Richland students, as of the Spring 2017 semester.

TABLE 3. RICHLAND COLLEGE RETENTION AND GRADUATION RATES AS OF FALL 2017

Variable	%
Return rate for Fall 2015-Fall 2016 by student enrollment status	
Full-Time	66
Part-Time	52
Completion rate of students who began in fall 2013*	
Graduated	16
Transfer out	25
Time to completion for students who began in Fall 2012*	
Normal Time	4
150% of Normal Time	9
Twice as long as Normal Time	18
Time to completion for those who began in Fall 2013*	
Normal Time	7
150% of Normal Time	16

Source: National Center for Education Statistics
**Note that not all students at the institution are tracked for these rates. Students who have already attended another postsecondary institution, or who began their studies on a part-time basis, are not tracked for this rate.

The advanced manufacturing industries, which mainly consist of workers trained in electronics technology and mechatronics, combine to form a key economic pillar and a major employer in the DFW area surrounding Richland. In Figure 1, a table from a labor market analysis shows a sample of the 1,645 manufacturing-related job postings in the Dallas area from May 1, 2013 to April 30, 2014, broken down by job title.

Figure 1. Table submitted with Clark State's DOL grant application. Numbers are based on Burning Glass data.

Table 2: Burning Glass Technologies Report – Labor Insight Jobs Postings, May 1, 2013 through April 30, 2014 – 1,645 Jobs Posted for Manufacturing (incl. Electronics) – Titles with 10+ Postings

Job Title	# Job Posting	Job Title	# of Job Postings
Machinist	273	CNC Lathe Machinist	20
CNC Machinist	252	CNC Operator	19
Manufacturing Engineer	86	Manufacturing Manager	18
CNC Programmer	62	Welder	17
Machine Operator	37	CNC Machine Operator	13
Manual Machinist	32	Tool and Die Maker	12
Maintenance Mechanic	30	Manufacturing Supervisor	11
Maintenance Technician	27	Mechanical Designer	10
CNC Mill Machinist	27	Mechanic	10
Mechanical Engineer	24	General Labor	10

IMPLEMENTATION PROCESS EVALUATION

Evaluation Methods

EERC's early implementation analysis of the VFETP program focused on the resources invested in the program and the college's implementation of key grant activities, executed in accordance with a program *logic model* developed collaboratively by the Richland and EERC teams in July and August of 2015. Logic modeling is a process used by evaluation researchers and implementation teams to ensure that everyone involved in the project understands how the program will produce its intended results: It is a shared roadmap for achieving a program's goals.[11] The program is illustrated by the resources, or *inputs*, applied to the project and by the *activities* that will be undertaken throughout the life of the grant. The intended results are broken down into three levels:

- *outputs*: the direct results of program activities,
- *outcomes*: the changes in the participants, which are typically observed within one to three years (longer-term outcomes may take four to six years), and
- *impacts*: the fundamental changes to the surrounding community or the organization, which are expected to emerge in seven to ten years (often after the conclusion of the project).

Through its focus on broader impacts and longer-term outcomes, the program logic model encourages us to think beyond the boundaries of program grants and to recognize the broader change that programs are working toward achieving.

The logic model developed by the Richland and EERC teams framed our analysis throughout the evaluation. It was revisited yearly with the project manager and adjusted, when necessary, to accurately reflect the project activities. In this report, we examine the grant's overall progress with regard to the activities and outcomes included in the logic model as well as discuss program outcomes and potential future impacts. All the data included in this report cover the time period between July 2017 and June 2018 and were collected using the following methodologies:

Site visit to the college. The EERC conducted a formal site visit to Richland College in February 2018. During the site visit, our evaluators collected information from multiple stakeholders involved in the project, conducting 12 semi-structured interviews with program staff and faculty involved in the grant as well as conducting two student focus groups, which involved students from the Manufacturing and Electronics certificate programs.

Telephone meetings and interviews with project leads. To understand ongoing program implementation efforts, members of the EERC team called the VFETP project leads monthly to conduct informal check-in meetings. Additional calls were made to the project manager in December 2017 and June 2018 to conduct formal semi-structured interviews to assess implementation progress and to conduct an ongoing review of the logic model.

Document review. We continued to collect relevant documents throughout the data collection process, whenever such documents became available. This additional information included meeting minutes, agendas, and other informative documents about employers, job expos, and the Dallas County Community College District planning.

Expanded Employer Study. This year, the team examined two sources of data to create micro case studies about the relationships between Richland and local industry and about specific employers and their relationships with the college. To do this, we used the following two sources of data:

> *Employer Interviews.* In September and October of 2016, we conducted telephone interviews with five employers identified as program partners by the Richland team. Two additional employers participated in in-person interviews during our February 2017 site visit. Those interviews covered topics such as their perceptions of the state of the industry and the state of the workforce; their workforce needs and human resource practices; and their working relationship with Richland and other community college programs.
>
> *Employer contacts survey.* Prior to our previous site visit in February 2017, we asked the Richland College staff who were involved in employer engagement efforts to complete a short survey. The survey included questions about the kinds of contact made, the methods of communication used, and the nature of their relationships with employers. Respondents included instructors, career navigators, and project and college leadership. In June 2018, we conducted additional follow up with college staff concerning their contact with specific employers who were included in the interviews. We analyzed all collected data using established analysis techniques. Qualitative data were managed, coded, and analyzed using qualitative analysis software NVivo 10. Student outcomes data were managed, cleaned, and analyzed using quantitative analysis software SAS and Stata.

Key Implementation Activities

In the sections that follow, we present updated findings related to progress on implementation activities:

- organization and staffing,
- management of space and equipment,
- design of curriculum,
- implementation of the career navigator model,

- Recruitment of program participants, and
- engagement with employers and the workforce system.

As in previous reports, we frame our discussion around the program logic model. Prior interim evaluation reports explored how expected program inputs (i.e. resources) were made available to the project and leveraged, how implementation activities were conducted, and early signs of whether or not the program was meeting its expected outputs and outcomes. Now that the program has operated for a full two years with the majority of its equipment and curriculum reforms in place, we are able to further explore the outputs, outcomes, and early evidence of impacts. In this report, we also revisit the employer study via the aforementioned case studies of the college–employer relationship. We explore strategies that were the most effective in engaging employers, along with how employers responded to those efforts, and we discuss implications for Richland College as it moves forward with maintaining and expanding these relationships.

Project Organization and Staffing

At the conclusion of the TAACCCT grant, the VFETP team was largely similar to its original design, with a few adjustments. The grant period began with the following staff to implement VFETP:

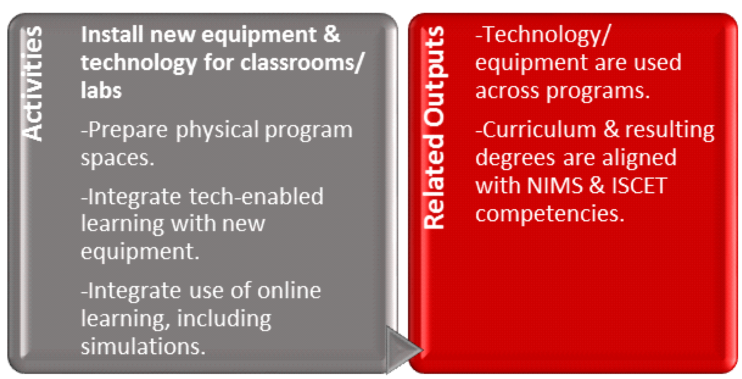
- Project Director (existing Executive Dean of the School of Engineering, Business, and Technology)
- Project Manager (new hire)
- Career Navigator (new hire)
- Lead Faculty, Electronics Technology (existing faculty)
- Lead Faculty, Advanced Manufacturing (existing faculty)
- Faculty, Electronics Technology (new hire)
- Faculty, Advanced Manufacturing (new hire)
- Executive Dean and Dean of Resource Development, Office of Planning, Research, Effectiveness, and Development (existing staff)

As the grant progressed, the school added an additional Manufacturing faculty hire, and with its expansion into Computer Information Technology (CIT), it added an additional CIT faculty hire and an additional career navigator. These hires were made with Richland funds. At TAACCCT's conclusion, all new hires will remain, with the exception of the project manager. The VFETP project also funded students to work part time as tutors in the Peer-Led Team Learning (PLTL) program, but the that program was folded upon completion of the grant (as will be discussed in the "Curriculum" section).

Although the project has continued with a similar structure to the one documented in the last interim report, some significant staff changes have been made as the TAACCCT funding winds down and the college moves toward a more permanent, college-funded staffing model. The college has assumed the cost of maintaining the career navigators and the additional faculty added for the grant. There were two major personnel changes in the VFETP team during the grant period: The second career navigator was replaced in Fall 2017 with a new staff member, and the Electronics faculty lead changed during the final year, with the original lead taking over the role of lead faculty for Transfer Engineering and the new Electronics faculty hire from the beginning of the TAACCCT grant assuming the role of lead faculty in Electronics. The prior lead remained available for guidance on the project as needed and was teaching several courses in the curriculum in the Spring 2018 semester; however, this lead's responsibilities will increasingly transition toward Transfer Engineering until they are concentrated there in the Fall 2018 term.

The VFETP project team existed in two silos: the team at the School of Engineering, Business, and Technology (EB&T) in Wichita Hall, which implemented the project activities, and the team at the Office of Planning, Research, Effectiveness, and Development (OPRED) in Neches Hall, which managed the administrative side of the TAACCCT grant. These two groups sit in physically different spaces on the campus and are intentionally distinct from one another to facilitate internal oversight of the grant progress by OPRED. The VFETP project director position was situated in the EB&T, and the project manager position was situated in OPRED; Richland maintained a rigid separation between the two teams, with the project manager ensuring communication between the two sides of the project. The project director carried out the key activities of the grant with the rest of the EB&T team. The project manager position was designed to work outside of the implementation process, serving as the liaison to OPRED: She monitored progress, managed reporting, and had regular meetings with the project director and key personnel, but she did not participate in the direct implementation of key grant activities. This arrangement ensured that compliance was prioritized and gaps in progress were identified, but it also limited the project manager's ability to contribute to fixing issues as they arose.

Space and Equipment



The labs remain a centerpiece of the program. The labs continue to be premier spaces that faculty and advising staff cite as beneficial for both recruitment and for giving students the hands-on experience that employers want to see in job candidates. When speaking about the equipment available to students at Richland, one college administrator stated: "Our equipment is unmatched." The Manufacturing students appear to be most positively affected by the quality of the lab space. In previous years, the only criticism of the labs that students raised in our focus group was that they wanted more time during class to spend in the labs. This year, however, our focus group cited the labs and the lab availability as one of their favorite elements of the program.

The college made several additions to their Manufacturing labs in the past year. In the past year, Richland purchased almost $500,000 worth of new equipment; these purchases were funded by the chancellor and were completed over the winter break of the 2017–2018 school year. One faculty member described the purchases and their benefit:

> We completed the entire FAS [Flexible Assembly System] assembly line, so now we have the entire system. It's really, I think, the one [that] has generated so much interest because it's so visual and so contemporary. And we also purchased new equipment for PLCs [Programmable Logic Controllers], where we can now teach that as a standalone class. We've also got another system with a FANUC [Fuji Automatic Numerical Control] robot, and those are two classes that I hope I will develop . . . over the summer to add to it. So, I think that entire lab has automation robotics. All that setup is, right now, [in] very high demand.

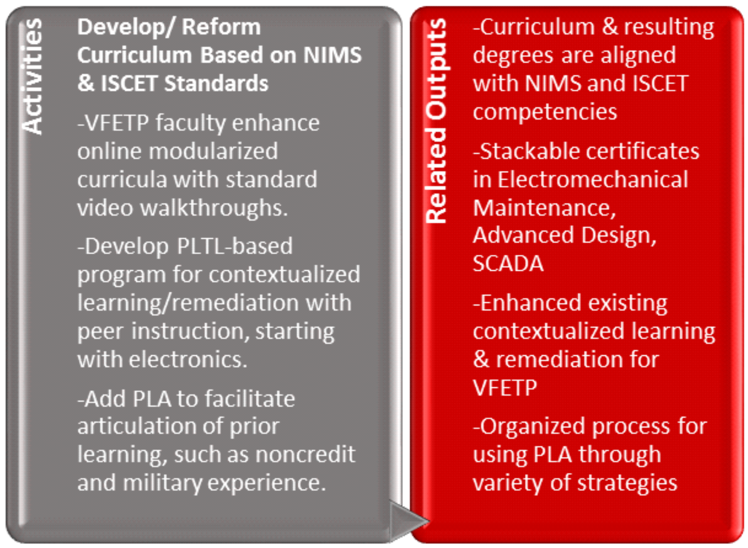
These additions to the lab continue to make Richland appealing to both students and employers. In addition to new lab equipment, Richland was able to use TAACCCT funds to update several existing computers and printers. According to one faculty member, this was needed and makes teaching their classes easier. Richland had also had intentions of setting up an industrial control system but, due to the time and effort that went into the Manufacturing program, the system was never developed. The spaces from the TAACCCT programs were described favorably by one of the consultants, who noted:

> At the end of the day, all of the faculty in that department share [space and resources]: Their offices are all in the same hallway, and, so, you're going to see that that helps the communication. There's no hierarchy. Unfortunately, because Manufacturing is with trades [in other community colleges], it may be the back part of the campus, or the other STEM instructors won't really value the professors. But I think that there's a good level of mutual respect and understanding [at Richland] that, when it comes to Manufacturing, the Machining students are just as important as the Engineering students.

The college is actively planning for ongoing maintenance of the equipment. In order to keep the equipment in the labs operational, Richland has established maintenance contracts and has written maintenance funds into their budget. The school is also splitting Advanced Manufacturing and Electronics: For the next budget year, the two will be separated into independent general ledger accounts in order to gain a better understanding of the costs of the Advanced Manufacturing program.

The college is currently dealing with repair issues in the lab. The flooring in the manufacturing lab still maintains extensive cracking that has now spread to the electronics lab due to improper materials having been applied when the labs were originally built (light concrete was used without expansion joints). The architect and Richland's facilities director examined the cracks and determined that they are more likely to be a cosmetic issue than a structural issue that will threaten the stability or the safety of the machines. The college considered putting flooring in the lab, but because of the machines in the lab, this was not practical. The major cracks in the floors have been repaired with an epoxy filler, and the school has decided to continue to repair the floors on an as-needed basis. The lab has also been gathering a lot of moisture, which can potentially cause rust. The school will be installing dehumidifiers or an extra air conditioning unit in the lab to keep the moisture out of the air.

Curriculum



The TAACCCT program at Richland College is best understood in two parts: the programs that were targeted for a broad, three-year intervention (Engineering Technology) and those receiving a limited, one-year intervention (Computer Information Technology, or CIT). For a complete overview of the pathways and associated coursework see Appendix 2. The Engineering Technology programs were part of the original grant design and received a broad array of services throughout the life of the grant. These included curriculum design or redesign, the addition of nationally recognized credentials, the addition of career navigator services, expanded employer outreach, and a variety of other reforms. Within Engineering Technology, there are two sets of pathways: one in Advanced Manufacturing and one in Electronics.

As noted in our interim report, the CIT programs were added as part of a grant expansion that was approved in January 2017. Those programs had a much shorter time frame for grant-related reform. The CIT programs completed their first full year of TAACCCT involvement in the final year of the grant. There was no curriculum overhaul, but at the time of our last contact, they were adding career navigator services and expanding course offerings in cloud computing (used for Amazon web services). The school also added one CIT faculty hire. Though CIT classes are in demand, CIT program growth is limited due to space considerations; there is no extra room for more labs. However, in its current state, it is still a larger program than the Engineering Technology program. (For further overview of the program sizes and compositions, see the "Student Outcomes" section.)

TABLE 4. PROGRAMS AFFECTED BY THE RICHLAND TAACCCT GRANT

Programs targeted for broad intervention[1] (Engineering Technology)	Programs targeted for limited intervention[2] (Computer Information Technology)
Certificate Programs: • Advanced Design • Advanced Manufacturing or CNC/CAD/CAM Certificate • Electromechanical Maintenance • Electronics Technology Certificate • Supervisory Control of Data Acquisition (SCADA) system[3] *AAS degrees*: • Electronics Technology • Manufacturing	*Certificate Programs*: • CISCO Certified Network Associate (CCNA) • Cisco Certified Network Professional (CCNP) • Help Desk/User Support Technician • Personal Computer Specialist • Personal Computer User • Programmer Level I • Technology Support • UNIX Operating System. *AAS degrees*: • Network Administration & Support • Personal Computer Support • Software Programmer/Developer
[1]At the program level, full intervention includes curriculum reform, new equipment and laboratories, additional faculty, and extended student supports (the addition of career navigator services) from Fall 2015 through Spring 2018. Additionally, Electronics courses implemented a Peer-Led Team Learning component. [2]At the program level, limited intervention includes the addition of career navigator services and additional faculty only from Spring 2017 through Spring 2018. [3]Though SCADA was part of the original list of Electronics and Manufacturing programs and was designed to receive the full intervention, it was never offered as a class at Richland.	

At the conclusion of the grant, all of the originally planned programs have been created or reformed. This includes certificates in Advanced Design, Advanced Manufacturing (or CNC/CAD/CAM), Electromechanical Maintenance, Electronics Technology, and Supervisory Control of Data Acquisition (SCADA), as well as associate degrees in Electronics Technology and Manufacturing. However, one program has not yet been implemented. SCADA was designed by a consultant and given to the Continuing Education department, as it would have been a lengthy process to get it through the District as a credit-bearing program. However, there had been turnover in the position of the Dean of Continuing Education, and the school was in a transition phase. No SCADA instructor was hired, and the course has not been taught yet. It is unclear whether this will change in the near future. It does not appear to be a certificate in high demand by local employers at this time, though it may be a useful add-on to other certificates in the program.

The original programs are designed to be stackable. As demonstrated in Table 5, the four Advanced Manufacturing and Electronics Technology certificate programs in operation are embedded in corresponding Associate of Applied Sciences (AAS) degrees. These certificates are credit-bearing, and the majority of credits from each certificate can be directly applied toward an AAS degree.

TABLE 5. CERTIFICATES EMBEDDED IN ENGINEERING TECHNOLOGY (MANUFACTURING & ELECTRONICS TECHNOLOGY) AAS DEGREES AT RICHLAND COMMUNITY COLLEGE

Advanced Manufacturing AAS (60 credits)	Electronics Technology AAS (60 credits)
CNC/CAD/CAM Certificate (43 Credits)[1]	Electronics Technology Certificate (42 Credits)[3]
Advanced Manufacturing and Design Certificate (16 credits)[2]	Mechanical and Electrical Maintenance Certificate (32 Credits)[4]

[1]Certificate requires three courses – ENTC 1391 Special topics in Engineering Technology General or HYDR 1345 Hydraulics and Pneumatics, MCHN 2335 Advanced CNC Machining, and MCHN 2338 Advanced Computer-Aided Manufacturing (CAM) – that are not part of the AAS.
[2]Certificate requires two courses – DFTG 2335 Advanced Technologies in Mechanical Design and Drafting and DFTG 2440 Solid Modeling/Design – that are not part of the AAS.
[3]Certificate fully embeds in the AAS.
[4]Certificate requires five courses – DFTG 2335 Advanced Technologies in Mechanical Design and Drafting, INMT 2345 Industrial Troubleshooting, INTC 1343 Application of Industrial Automatic Controls, INTC 1457 AC/DC Motor Control, and MFGT 2459 Industrial Troubleshooting – that are not part of the AAS.

Online curricula are now in place via Immerse2Learn. Richland had a supplemental grant to create specialized online curricula for manufacturing processes. This resulted in a lengthy process that involved two separate consulting groups: the National Institute of Metalworking Skills (NIMS), who conducted the cognitive task analysis (discussed in detail in the second interim evaluation report), and Immerse2Learn, who handled the design of online materials related to the project. Both groups worked in tandem with the school's faculty and staff, and as is often the case when coordinating multiple organizations and contracts, there were bureaucratic and communication issues along the way.

There were some challenges with the process of setting up the cognitive task analysis (CTA,) which we described in detail in our most recent interim report). Coordinating with employers was one source of delay; relying on a faculty member with a large teaching load for communicating with consultants and employers was another. It ended up being a larger job than the school had anticipated, and it may have gone better with an administrative assistant or other dedicated liaison working part-time to assist in the implementation of the program and to ensure continuous communication between all of the parties. Once the program added a second faculty member, the workload improved, and progress began to happen more quickly. The results of the CTA were forwarded to the Immerse2Learn consultants for the development of teaching materials.

In December 2017, the school received the final products from their Immerse2Learn consultants, an online curriculum drawing based on the CTA, which was intended to prepare students for the NIMS Level II certification in Electronic Discharge Machining (EDM). Upon receipt from the consultant, the Manufacturing faculty lead reviewed and adjusted the materials as needed. There followed lingering bureaucratic holdups, which delayed the launch of the product until late Spring 2018, when it was presented to the Richland community at the final employer advisory committee meeting. It includes online video modules that demonstrate detailed manufacturing processes and is now used in Richland's Manufacturing courses.

National credentials have been added to the programs, but the demand for them is mixed. The school implemented two major national certifications as part of the grant, becoming a certified testing center for both.

First, the International Society of Certified Electronics Technicians (ISCET) offers a certification that serves students in the Electronics Technology program. The school will continue to maintain its relationship with ISCET and to serve as a testing center for the organization as long as that arrangement is mutually agreeable; however, Richland has not had any requests for the ISCET test, even though the offered to cover the costs for interested students. Several of our interview respondents attributed this trend to a lack of interest in the credential among local employers, and one respondent was frustrated that the ISCET itself was not doing more work to promote its credential in the area. Interview respondents also noted that the structure of the ISCET certification requirements are such that students must take it all at once, and only after completing their Richland coursework – right when many students were starting jobs and did not have a lot of extra time for retrospective review and test prep. The respondents felt that, in the end, the ISCET certification became too much extra work at a time when students, being already employed, could no longer see its value.

In contrast, NIMS worked to promote its credential in the area, building on its reputation in other regions. As one Richland administrator noted, "Employers are becoming more familiar with NIMS. NIMS was pretty much an East Coast and West Coast thing. So we're filling in that gap. But I think we're successfully filling in that gap." The sentiment that Richland was an opportunity for NIMS to break into the region was also shared by NIMS representatives. NIMS was highly involved with Richland through its consulting agreement and gave the school a beta interactive résumé test that helped students articulate what skills they had and how they fit with the industry. The tool allowed students to enter their credentials, then used that information to generate three or four bullet points about what they were proficient in. The value of this exercise extended beyond educating the employers, as a NIMS consultant described:

> Of course, we were expecting it to be valuable to employees, which it was, but I think it was valuable more to the students because they were able to read it. And it was like, "oh, *this* is how you talk . . . to an employer about what it means to be getting a manufacturing certification, or what it means to be a sophomore at Richland," and you now realize that these are the skills you have actually relearned through your time.

NIMS offers a variety of subjects and levels of certification, which makes it easier for students to take certification tests as they progress through their program rather than waiting until they fully complete it. This means that the courses themselves serve as preparation, and that no major content review is needed prior to taking the test. The tests were very popular. Between August 2015 and February 2018, 277 NIMS tests were administered at Richland. This included 78 tests for dual-enrollment students who are not part of the TAACCCT grant and 21 for faculty. The remaining 178 tests were for TAACCCT students, who passed 139 of them. The two tests that challenged students the most were Job Planning, Benchwork, & Layout (71% pass rate) and Measurement, Materials, & Safety (75% pass rate). Table 6 shows the number of students who passed and who failed each of the NIMS tests.

TABLE 6. NIMS TESTING FOR VFETP STUDENTS

Credential	Pass	Fail
CNC Lathe Operator	3	0
CNC Milling Operator	3	0
CNC Milling: Programming Setup & Operations	3	0
CNC Turning: Programming Setup & Operations	3	0
Drill Press Skills	5	0
Job Planning, Benchwork, & Layout	30	12
Measurement, Materials, & Safety	82	27
Milling I	5	0
Turning Operations: Turning Between Centers	1	0
Turning Operations: Turning Chucking Skills	4	0
Total	139	39

Source: Program administrative data

Certificates are seen as helpful tools for getting discouraged students onto pathways toward degrees and upward mobility. Certificates were described by many as valuable tools to get students into college-level courses. One advisor described them as “a really good way to capture students that are in despair.” This despair was typically born out of students’ challenges with money, time, and overall college preparedness. In contrast, certificate programs were shorter and more affordable, and the subjects were all designed to be applicable to employment and, therefore, were less intimidating to students than core college courses can be. The advisor further elaborated on how certificates help her to guide discouraged students toward career pathways:

> A lot of our students don’t know this; some of them don’t even know what a certificate is. So, it takes time to explain. And I think once you explain it to the students, they see that – they can see the light at the end of the tunnel a lot quicker. And we have – I mean, we tell the students, a lot of them that come in, especially with money issues: “I don’t have the money to pay for 60 hours.” “I don’t have the money.” ”I don’t the time because I’m working.” . . . And I go, “Well, try the certificate. . . . You can get that and get your foot in the door, and then you can come back and take maybe some more classes to get you more prepared for what you’re doing. Or your boss might say: 'Hey, you’re a really good worker. Let me pay for your extra classes.'" So you’re giving them the incentive to also be ready to go to work and be good employees.

She also noted that students who left to work could come back more easily because the credits associated with the certificates put them well on the way toward the degree. However, motivation for students to continue along the pathways after entering employment is highly dependent on their employer and whether the employer supports and incentivizes further education: If the students liked their jobs and would not see a wage increase or other benefit for adding a degree, they would not necessarily be motivated to come back and complete the AAS. Employer support for continuing education can make or break students' aspirations, and certificate programs are a good way to place students with companies and initiate that relationship. One striking example offered by the advisor was the case of Aaron, who went from being a skeptic exploring the programs to a striving degree-holder:

> [Aaron] was like, "Oh, I'm never going to get hired by anybody. Nobody wants to hire me." I said, "Aaron, let's just do a certificate." And he started out with a certificate in Engineering Technology. And he said, "Well . . . I have a [criminal] record . . ." And I said, "Aaron, companies sometimes will take chances on us. So don't worry about the past. Look at what we're doing. Focus on this, and then we'll go, and we'll start talking to [a major company in the area]." [The company] took a chance on him. They hired him. He went in as a technician. He continued doing his degree here. And he was the happiest person. Because he came in after they hired him. He said, "I never thought I was going to find a job because of the fact that I have a record." And I said, "Well, a lot of times, it also depends on the type of record you have. I mean, you didn't hurt somebody. You just made a mistake. And they were able to oversee that because your grades were good. You're a good person. Your letters of recommendation from us helped as well." So, I said, "Aaron, you never want to quit. You always want to keep pushing." And so, he's been at [the company] now for, like, I want to say, three years. He got hired on, and he was just kind of part time; then, they made him full time. Then, they told him: "Go back and get your applied science degree in the engineering technology." And he did that. And there he is now. So, now, he comes by once a month and says, "Hey, I think I'm going to take maybe an engineering class, in case I decide to go to UTD down the road." And [his employer] will pay for it. Why not? Why not take advantage of that?

Pathways into four-year colleges still need further smoothing. There exist no direct articulation agreements that TAACCCT students can use to fully transfer credits into four-year schools. Texas schools follow two course guides: the *Academic Course Guide Manual* and the *Workforce Education Course Guide Manual*. Many schools accept courses from the former, but few accept credit transfers from the latter, which is what the TAACCCT programs follow. Four-year schools are beginning to take more workforce programs, but the current opportunities are better for IT students rather than for those in Electronics or Manufacturing.

However, Richland has secured four articulation agreements that overlap with some of the TAACCCT courses, as outlined on their program site[12]:

- Associate Degree with an Emphasis in Computer/Electrical Engineering, in conjunction with the University of North Texas, toward completing a Bachelor of Science degree in computer or electrical engineering.
- Associate Degree with an Emphasis in Electrical Engineering, in conjunction with the University of Texas at Arlington, toward completing a Bachelor's degree.

- Associate Degree with an Emphasis in Electronics Engineering, in conjunction with Texas A&M University-College Station, toward completing a Bachelor's degree in Electronics Engineering Technology.
- Associate Degree with an Emphasis in Industrial Engineering, in conjunction with Texas A&M University-Commerce, toward completing a Bachelor of Science degree in Industrial Engineering

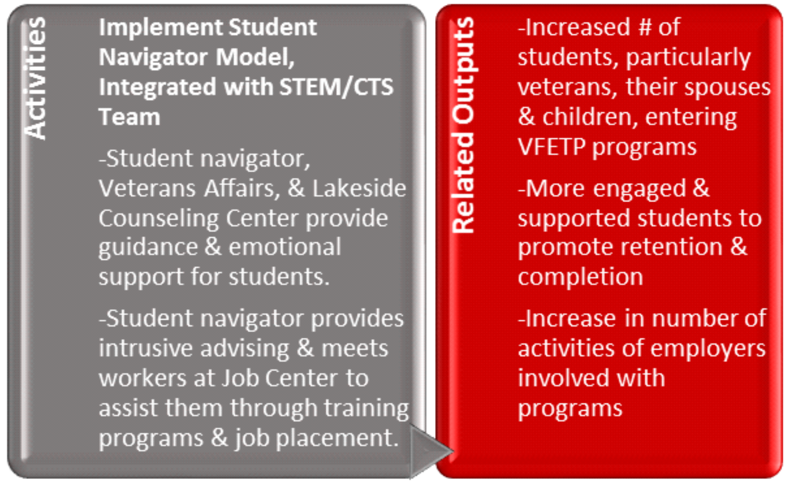
While the TAACCCT certificates are not neatly embedded into these programs, a student who had completed a TAACCCT certificate would not necessarily be starting from scratch should they decide to pursue these paths into four-year colleges.

Prior Learning Assessment (PLA) reforms continue at the District level, so the project director implemented a stop-gap solution for TAACCCT programs. Richland had sought to include reforms to PLAs in the grant program, but these reforms were bogged down in the broader District as it worked to design a more uniform District-wide policy. In the meantime, the project director adopted a model to assess credit for prior learning that was put forth by a Missouri TAACCCT recipient, the MoManufacturingWINs Consortium. As the District had been operating on an ad hoc basis prior to the intended reforms, the project director had the authority to do this thanks to her position as the executive dean of the School of Engineering, Business, and Technology at Richland. However, until there is District-wide PLA reform, there will be no online advertising of the Engineering Technology PLA process. Faculty are aware of the process and can refer interested students, but it does not come up very often.

One interesting area where PLA does come up is in employer relations at Richland. The school was working with a major local company to train its incumbent workers, so the two parties were in discussions about credit for prior learning. These talks may establish a model for PLA that can be replicated in the future.

The Peer-Led Team Learning (PLTL) element of the program will not be sustained. As was discussed in our interim report, PLTL had only been put in place for Electronics students, and there were difficulties finding qualified students to serve as peer leaders. This was largely due to the short nature of the program: By the time students were identified, they were often close to graduating. The reform was seen as redundant vis-à-vis the already existing tutors in Richland's CTE/STEM Advising Center, so when the extra funding provided by the grant was gone, the program went back to relying on CTE/STEM tutors.

Student Navigators



Richland has doubled down on the career navigator model. As noted in the "Project Organization and Staffing" section of this report, upon expansion of the grant into CIT programs, Richland hired a second navigator. Both positions have been shifted to the school budget and will be sustained beyond the conclusion of the grant. Initially, the plan had been to have the second navigator handle CIT, while the original navigator continued overseeing Advanced Manufacturing and Electronics; however, now, the two navigators work collaboratively across the programs. The original navigator is the lead, with the most developed portfolio of students, and has worked to train the new navigator in this role. As the second navigator had only been in the job for four months at our final site visit, the majority of our discussion focuses on the original navigator.

The career navigators have a multifaceted role. They are responsible for assisting the Richland CTE/STEM Advising Center during peak registration periods, recruiting students into the VFETP program, offering intrusive advising and wraparound services to students in the program, and engaging with employers to find opportunities for student internships and employment.

Communication improved greatly over the course of the grant. In our interim reports, we noted a lack of clarity among grant faculty and staff about the role of the career navigators. The position evolved over the course of the grant as its jurisdiction was negotiated and clarified. During our last site visit, it was evident that this was much improved, and that the navigators had become an integral part of the Engineering Technology team, with a role that was more clearly understood throughout the school. As the lead navigator noted, “I think things have gotten a whole lot better. I think we’ve actually kind of turned a tide, and things are actually starting to kind of grow in the way that they’ve been in our minds for a while.” Two key efforts appeared to contribute to the improvements: a concentrated effort among staff at the CTE/STEM Advising Center and the navigators to improve communication and a concentrated effort on the part of the Manufacturing faculty and navigators to make sure that the navigators receive training in some key skills in Manufacturing. We will discuss each in turn.

The navigators became more integrated with the CTE/STEM advising team. The navigators are formally staff members of the CTE/STEM Advising Center in the School of Engineering, Business, and Technology, and their offices are physically located within the

Advising Center. Initially, as noted in our interim reports, neither the navigators nor the CTE/STEM advisors were clear on the two navigators' roles or how they worked together. However, at the last site visit, it appeared that many of these issues had been fixed. As described by the director of CTE/STEM advising: "they've really become a part of our team." This was largely due to concerted efforts on the part of the CTE/STEM advising director and both navigators to communicate more effectively with one another. One particularly effective component of that effort was a meeting where a career navigator was invited to present on her role to the larger group of CTE/STEM advisors. Her presentation included details about the Engineering Technology programs to help the advisors become better able to direct potential students to the programs. Finally, the navigators also made their calendars more transparent and accessible, so that when they were not in the office the other advisors could understand where they were and what they were doing.

During peak registration periods, the navigators were expected to assist the CTE/STEM Advising team with student registrations. In these weeks, both teams of advisors would identify and flag students who were interested in TAACCCT-related programs; the names and contact information connected with those students were then entered into the navigators' database. The navigators then followed up with those students throughout the semester.

The faculty trained the navigators to make them more familiar with the program's technical components and the skills they impart. In earlier reports, faculty were not always clear on the role of the navigator or how it differed from the CTE/STEM advising roles. However, concentrated efforts at relationship building throughout the grant improved collaboration between the faculty and the navigators. One particularly successful effort was the training of the navigators in key skills and program components in Manufacturing. This training was useful for recruiting, and it gave the navigators increased credibility when making pitches to employers. Faculty reported that after the training, the original navigator had become very helpful with employer outreach, as described by one respondent:

> Respondent: All e-mails I get from industry -- new industry partners wanting to hire -- I send them to her. I can't keep up with them. Or it's the night when I answer the e-mails, a week later. There's voicemails now, like 10 or 15... so she helps me. But she hasn't been at that point that she could help me until now.
>
> Interviewer: Why not?
>
> Respondent: Well, she had to learn the program. When did we hire her? What, – a year or so back? I don't remember. So she came in the new – "What's this? What is it? What do you do?" And she still doesn't know it, but she's learning, and she's gone out with us, and she knows more than she did. And she and I work very well together, and she has the same vision for the program. . . . She's working on a brochure, too, as well. So we don't market. But she does go out marketing now.

Faculty also reported accompanying the navigators in their first interactions with employers, to make introductions and to signal to their employer contacts that the navigators were knowledgeable in the field. This increased contact between the navigators and faculty and demonstrated a united front to employers.

The navigators brought internship and job opportunities to Richland faculty, looking for students who may be a strong fit. In this sense, they served as labor market intermediaries, connecting employers and students. Faculty members said that they would typically respond to these opportunities in one of two ways: They would announce the opportunity in classes, or they would approach individual students directly if they knew one or more who would be a particularly strong fit. Having navigators who could find these opportunities and pass them along to faculty for distribution facilitated this process. Additionally, with greater familiarity, there was greater collaboration on student issues. For example, faculty started sending to the navigators the names of students who were experiencing challenges or disappeared from class. The navigators were then able to reach out by phone or email to check in and see what they could do to help those students return to class and complete their program.

Students were familiar with the navigators and felt that they were helpful. The career navigators visited most classes at least once per semester. In the student focus groups we conducted, nearly all students reported meeting a career navigator at some point and recalled that the encounter had been helpful. Navigators helped students understand what their program was about, what the requirements were, and where they stood in terms of what courses they would have to take to complete the program. The navigators also helped students work on their résumés and gave them advice for seeking employment, even if they were only looking for interim work to help them complete their program. The students saw the navigators in their classes, often encountering them multiple times in a month. One student reported that a navigator had been helpful with sorting out his veteran’s benefits:

> She does everything as far as our work with our schedules [is concerned]. Like, I had problems with my VA stuff, because the program – I guess they changed it over the summer. And so, [the paperwork] wasn’t certified. So, she helped me with that, and she helps with the career stuff.

The navigators had several resources on Richland’s campus to draw upon on for student support. In addition to the CTE/STEM Advising Center (which also offered tutoring services), there were programs offering wraparound student supports. The school made an effort to address student poverty, which is an issue of growing concern nationally. Navigators often referred students who were single parents, displaced workers, economically disadvantaged, formerly in foster care, or disabled to a program on campus called Working Wonders. The Working Wonders program offered a variety of assistance programs to help students with enrollment and registration, advising, crisis intervention and counseling, textbook loans, childcare subsidies, transportation assistance, and more. The program also brought a Texas food bank truck to the Richland campus regularly. The navigators were familiar with these resources and referred students when appropriate.

The navigators worked to remain approachable to students. This was likely a key factor in getting students who needed help to reach out in the first place. One navigator described the efforts to offer this support:

> I think just the resources that are made available to them such as tutoring, things like that [help students succeed]. Also, just being able to reach out to them, and being able to identify a student that's in the program and see them in the hall: "Hey, how are you doing? How's your classes?" And it's not like they're another number. Then they feel like: "Okay, you actually care, and I feel like I can come to you if I need to."

The other navigator described the process of pursuing a student who was at risk of falling through the cracks, which demonstrated this high-touch approach:

> I have one right now that's kinda put a pause on [the program] because he got a job to actually go out and work with Hurricane Harvey victims. And so, he's like: "I'm going to go, and then I'll be back. I promise you, I'll be back." And I'm like: "Okay. Great." So, I kind of just check in on him every now and again to say: "Hey, I just want to check in. How are you doing? How are things going with you? Are you looking at coming back this semester? Looking at Fall?" And so, yeah, [the students have] done really well. It's just been a matter of us making sure that we're verifying all of their information, filling out the forms, and making sure the bills are in for them.

While these intrusive advising tactics were an important part of the navigators' tool belts, they also worked to ensure that students were developing the skills needed to navigate the system on their own:

> I think, about year two, I swapped from being "mom" and "I'm going to take care of it all for you," to: "Okay, this is what I want you to be able to do. I want you to be able to understand what it is that you're doing, so if something happens and I'm not here, or I'm ill, you can still be able to function and process through it all."

The navigators also provided some job market advising for students who were near program completion, such as by helping students create a résumé or conducting mock job interviews.

Navigators were involved with student internships. Working with the associate vice president of workforce and continuing education, the navigators visited potential internship sites to determine that they were safe and could meet the requirements for hosting an academic internship. Richland does not require internships to pay students, though one navigator reported that most actually did pay, typically in the range of $11 to $15 per hour. One navigator described meeting with a few students who had been placed in internships but were not impressing employers with their performance. She noted that the meeting entailed talking to students about what they could expect as interns and how to behave in a more professional manner on the job:

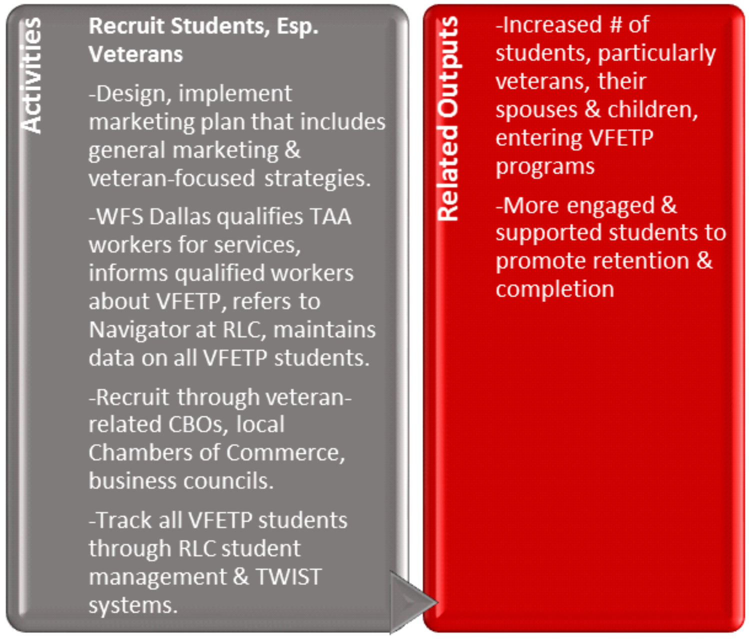
> I've only had a couple [students struggling at their internships], and I think it was more personality clashes with the student themselves, and kind of what their expectation was when they went in. And so, we had to sit down and have a heart-to-heart of: "How are you approaching this job?" Because we can't go in making demands, and "I'm not going to do [it]." That's not how we're gonna be able to kinda build with an employer. And so, yeah . . . I can only think of a couple that we've had that instance in. Typically, they go in. They do very well.

In the future, the navigators may have increased advising responsibilities. When the program was originally designed, the intent was to have one navigator working with students in the original Engineering Technology classes. As of our last site visit, there was little familiarity with the navigator role in the CIT programs, and CIT faculty referrals to these services were limited. This was an issue with the Engineering Technology programs in the first year, so a similar pattern may repeat as the relationship between the navigators and the CIT programs develops. Now the navigators are working with all STEM-related career and technical education programs, so they will continue to cover the TAACCCT programs in Engineering Technology and CIT. Their caseloads are expected to increase as TAACCCT funding draws to a close, perhaps by engaging with more STEM-related programs. According to one Richland administrator, the school was in the process of implementing the Guided Pathways to Success advising initiative at the time of our last site visit; this which will be a major undertaking that will require growth in the positions of advisors, career navigators, and transfer counselors. The expansion of advising services into the more holistic career navigator model would fit well in this initiative; it also would mean that the TAACCCT program served as a useful test case for the school as a whole.

Though navigator services were available to CIT students, most remained with a previous advisor. There was one particular point person in advising for CIT students, and most students were comfortable with him and continued to rely on him for their advising needs throughout the grant period, despite the availability of career navigators: Those students were not always taking full advantage of the kinds of services the career navigators could offer. The navigators and this CIT advisor kept each other informed about students, and the navigators remained available to answer any questions. They also kept copies of these students' information so that they were ready to assist if the students decided to use their services.

This mirrors the start of the navigator services in Engineering Technology in the earlier years of the grant. It took a while for the original navigator to build relationships with students, many of whom had established relationships with other advisors in the CTE/STEM Advising Center. It was also difficult for the CTE/STEM advisors to let students go in those early days; they felt connected to their advisees and were unfamiliar with the role of the navigator. However, with time, the navigator began to see more students, and the CTE/STEM advisors became more comfortable handing new cases over to her. It is reasonable to expect that a similar trajectory may emerge in CIT.

Recruitment



In the final year of the TAACCCT grant, attention shifted from recruitment (though recruitment efforts were ongoing) toward student retention and program completion. The recruitment strategy generally remained consistent with prior years, and the school was satisfied with the programs' intake numbers. The navigators targeted college fairs, job fairs, and community meetings armed with information packets and flyers they made for the program.

The navigators worked to bring former students back into the fold. In the last year of the grant, the navigators worked through student files to identify students who had taken some Engineering Technology courses but did not have a filed degree plan. Finding over 300 of such students, the navigators were working on reaching out to each one to talk through whether they were interested in pursuing a certificate or degree and how much more coursework it would take to complete their program. They were also working through a list of students that had filed a degree plan but were not taking classes, getting in touch to see where these students were and whether they were interested in coming back. The director of CTE/STEM advising described the effort:

> You're not just telling them to come in: You want to build that relationship. And you want to let them know that: "Hey, I want you to come in. So, I want to meet you. I want to file your degree plan so that we can make sure that, when you're ready to go for a job, we have all of your paperwork ready." Maybe they don't realize that they've completed a certificate. Maybe they don't realize that they're one class away from a certificate. Or maybe even one class away from an AAS. And so there's a lot of students out there that we need to contact and reach [out] to them and bring them in.

The navigators built relationships with local high schools. While high school outreach was not a goal of TAACCCT, Richland College prioritized relationships with local schools, and the program implementers saw this form of outreach as a way to recruit new students. Starting at the beginning of the grant, the Engineering Technology group worked with dual-enrollment students; they became closely affiliated with a teacher at the DFW District' Garland High School, who regularly brought students in to learn about the program – and, occasionally, even to take NIMS tests. Though these students were not officially a part of the TAACCCT program because they were in high school, they benefitted from the grant's implementation in terms of the development of Richland's new lab spaces and the integration of NIMS into the Advanced Manufacturing curriculum. High school outreach helped the college build relationships with local high school students and established a potential pipeline for future certificate and AAS students for the program.

Some area high schools began offering programs similar to those offered by Richland, though the first navigator described these as more theoretical and more oriented toward creating immediate entry into a four-year degree; this left room for some students to come to Richland to supplement their skills:

> What we're hearing from employers is that's great that you understand the theory, the four-year theory of it all. But there's some basic classes within these certificates and within the degree that, if you take those, you'll understand the practicality of it, and that makes you an even better engineer. So I'll let [high school students] know that that's great if you want to go and get a four-year degree, but in the summers, if you want to come take a class or two with us so you understand the practicality behind it all, you can do that as well. And so, that gives them options with the short-term certificates. We have some students here that are two-year students that are going in and getting engineers degrees at UTD [University of Texas at Dallas].

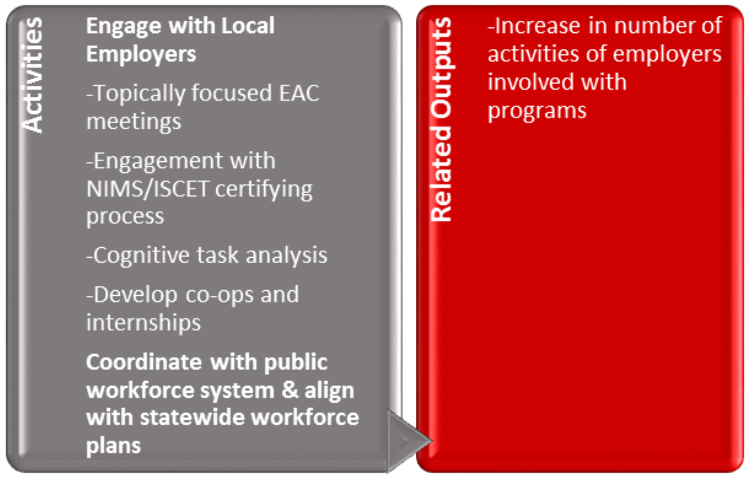
Special Population: Veterans

Veteran recruitment remained problematic throughout the life of the grant. The career navigator reached out to the area's military bases early in the grant and was told that she could give information out but could not directly recruit the veterans. This hindered follow-up efforts. In contrast, high schools and job fairs invited the navigator to attend and encouraged recruitment activities such as recording students' information and following up, which she was permitted to do as aggressively as she wished.

The VFETP implementation team tried to reach veterans through mass mailings and emailing, using contact information they purchased from listing services. Additionally, Richland was surprised early in the grant with being limited by TAACCCT in its recruiting activities to the Dallas County area, so they sought and received an extended service area in January 2017. This expansion gave them access to the Naval Air Station Fort Worth Joint Reserve Base in Tarrant County. However, they did not find events that they were able to attend to gain access to that population.

The program is prepared to serve veterans. Though the school was unable to identify a successful strategy for recruiting veterans in a targeted manner, it designed its systems to be ready for any veterans that do come through. The Electronics program selected its equipment to mirror the equipment used in the military. The campus has a Veteran Services department, and the handful of veterans we encountered in our focus groups throughout the grant reported that the campus was veteran-friendly and that they had no issues receiving benefits. One student even noted that the career navigator helped them navigate the process of receiving his GI Bill benefits.

Employer and Workforce System Engagement



Advisory committee meetings were a focal point of employer engagement. Throughout the grant, the college held separate biannual advisory committee meetings: one for TAACCCT and one for CTE programs (which was required by the state), with some overlap in employer participation across the two meetings. Staff and employers both noted that there was widespread representation on both committees from local employers, including representatives from "mom-and-pop" shops as well as from large global companies that operate outside the Dallas area. Topics discussed by both advisory committees were emblematic of goals pursued as part of the grant, including employer participation in curriculum and skill development as well as the need to maintain a focus on continuing education so that the college can better meet the constantly changing industry demands. For example, one administrator explained how each committee is unique but also similar in this regard:

> [W]hereas the TAACCCT grant [meeting] is much more specific, the general one that I do is much more global and far-reaching. . . . We'll talk about things like future revisions to the curriculum that may be called for. We'll talk about things like, maybe, some new emerging certification related to the program that is really taking hold in the industry now: So, this is something that we need to build into the curriculum. We'll also have conversations – because our CE [Continuing Education] department is represented in all our advisory committee meetings as well – because sometimes, in that more global discussion, we can say: "Okay, so the degree is fine as is, but we need to offer this little CE piece over here to get them that specific skill set or offer this little certification over here," and we can do it more readily in the realm of continuing education. And it makes more sense for it to live there, as opposed to trying to embed it in the curriculum and go through all those processes, because it's one of those industry-trending things that may not be the case a year from now. So we're able to do that.

The idea of merging the two advisory committees was considered, but the grant staff reflected that some of ways the CTE advisory committee was run would not be conducive to the goals of the TAACCCT advisory committee. Moreover, TAACCCT meetings were sometimes held virtually, provided updates on the grant programs, and allowed employers to vote on academic degrees and curriculum issues. Finally, although some employers participated on both committees, the TAACCCT advisory committee might not have been of interest to the employers who were not interested in certain skills, textbooks, and certifications, such as NIMS.

Employer outreach was largely informal and primarily conducted through email. Richland staff reported that employer outreach remained a priority of the grant, even as it wound down, with a lot of the activity happening outside of the formal advisory committee meetings. For example, staff found local job opportunities through job search engines such as Indeed.com and sent emails to the companies that posted them to offer information about the TAACCCT program, its students, and its advisory committee. Staff also reported that some employers who responded to these queries had been unaware that the program at Richland existed. This outreach method was successful at times. One staff member shared that she once heard from an employer almost a year after the company was originally contacted:

> The interesting thing is that I got an email the other day from someone, and it was basically, like: "You don't know me, but my boss sent this email to me. So, I want to know when you . . . have your next event, let us know." So, I was like: "Okay, this is a year old, but it's still working!" It really kind of made my day that somebody actually responded so late, so far down the road.

The college sought to customize programs to meet distinctly local needs. One of the main stated goals of Richland's initiative to engage local employers and workforce systems was to make sure that its curriculum was designed with regional interests in mind and took a direct approach to meeting the needs of local industry rather than a state-oriented or even national approach. One Richland staff member further explained this decision to prioritize the local:

> It's better for [colleges] to . . . directly engage with their local industry because then they can make sure that they are training specific [skills] that may only be relative to their area. And if they are maybe taking a statewide approach, or even national approach, they're going to miss some of the nuances of their local industry. So Richland did a very good job of plugging in . . . I was there at multiple meetings where they spent an hour going through the curriculum and making sure that the industry agrees 100 percent that this is what those students should be taught.

This approach garnered support from local employers, who continued to work with the school to build new pathways. For example, borrowing from the TAACCCT model of aligning curriculum with industry needs, the next goal that both Richland and local employers expressed interested in pursuing is to develop a new supply chain program (potentially involving robotics) to develop pathways for skilled technicians to work in logistics. Although

TAACCCT can provide a framework for developing a program like this, the college is still in the exploratory process and still needs to build a greater capacity before any plans to build a new program are solidified. Additionally, there were some conversations among college staff and engaged employers about creating a TAACCCT-like program for Information Security related to manufacturing, drawing on the SCADA program, since many employers have voiced a demand for it. As with the potential supply chain program, most colleges have not developed a curriculum for these types of skills, nor are there many existing pathways, so these additions would involve a great deal of preparation. The college is only in the earliest stages of exploring these program extensions, but both appear to be good next steps for engaging local industry.

Faculty played an important role in employer engagement. Richland faculty members who came to the college from the manufacturing industry remained an important part of the program's employer network, and they helped to create and sustain the employer relations at Richland through their existing industry contacts. For example, one large company that operates on a global scale recently joined the college's advisory committee looking to develop a pipeline with Richland. A representative from that company seeking to fill an entry-level position contacted one of Richland's faculty members with whom a prior relationship had been established, and that prior industry contact ended up yielding a job placement for a TAACCCT program graduate.

An approach that one faculty member at Richland reported developing was trying to systematize pipelines with official recommendations from within the program, so students or graduate candidates from the program could be internally vetted and approved before they went on a job interview. Faculty would provide a certificate of approval for students who were able to meet certain criteria, and that certificate would let the company know when it is receiving a qualified candidate who is ready for hire. In other words, if an employment-seeking student from Richland were to go to a job interview without this certificate of approval, the company would know that Richland did not refer them for that job. This idea was a consequence of multiple instances in which Richland interns or graduates had gone for job interviews with certain employers who were still in touch with Richland faculty, and the employers contacted the faculty with concerns that those candidates were not qualified.

Since employer relations were a key aspect of the grant, another idea that floated around among the VFETP grant staff was to make more of an effort to include the navigators in employer outreach, although the navigators at Richland were already overwhelmed with the responsibilities of their role. One suggestion that emerged from interviews was that it might have been beneficial to have individuals more dedicated to this process working on it as well, such as a program ambassador, who would not have so many responsibilities on campus and could focus exclusively (or even primarily) on outreach to local industry. This type of outreach was also part of the role of the assistant vice president of workforce and continuing education, so the navigators worked with her in this capacity as well.

Richland's curriculum in Manufacturing continued to be heavily influenced by local employers. At the time of our last contact with Richland staff, a major manufacturer in the area was working with Richland to create a training curriculum for its incumbent workers. The manufacturing faculty was working with parts the employer had given them and was planning to conduct a cognitive task analysis for the processes required to manufacture the parts. Much of the incumbent-worker training was slated to occur on-site at the manufacturer's facility, with the involvement of instructors and facilitators from Richland. The college also planned to prepare and administer tests for NIMS certification for these workers. The idea was to ultimately develop three levels of positions: an entry level, an intermediate level, and a journeyman level, each corresponding with different levels of apprenticeship and training. As one administrator noted, when the company was choosing a location for this training, they opted for Richland because they had an established relationship with the school. Another major company was considering a veteran-focused training program using Richland's faculty and staff and building on the school's NIMS programs.

Some employers reported that the certificates were important for hiring in both manufacturing and electronics industries. For example, one member explained that NIMS remained important to manufacturing employers as an indicator of the skill competency required for students to deliver quality work. Although this belief was not uniform across the college or industry, Richland nonetheless emphasized the value of the NIMS certification processes in its TAACCCT programming. College staff speculated that employers had concerns about the low performance of students from other regional schools and believed that the inclusion of these certifications in their own programs helped to ensure and to communicate their high levels of standards.

Nonetheless, employers were still having trouble finding workers. Employer respondents reported that they struggled to find hires with the necessary and appropriate soft skills to work in the industry. Similarly, employers were having trouble with candidates' gaps in employment experience. For example, traditionally, in order for employees to work in highly skilled positions in aerospace, they were expected to "migrate up the chain," but in recent years, younger hires want to start closer to the top of that chain and consequently there has been significant attrition and other concerns at companies, mainly related to what they consider is an issue of millennial culture. For example, one company revealed that 50 percent of its employees would become eligible for retirement in two years, yet the STEM students needed to take over these skilled positions are "graduating [at a rate of] probably about 30 percent of what's required to continue to execute on our technologies. And that's across the industry."

Apart from the skill requirements, employers also reported that there was simply not enough supply to meet the demand for skilled labor; this is not surprising, given the low unemployment rates in the Dallas metropolitan area. Also, many of the students interested in working in advanced manufacturing and machinery are in four-year programs and are subsequently entering traditional engineering positions rather than filling open positions in technical manufacturing. Grant staff at Richland viewed this gap as an opportunity for the program to maintain relevance in the local manufacturing industry. Staff also mentioned that community colleges around the country were likewise seeking to fill this void by developing their technical programs and their relationships with employers to meet industry demand. For this reason, Richland was eager to develop more permanent programs before the competition for placing students intensifies.

Because of the urgent demand for skilled workers, some students were choosing not to finish their programs or degrees. Some employers were so eager to hire workers as quickly as possible (and to train them internally) that some students were offered jobs before they completed their education. When asked about whether the VFETP program had made an impact, one staff member explained:

> I'm sure it will [make an impact] because there's still a need for people to do the manufacturing work – so yes. We tend to have companies come and say: "We need people." ...[T]he students aren't really finished with their studies, but employers will take them. Then, that's where we're concerned because we want the students to come back and finish.

While there appears to be a unique demand in the labor market for graduates from these programs, employers are still evolving in their understanding of these programs and their graduates. Employers reported that community college graduates can fill a unique role. Some large local companies that typically look to hire recruits with four-year degrees or equivalent experience in the field had begun to hire two-year-degree holders for machining work. For example, at one large company, these entry-level hires received healthcare and benefits but were considered lower-tier workers in a three-tier model and would not receive bonuses until they reached the third tier. This same company explained that, when engineers with four-year degrees were hired in a machinist role, they were typically seeking to move into higher-paying positions sooner rather than later, whereas graduates with two-year trade degrees or certificates were more satisfied with working as a lower-tier machinist for the long term. However, although companies mentioned making more room for these lower-tier workers to move up an internal job ladder, most of the salaried employees being hired were not coming from community colleges but from four-year colleges. Primarily, recruits from community colleges were classified as "hourly" employees, though companies expressed that they were open to changing this model.

The college sought to build connections with economic development efforts. Richland staff reported that they were developing connections through local as well as regional Boards of Commerce and Economic Development arms because connections with those types of city institutions were especially valuable. Staff members reached out to and coordinated with economic development organizations in Richardson and Garland and found companies in those areas that were interested in working with TAACCCT. One staff member further explained the appeal of working with economic development:

So, to me, if you build with your EDs [Economic Development contacts], you kind of have a direct link into them – into what's going on – because they know the [employers in their area]. And you need to build a relationship so that, when they're going to talk to the [employers], they may invite you along.

Another example of economic development success reported by the college staff is the instance when, with the help of the Richardson Economic Development Board and the professional network Richland has created, they helped attract an IT company to relocate near the area. This move is projected to add about 600 jobs which will, hopefully, be filled with Richland students and graduates. Staff have also reported that they host other events: some geared toward establishing new relationships with local and regional Chambers of Commerce, others focused on networking with their existing contacts of employers and other city-run organizations. While the college has initiated these efforts, it has encountered some difficulties with getting them started and fully formalized.

Workforce development coordination was slow to develop. Grant staff cited having worked with one workforce development organization in the past but mentioned that there had been issues with obtaining the data they needed from the organization and that staff at the organization had not promoted Richland's programs as the college had hoped they would. However, one Richland staff member reported that she began working with two students during the grant period who had come to the college through a local workforce organization, and that this had provided her with an opportunity to start a relationship with that organization – one that she hoped would continue in the future.

STUDENT OUTCOMES EVALUATION

The student outcomes study is presented in two parts. In the first part, we conduct a descriptive analysis of the TAACCCT students' educational and employment outcomes using student administrative data. In the second part, we use quasi-experimental techniques (propensity score matching) to evaluate the impact of TAACCCT participation on Richland Community College Manufacturing students, focusing on academic performance and outcomes. To do this, we compare TAACCCT students to a similar population of students at Richland in Computer Information Technology programs – our "non-TAACCCT-touched" control group. As each set of analyses has a unique methodology and incorporates different data, we present the two parts separately.

Both components of the student outcomes evaluation draw on administrative data for TAACCCT students. Richland identified a "TAACCCT student" as any student who enrolled in a TAACCCT course during the study period (Fall 2015 through Spring 2018). This timeframe was selected based on implementation activities. Richland's TAACCCT program introduced three key elements that affected the student learning experience: the addition of a career navigator, the redesign of several Manufacturing courses, and the installation of laboratory equipment for hands-on learning. Although the grant began in Fall 2014, the true launch of the program reforms did not happen until Fall 2015 due to the planning process, the time it took to acquire and install new equipment, and the longer-than-anticipated process of hiring a career navigator.

Richland's implementation of the TAACCCT grant started in the Manufacturing & Electronics Technology (MET) program. In Fall 2017, the program was officially expanded to include the Computer Information Technology (CIT) program, which involved a smaller package of reforms (the addition of career navigator services and one additional faculty member). Therefore, TAACCCT students in this study consist of both MET and CIT students. For some analyses, we have divided the data into classes: The *2015 Class* includes those students whose first TAACCCT exposure was in the Fall 2015, Spring 2016, or Summer 2016 semesters. The *2016 Class* includes those students whose first TAACCCT exposure was in the Fall 2016, Spring 2017, or Summer 2017 semesters.

Part I of this evaluation of student outcomes presents a quantitative analysis of Richland TAACCCT students' enrollment patterns, demographic characteristics, and academic and employment outcomes. We will discuss our findings in terms of two broad domains:

- *Student enrollment and demographics*: TAACCCT students' sociodemographic background (gender, race/ethnicity, age), registration status at first enrollment, financial aid status, and military background.
- *Academic achievement*: TAACCCT students' program completion outcomes, number of credits and credentials earned, time elapsed from initial enrollment to first credential, and retention rates.

The evaluation team had also planned to discuss employment outcomes for program completers; however, the limitations of the available administrative data made it impossible to assess employment outcomes for the evaluation.

In Part II, we present a quasi-experimental analysis using *propensity score matching* with observational data to examine TAACCCT's influence on students' academic achievements in terms of graduation, retention, and earned credits during the follow-up period. We isolate these effects from any possible interaction with previous experience at the college by limiting our sample for this analysis to first-time students at Richland. Early on in the project, in collaboration with the Richland implementation team, we identified CIT students as the student population that was most similar to the Manufacturing students and chose them to serve as the control group for our analysis. To avoid contamination with the 2017 CIT expansion, we limit the comparison to students who were in the program from the beginning of implementation in 2015 through Summer 2017.

The aim of this analysis is to address three important questions involving the effects of Richland's TAACCCT program:

- *Student retention*: Did TAACCCT students have better retention rates than their counterpart non-TAACCCT students in the CIT program? To address this question, two retention measures were considered: immediate retention and latent retention (the latter is focused on whether students were retained for the majority of semesters in the follow-up period).
- *Completion rate*: Did TAACCCT help students stay engaged in school and achieve their credentials? Were degree and certificate completion rates higher for TAACCCT students than they were for CIT students?
- *Credits earned*: Among those who did not graduate during the grant period, did TAACCCT students earn more credits than their counterpart (non-TAACCCT) CIT students?

Part I: Descriptive Analysis

Methods

Data for this final report were pulled by Richland staff from their own administrative and workforce data sources in the spring of 2018. School administrative data sets provide current and historic academic history on course registration, credit-earning outcomes, and graduation outcomes. The data include registration information, course history (credits attempted and earned), and graduation information for each student. It also includes students' self-identified demographic information (race/ethnicity, sex, age, disability status, and military experience) as well as their financial aid status (using Pell eligibility as a proxy).

Measures

The population of TAACCCT students was determined by Richland Community College. Between Fall 2015 and Fall 2017, 858 unique TAACCCT MET students were identified. This count includes students who were already at Richland prior to Fall 2015.

Since there were only a few Native American, Asian, or international students, and few students reporting two or more races, we collapsed these responses into a single *other race* category to ensure confidentiality. Students' age was captured at the time of their first enrollment in a TAACCCT program and was calculated using date of birth. Students enrolling at age 25 or older were considered *nontraditional* students, and those enrolling before age 25 were traditional students. The category *Veteran* includes students with military experience as well as the spouses of veterans. *Pell eligibility*, documented in the administrative data set, served as a proxy for financial status. We created the variable representing students' *registration status* (enrolled full-time or part-time) based on the Department of Labor's (DOL) definition of full-time students: those taking 12 or more credits in the Fall or Spring terms, or 6 or more credits in the Summer terms. Students whose credit loads fell short of those totals were categorized as part-time students. In all analyses, students' *registration status* is the status under which they were registered in their first term during the observational period.

Data on students' academic performance were retrieved from Richland's Spring 2018 term records. We calculated the *number of credits earned* for each student over time using the following method: Students who earned a grade of D or above, were counted as having passed the course and earned the course credits. Students were counted as *retained* in school to pursue their credential using two criteria: (1) if they remained registered for any course in the semester subsequent to their first TAACCCT enrollment, and (2) if they remained registered for any course in any two semesters out of the three semesters that followed their first TAACCCT enrollment.

Results

In this section we provide descriptive results on TAACCCT participants. We begin with a discussion of the demographic characteristics of all students enrolled in TAACCCT programs. Next, we examine academic outcomes, discussing retention and graduation rates as well as the numbers of credits earned by TAACCCT students. Finally, we turn to a subsample of TAACCCT students for whom we have two-year data (those who first enrolled in Fall 2015 or Spring/Summer 2016) to examine their experiences, given the longer period of time that has passed since they began their relationship with Richland.

Program Enrollment and Participant Profile

Over 200 students participated in TAACCCT at Richland in any given year. Table 7 presents the number of TAACCCT students in MET and CIT programs in the 2015, 2016, and 2017 academic years. These are not unique participant counts: These numbers reflect how many students were in the program *at each point in time*. Thus, a student who enrolled in TAACCCT programming in more than one academic year should be counted in multiple years.

TABLE 7. TOTAL TAACCCT ENROLLMENT BY YEAR

Year	MET		CIT	
	N	%	N	%
2015–2016	166	26.1	--	--
2016–2017	230	36.2	--	--
2017–2018	239	37.6	383	100.0
Total	635	100.0	383	100.0

Source: Richland Community College Student Administrative Data

Adding up all MET and CIT students during the grant period yields 858 total unique participants in the study sample. Table 8 presents the number of students who first enrolled in the TAACCCT program in each academic year. There were 166 TAACCCT students in Manufacturing programs in the 2015 academic year. In the 2016 academic year, 162 additional students enrolled in those programs, and the Fall 2017 and Spring 2018 semesters brought an additional 150 Manufacturing enrollees. In the 2017 academic year, 380 CIT were added to the TAACCCT program.

TABLE 8. UNIQUE PARTICIPANT ENROLLMENT OVER TIME

Academic Year	MET		CIT	
	N	%	N	%
2015–2016	166	34.7%	--	--
2016–2017	162	33.9%	--	--
2017–2018	150	31.4%	380	100.0%
Total	478	100.0%	380	100.0%

Source: Richland Community College Student Administrative Data

The demographic characteristics of Richland TAACCCT enrollees are presented in Table 9. Among the 478 unique Manufacturing students, the majority were male (85%). Just over a third of Richland's Manufacturing students self-identified as white (36%), over a quarter as Hispanic (27%) and another 16 percent as African American. In the TAACCCT CIT program, white, African American, and Hispanic students were almost equally distributed at a rate of around a quarter of the sample student population (265%, 27%, and 26%, respectively).

Over 22 percent of TAACCCT Manufacturing students received financial support in the form of Pell grants; about the same proportion – 25 percent – of TAACCCT CIT students received that form of financial support as well. Around ten percent of the students in the study had a military background (9% of Manufacturing students and 12% of CIT students). Only one-third of TAACCCT's Manufacturing students were registered as full-time students, while 43 percent of its CIT students were enrolled full time. Over 60 percent of all TAACCCT students in the study were non-traditional students (61% of the Manufacturing students and 65% of the CIT students).

TABLE 9. STUDENT CHARACTERISTICS

Characteristic	MET		CIT	
	n	%	n	%
Sex				
Female	71	14.9	72	19.
Male	407	85.2	308	81.
Race/Ethnicity				
White	170	35.6	97	25.5
African American	80	16.7	103	27.1
Hispanic	127	26.6	98	25.8
Other	70	14.7	58	15.3
Not Reported	31	6.5	24	6.3
Financial aid				
Pell	107	22.4	95	25.0
Military background				
Veteran	41	8.6	44	11.6
Registration status				
Full-time student	160	33.5	162	42.6
Part-time student	318	66.5	218	57.4
Age				
Non-traditional	291	60.9	247	65.0
Traditional	187	39.1	133	35.0
Total number of students		478		380

Source: Richland Community College Student Administrative Data

Academic Progress

TAACCCT students earned a total of 101 credentials between Fall 2015 and Fall 2017. One important goal of the TAACCCT program was to improve the rate at which students completed credentials (e.g., certificates and degrees). Looking first at MET students, 30 students in the 2015 Class and 5 in the 2016 Class earned credentials. All 38 students who entered the TAACCCT CIT program in 2017 earned credentials within one year: 30 earned certificates, and 8 earned AAS degrees. Table 10 presents the number of associate degrees and certificates earned by students in each cohort in terms of their *time to credential*: the time lapse between students' first TAACCCT enrollment and the credential completion date.

It is not surprising that the 2015 Class earned most of the credentials, since this group had the most time to do so out of all the students in the dataset. The majority of the associate degrees and certificates were awarded within one year of students' first TAACCCT enrollment.

Because this dataset includes students who had been enrolled at Richland prior to the evaluation study period, it is likely that some students in the 2015 Class were working on their education for multiple terms when they entered the TAACCCT pool. When students reached two years post-enrollment, few additional credentials were awarded, which can be explained by the low number of students in the sample who had more than two years of data on file (this cohort is comprised of only those who entered TAACCCT in Fall 2015).

TABLE 10. NUMBER OF CERTIFICATES AND ASSOCIATE DEGREES EARNED BY TAACCCT MET AND CIT STUDENTS, BY TIME TO CREDENTIAL

Time to Credential	Manufacturing Program				CIT program	
	AAS		Certificate		AAS	Certificate
	2015 Cohort	2016 Cohort	2015 Cohort	2016 Cohort	2017 Cohort	2017 Cohort
Within one year	14	3	14	2	8	30
Between one and two years	12	0	11	0	0	0
After two years	3	2	2	0	0	0
Total	***29***	***5***	***27***	***2***	***8***	***30***

Source: Richland Community College Student Administrative Data

Figure 2 demonstrates the distribution of credentials earned by MET TAACCCT students by type. Among the aforementioned 101 credentials, 63 were earned by MET students. The majority (n=20) were Engineering Technology - Electronics Technology certificates and associate degrees (n=19). The next most popular credential was the Engineering Technology–Manufacturing associate degree (n=10), followed by the CNC/CAM/CAD certificate (n=8) and the Electrical Engineering associate degree (n=4). One Semiconductor Manufacturing associate degree and one Semiconductor Manufacturing certificate were also awarded.

Figure 2. Number of Credentials Earned by MET TAACCCT Students, by Credential Type (Fall 2015 – Fall 2017)

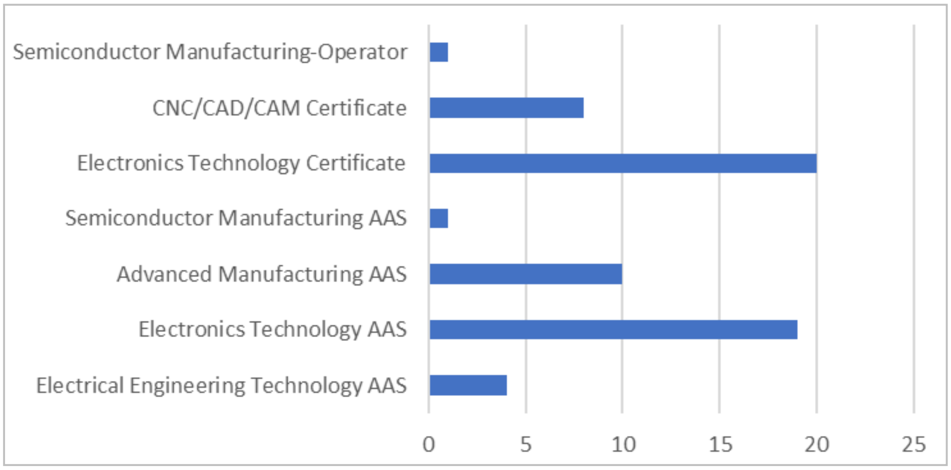
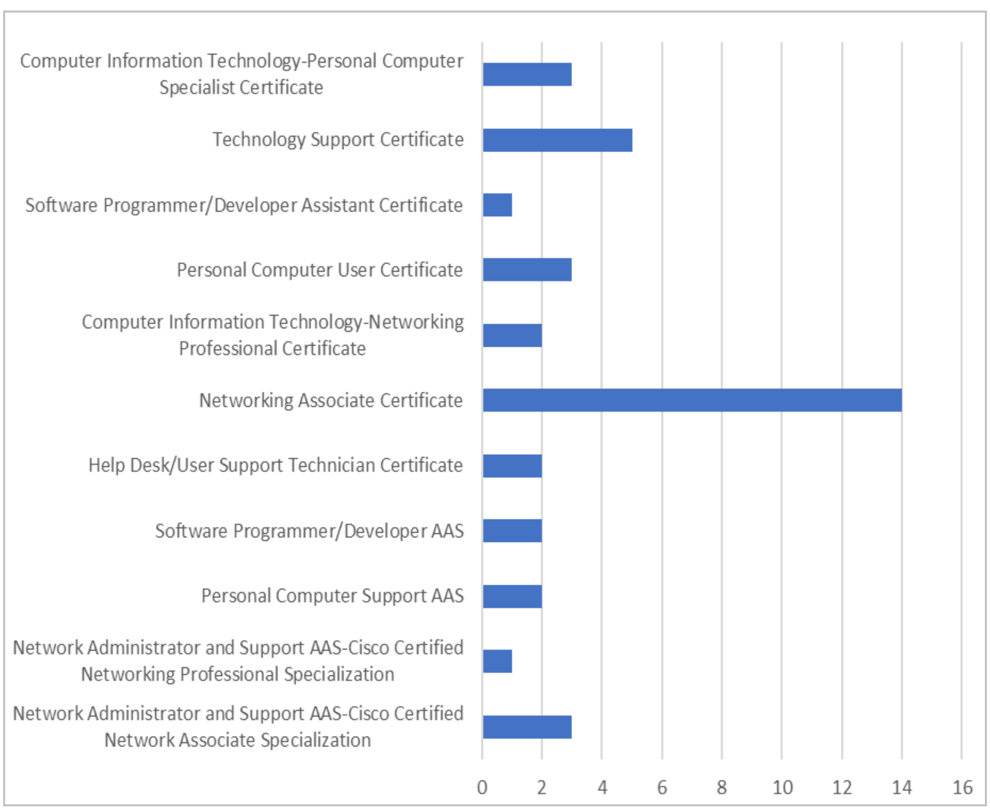


Figure 3 presents the distribution of credentials earned by CIT TAACCCT students by type. From the aforementioned 101 credentials, 38 were earned by CIT students. The majority were CIT–Network Associate certificates (n=14). The next most popular credential was the CIT–Technology Support certificate (n=5). Several other types of CIT associate degrees and certificates were awarded.

Figure 3. Number of Credentials Earned by CIT TAACCCT Students, by Credential Type (Fall 2017)



Pathways of First-time Students Enrolled in TAACCCT

We examined the pathways of those who were first-time students upon enrollment in TAACCCT. To understand their pathways in the program, we examined two important academic outcomes: earned credits and retention (measured by registration status in one-year and two-year periods following entry into in the TAACCCT program). In this section, we first focus on first-time students in MET TAACCCT programs for whom we have enough information to calculate *one-year outcomes* (those enrolled between Fall 2015 and Spring/Summer 2017); we then turn our focus to only the students whose information was sufficient to calculate *two-year outcomes* (the 2015 Class, which includes all students enrolled between Fall 2015 and Spring/Summer 2016). As the sample is limited to first-time students, the total sample size for this analysis of student pathways is 114 students.

Progress Along Pathways at One Year

Table 11 shows the earned credits and number of enrolled terms for the 114 first-time TAACCCT MET students in the year after their first TAACCCT exposure. In the year immediately following their first TAACCCT enrollment, students earned an average of eight credits, more than half of which were for completing courses in the MET program (4.6 credits). On average, in one year, these students remained registered at Richland for over 1.5 semesters. When we restrict our analysis to first-time students, none of the TAACCCT MET students earned credentials within one year. More than half of TAACCCT students were retained in the first year after their initial TAACCCT exposure (54.4%). The other 46 percent of students halted their studies after their first TAACCCT semester and did not return within the one-year timeframe.

TABLE 11. ACADEMIC PROGRESS AMONG FIRST-TIME MET STUDENTS IN THE FIRST YEAR OF TAACCCT EXPOSURE (2015 AND 2016 CLASSES, N=114)

Enrollment	Average Credits Earned(Range)
Average total credits earned	8.4 (0 – 34)
Average total credits earned in MET	4.6 (0 – 19)
Average number of terms enrolled	1.5 (1 – 2)
Academic outcomes at one year of TAACCCT exposure	n (%)
Students who completed certificate or degree	0 (-)
Retained students (enrolled sometime after first year)	62 (54.4%)
Students no longer enrolled	52 (45.6%)

Source: Richland Community College Student Administrative Data

Progress Along Pathways at Two Years

Many students were retained in the program after two years, though only one of these students ended up completing a credential within the study period. We were able to track longer-term outcomes for the TAACCCT MET 2015 Class as well, which allowed us to examine whether students remained on these pathways. For this incoming cohort, we gained access to data covering a full two years' worth of semesters for the 50 first-time students enrolled in TAACCCT. Table 12 presents the number of credits earned by these students and their academic outcomes.

First-time students in the 2015 MET class earned an average of 13.6 credits in the two-year time frame following their first enrollment, representing about 5 credits more than the average one-year outcome. More than half of the earned credits (8.4 on average) were for MET courses. In terms of retention, students in the two-year analysis remained registered in Richland for an average of 2.4 semesters following their initial enrollment.

Among first-time TAACCCT MET students, only one earned one credential within two years of first TAACCCT course enrollment. To explore how well the TAACCCT program helps students stay engaged in school, EERC examined students' registration statuses over time. The results are presented in Table 12. The majority of TAACCCT students (60%) were retained in the first two years after TAACCCT exposure. About 38 percent of students (n=19) stopped out after their first TAACCCT semester and did not return within the two-year time frame. Retained students either continued their studies in the semester immediately following their first TAACCCT course or re-enrolled after skipping one term. Almost 73 percent of retained students (22 out of 30) re-enrolled for two or more semesters after their first TAACCCT term.

TABLE 12. ACADEMIC PROGRESS AMONG FIRST-TIME MET STUDENTS IN THE FIRST TWO YEARS OF TAACCCT EXPOSURE (2015 CLASS, N=50)

Enrollment	Average credits earned (Range)
Average total credits earned	13.9 (0 – 60)
Average total credits earned in MET	8.4 (0 – 38)
Average number of terms enrolled	2.4 (1 – 4)
Academic outcomes at two years after TAACCCT Exposure	n (% of N)
Students who completed a certificate or degree	1 (2%)
Retained students (enrolled any term after first)	30 (60%)
Students no longer enrolled	19 (38%)

Overall, this breakdown indicates that it likely takes first-time TAACCCT MET students more than two years to complete their programs. This outcome is consistent with the low (14) "average credits earned" outcome. Nevertheless, most of the students remained registered in subsequent semesters following their first TAACCCT enrollment.

Part II: Quasi-Experimental Analysis

In this section, we present analytical results from a quasi-experimental analysis via propensity score matching to evaluate the impact of the TAACCCT grant on Richland MET students who were in the program for the first time between Fall 2015 and Spring/Summer 2017. Since only one first-time MET student earned a credential in the 2-year period after their initial TAACCCT enrollment, we have set aside the criterion of completion and focus on two academic outcomes: retention and credits earned.

Method

Propensity score matching has become a popular approach to estimating program effects using observational data. When studying things like educational training programs, where randomization is unethical or not possible, propensity score matching has become a widely accepted way to account for the conditional probability of treatment selection as a means to reduce bias when comparing program outcomes between experimental treatment and control groups. The propensity scores are estimated using all the variables that are related to the outcome of interest and serve as balancing scores to create matched treatment and control groups similar to those researchers would achieve under randomized control trials. The matched treatment and control groups are similar except for their treatment status in the experiment.

Sample

The treatment group consists of students who entered the TAACCCT MET program beginning in Fall 2015 through Spring/Summer 2017. To prevent the presence of prior college experience from potentially influencing students' current academic performance, we restricted this part of our analysis to first-time students: those who were not enrolled at Richland in the prior cohort year. As in the analysis above, after removing subjects with prior college experience from the sample, the treatment group consisted of 114 first-time students. We further restricted the data to those containing values for each outcome of interest. (See Appendix C, Table C-1, for sample size for each outcome variable).

The control group consists of students who enrolled in CIT program between Fall 2014 and Spring/Summer 2016 semesters. As with the treatment group, we focused on first-time CIT students (N=294) who were not in school in the prior academic year. Further data restrictions were applied as necessary when analyzing several particular outcomes within the study.

Outcomes of Interest

There are two important academic outcomes, and each was examined within one-year and two-year frameworks:

- *total credits earned*, which we examine at two points: within one year of enrollment and within two years of enrollment, and
- *student retention*, which we have also broken down into two categories: *immediate retention* (reenrollment in the term immediately following initial enrollment) and *long-term retention* (immediate retention plus one more term of enrollment within the two years following initial enrollment).

All retention outcomes are *categorical* variables (with 1 as an indicator of the item), while the total credits earned variables are *continuous*.

We created samples for each of the one-year and two-year outcomes. The samples used for each outcome analysis are presented in Appendix D, Table D-1. For each of the one-year outcomes, we followed the cohorts for one academic year (including the starting semester), and for each of the two-year outcomes, we followed the cohorts for two academic years (including the starting term). The immediate retention outcome examines the registration status in the term immediately following enrollment.

Covariates

In this evaluation, the variables used for matching are those that have been demonstrated in the educational literature to be associated with academic outcomes. They include students' sociodemographic characteristics such as sex (male, female as reference group), race/ethnicity (African American, Hispanic, Other, and white as reference group), age (traditional students, with non-traditionally-aged students as reference group) as well as the students' financial aid conditions (using Pell as a proxy). Variables such as students' academic ability (whether taking replacement courses) and registration status (whether they were full-time or part-time students) are also considered. The distribution of the covariates for the treatment and the control groups are presented in Appendix C, Table C-2.

These variables are all categorical variables, with "1" as an indicator of the item. Demographic information was self-reported, while financial aid and academic information were obtained from the administrative database.

Statistical analyses

We estimated the propensity score using the covariates that are theoretically related to the academic outcomes and then matched the TAACCCT MET students to the CIT students based on the propensity scores. The propensity-score-matching procedure minimizes the baseline differences between the TAACCCT and non-TAACCCT groups. We used the 1:2 *nearest-neighbor matching* procedure with a caliper of .17 for retention outcomes and .2 for credit accumulation outcomes. After matching, a *logistic regression model* was applied to predict the probability of students receiving treatment (TAACCCT) using the baseline covariates. The extent to which propensity score matching reduced the differences between the TAACCCT group and the CIT group was assessed by comparing the standardized differences in the average covariate value prior to and after the matching. Finally, we used the *robust Abadie–Imbens standard error* to evaluate the TAACCCT effects on the three major outcomes.

Results

Propensity Score

We first conducted a logistic regression using the covariates specified above to predict the treatment status to see if the covariates that are associated with the outcome predict the treatment assignment. This is a way to test whether being in the TAACCCT group is explained by these variables. Variables significantly associated with the treatment assignment (especially when they are associated with the academic outcomes of interest) should be included in the propensity score matching.

Next, we used propensity score matching to balance the pretreatment conditions between the treatment and the controls. We assessed the extent to which propensity score matching reduced the difference between the treatment and the control groups on the covariates by examining the standardized differences between the treatments and the controls in terms of the covariates. Since we have four outcome variables, and the sample sizes used in each model differ (as shown in Appendix D, Table D-1), we present the balancing results respectively. The results on matching balance are presented in Appendix D, Tables D-3 through D-6. Tables D-3 and D-4 examine the balance results on the two one-year academic outcomes: the immediate retention rate, and the total credits earned in one year. Tables D-5 and D-6 present the balance results for the same outcomes at after two years.

In general, logistic regression results suggest that, for the short-term (one-year) outcomes, the number of students who took replacement courses was positively associated with those students receiving TAACCCT, and that students in the “Other” racial group were less likely to be in the TAACCCT MET program than in the control group. For the two-year outcomes, two characteristics – taking replacement courses and being male – were positively associated with TAACCCT status (see Appendix D for tables on balance check. the significance level is *p=0.05*). Propensity score matching helps reduce the differences in the TAACCCT and non-TAACCCT samples on these covariates. The reduction in difference toward zero after matching suggests better balance or less difference in the pre-treatment conditions between the treatment and the control groups. After propensity score matching, the difference between the treatments and the controls are not statistically significant.

Treatment effects

Table 13 presents the differences in the one-year outcomes while Table 9 shows the difference in the two-year outcomes, both estimated by propensity score matching. These represent estimates of treatment effects on the experimental treatment group. When significant findings were discovered, treatment effects were evaluated using robust standard errors to examine the treatment effects on the population.

There is no evidence of a positive impact of TAACCCT on student academic outcomes. In general, TAACCCT MET students were similar to non-TAACCCT CIT students in terms of school retention in both one-year and two-year data categories. The differences in retention rates between the treatment groups and the controls were small and not statistically significant. Moreover, TAACCCT students earned fewer total credits than the non-TAACCCT students both at the one-year mark and by the end of the two-year period. The difference at the one-year cutoff was statistically significant. Since first-time TAACCCT students did not earn any credential in their first year and only one TAACCCT student earned a credential in the two-year period, the datasets fail to suggest any positive impact of the TAACCCT program on MET students' chances at program completion.

One-Year Outcomes

As demonstrated in Table 13, the estimated immediate retention rate among first-time TAACCCT MET students was eight-tenths of a percentage point higher than their counterpart CIT student control group (0.55 vs. 0.47). This difference is not statistically significant. On average, MET students earned almost 3 credits less than credits earned by CIT students in the first year. The difference in the total number of credits earned within one year is statistically significant when we consider the treatment effects on the treatment group. The impact remains significant when we consider the treatment effect in the general population using the robust standard error estimator.

TABLE 13. TREATMENT EFFECTS ON ACADEMIC OUTCOMES WITHIN ONE YEAR

Academic outcomes within one year	Treatment Group Mean/Proportion	Control Group Mean/Proportion	Mean/Proportion Difference
Immediate retention rate	0.55	0.47	0.08
Total credits earned within one year	8.4	11.4	-2.99*

*p<.05 **p<.01 ***p<.001

Two-Year Outcomes

Table 14 examines the TAACCCT MET program impact over a two-year period. The proportion of MET students who stayed in the program for more than two terms in the two-year period after their first enrollment was similar to their counterpart CIT students. The difference in retention rate is only 0.03 which is not statistically significant. Moreover, compared with CIT students, MET students, on average, earned almost 7 fewer credits in those two years than CIT students. However, this difference is also not statistically significant.

There was not much difference in retention between the treatment and the control student groups. Therefore, based on this study, the long-term impact of TAACCCT in helping students stay engaged in school is not evident. The lack of statistically significant impact may be explained in part by the small sample size (there were only 50 TAACCCT MET first-time students with two-year outcomes), which may yield less statistical power to detect any significant difference. Moreover, on average, MET students earned fewer credits than CIT students. This may be explained by the differences in the courses offered by the two separate programs, their requirements, and designs.

TABLE 14. TREATMENT EFFECTS ON ACADEMIC OUTCOMES WITHIN TWO YEARS

Academic outcomes within two years	Treatment Group Mean/Proportion	Control Group Mean/Proportion	Mean/Proportion Difference
Proportion retained for 2 terms if not graduated	0.44	0.41	0.03
Total credits earned within 2 years	13.2	20.1	-6.9

*p<.05 **p<.01 ***p<.001

Limitations

There are a few limitations to note regarding the Student Outcomes Evaluation findings. First, the study sample size of approximately 160 students per academic year is considered small. The sample of first-time students in the TAACCCT MET program is even smaller, with only 50 students who were in the program long enough to qualify for measuring two-year outcomes. Second, the duration of the observation period of MET students was, at most, two years long: this short amount of time is particularly insufficient when we examine temporal-dependent outcomes such as students' graduation or retention rates. Third, the data used in this study are Richland's administrative data, which reflect students' academic information and demographic characteristics. However, administrative data do not provide information on students' family and socioeconomic background, which are factors that may be associated with their academic achievements and outcomes. Future studies are needed to understand the mechanisms through which TAACCCT has a positive effect on graduation rates and credit accumulation.

DISCUSSION: LONG-TERM OUTCOMES AND IMPACTS

As noted in the "Methods" section, the intended outcomes of any given logic model include three categories: *outputs* (direct and immediate results of the program activities), *outcomes* (short and long-term changes in participants), and *impacts* (broader changes in the organization or community). At the program's conclusion, we can measure the outputs and short-term outcomes of the program, as we have done in the "Key Implementation Activities" section of this report and in past Interim Evaluation Reports. However, long-term outcomes typically take from four to six years to produce, and the broader impacts are typically expected in seven to ten years: both analyses take place long after the conclusion of the project. While we cannot predict the future, what we can do at the conclusion of the project is identify its aspects that were successful and made significant impact as well as point out problem areas that may need more attention moving forward. We can also examine some project off-shoots that may ultimately blossom into the positive long-term outcomes and impacts that the Richland team is hoping to achieve.

While acknowledging that these are by no means mutually exclusive categories, for clarity, we have organized the observations of this report into three broad categories: student, college, and community-related outcomes and impacts. We also discuss our observations on other factors that may affect the sustainability of the project moving forward.

Student Outcomes and Impacts

The "student" category offers the longest discussion of outcomes and impacts, which makes sense since improved experiences and trajectories for students were always the central mission of the VFETP grant. The logic model offers student outcomes that are quantitatively measurable: improvements in program completion and student retention, credential-earning and credit-earning, and securing and retaining employment. These alone are difficult targets to reach in three years, given the realities of academic scheduling and the sheer amount of time it takes for students to earn credentials. In the Student Outcomes Evaluation, we did not find evidence to support the efficacy of the TAACCCT program for Richland's MET students; among first-time Richland students who entered the program, only one out of the 50 who remained in the sample for two years was able to complete a certificate or degree. In quasi-experimental analysis, the only statistically significant difference between treatment (MET) and control (CIT) student outcomes was that the MET students earned nearly 3 fewer credits than the control group students. This lack of completion may be explained with differences in the curricula of the CIT programs, as well as the different speeds at which the programs were rolled out. It does raise the concern that Richland's MET students may not be able to complete the certificates and degrees in the two-years-or-less time span advertised by the program. Future attention should be paid to the one and two-year completion rates of new students: If these rates do not improve by Spring 2020, corrective action may be warranted.

Though the International Society of Certified Electronics Technicians (ISCET) credentialing has not found a market in the Dallas area, Richland had greater success with implementing the National Institute for Metalworking Skills (NIMS) program. Out of 178 NIMS tests administered to TAACCCT students, 139 were successful "passes" (a 78% pass rate). It appears that students who take the tests are largely prepared for them. This may be one factor explaining why MET students are not completing certificates and degrees at higher levels. Each of these NIMS tests represents a new credential for students, evidencing specific knowledge and skills. It may simply be that students gain what they need to participate in the job market upon successful completion of these national certifications. As noted in the second Interim Evaluation Report, roughly 85% of MET students surveyed saw certification as an important part of joining their occupation (Table 3), and more than half thought that employers paid more for people with certifications, and that employers preferred certifications for hiring and promoting workers (Table 4). Ranking the level of importance they placed on different elements and resources of the program, the opportunity to have a hands-on learning experience and the ability to easily get a stable high-paying job were more important to students than the ability to apply coursework toward an associate degree (Table 7). The ability to complete the program in less than a year was the least important feature. Simply put, it appears that students are more concerned with employment than they are with obtaining degrees or completing them quickly, and this may have affected the outcomes for the program on those fronts. In the program's application to the Department of Labor, and in interviews throughout the life of the grant, Richland faculty and staff expressed frustration that students were often lost to the high workforce demand of the job market; it is not clear that this situation has been remedied.

Richland has developed pathways for students, through the Advanced Manufacturing and Electronics program, in the form of certificates that nest into AAS degrees, and the school does offer some potential on and off-ramps to education for students who stop out for paid employment. The certificates are not fully nested: With the exception of the Electronics Technology Certificate, all other certificates include classes that cannot be applied to the AAS degrees. The progress toward degree completion varies by certificate. For example, Electronics Technology certificate holders are within 21 credits of AAS degree completion. A student who has completed the smaller Advanced Manufacturing and Design certificate will require 51 more credits to complete the Advanced Manufacturing AAS, while a student who has completed the longer CNC/CAD/CAM certificate will only require 26 more credits for an associate's degree. A student who completes the Mechanical and Electrical Maintenance certificate will require 48 more credits to complete the Electronics Technology AAS, despite completing one year's worth of college credits (32). In the future, if Richland wants to increase the number of certificate students transitioning over to academic degree programs, it may be beneficial to revisit the curriculum and consider ways for more of the certificate credits to be counted toward an AAS. Further pathway facilitation could also include formalizing more articulation agreements with four-year schools and aligning the program's curricula in a way that mitigates credit loss and applies some credits toward electives in bachelor's programs.

Prior learning assessment (PLA) is an additional strategy for building pathways through the programs, offering a chance for non-traditionally-aged students (who compromise the majority of VFETP students) to receive college credit for skills and knowledge acquired on the job. These assessments are a particularly valuable tool for workforce training-oriented programs like VFETP. Although PLA reform is currently being addressed at the District level, the use of a TAACCCT-originated program (the MoManufacturing WINS model) by the Dean adds a level of formality and standardization to a process that schools often approach on an ad hoc basis and is a reasonable interim step.

At the conclusion of the TAACCCT grant, veterans and their spouses had comprised about 1 in 10 TAACCCT students (approximately 9% of MET students and 12% of CIT students). Even though program staff reported feeling frustrated in their efforts to reach the veteran population, VFETP is ready and able to serve veterans in its content and selection of equipment. The few veterans we encountered reported that the program was veteran-friendly, in part due to the veterans' services office at Richland. It is difficult to ascertain with such small numbers whether these students will have better outcomes than their counterparts in other programs, but for the moment, it appears that the program is prepared to serve veterans and their spouses should greater demand arise.

College Outcomes and Impacts

The supplemental grant afforded Richland the opportunity to extend its engagement with employers, tailoring training to the sought-after skills valued by the local employer community. Through the *cognitive task analysis* (CTA), Richland was able to collaborate with employers to isolate the taken-for-granted knowledge of the more experienced workers, developing training modules to instill that knowledge into the new employees Richland was injecting into the job market. These kinds of efforts have great potential to address industry concerns about the "brain drain" caused by retiring older workers, to fill knowledge gaps in the workforce, and to give Richland graduates an advantage in the job market. The initial CTA process was limited and could be expanded, and in the future, it would likely benefit from some further administrative support to push the process along.

One final asset the program established in developing relationships with local employers was the career navigator position. The career navigators play a valuable role in shepherding students through the program and connecting the students and the program to local employers. They are students' guides, putting them in touch with appropriate wraparound services and ensuring that their schedules are designed appropriately. As the program shifts from grant to school funding, the career navigator role will increase to cover more programs and students; the addition of a second navigator helps to reduce these added pressures. In addition, the career navigators at Richland are serving as bridges to other student support resources within the school. The CTE/STEM Advising team, for example, provides additional academic advising services; the Veterans' Services group addresses the specific needs of that population; and the Working Wonders team provides wraparound services for disadvantaged students. The career navigators also serve as social connectors, which gives them an opportunity to work on building the programs' reputations with high schools and other potential sources of students, as well as with area employers.

The value of ISCET is unclear at this moment. Local employers do not seem to know much about it, and Richland students do not seem to see it as particularly important for their job prospects. The ISCET organization has not done very much to publicize the value of its credential in the area, and without that push, it is unlikely that the level of interest on the part of employers or students in this certification will change. However, NIMS has made greater efforts as an organization to increase its profile in the Dallas area, and Richland has been an important partner in those efforts. Students were interested in NIMS certifications and were succeeding at the NIMS tests. Whether these certifications lead to greater pay for area workers remains to be seen; it would likely happen as a long-term impact, and as such, this question is beyond the timeframe of this study. Future research attention toward this matter could be useful as Richland pushes forward with these certifications; as a testing center for NIMS, Richland stands out among local Manufacturing programs.

Community Outcomes and Impacts

The broader impact on the community is difficult to assess: Given the vast size of the area that Richland serves, the college is just one piece in a much larger puzzle. Unlike more isolated programs operating in smaller towns and cities, Richland is one of several programs aimed at training students to enter a large and booming industry in the large and booming DFW Metroplex. Richland's MET programs are not even the only Manufacturing training programs that the Dallas City Community College District operates. With the short timeline of this study, it is difficult to observe and measure the degree to which Richland was able to address workforce shortages in the Dallas area manufacturing and electronics industries.

It is certain, however, that Richland started a new workforce pipeline. The lab spaces that Richland installed are viewed positively by area employers and area students. The reputation of the TAACCCT-developed programs is excellent among employers who have experience working with Richland. The high regard for Richland is evident in ongoing collaborations with major area employers, which are entering new territory; some are beginning to set up apprenticeship and internship agreements with Richland as this grant concludes. At the start of the grant, Richland set a goal of prioritizing the directives outlined in the 2012 Texas Governor's Plan[13] for higher education and economic development. The goals for higher education included:

> To prepare individuals for a changing economy and workforce by providing an affordable, accessible, and quality system of higher education, and furthering the development and application of knowledge through teaching, research, and commercialization.

And for economic development, the goal priorities were:

> To provide an attractive economic climate for current/emerging industries, and market Texas as a premier business expansion and tourist destination that fosters economic opportunity, job creation, and capital investment by: promoting a favorable business climate and a fair system to fund state services; addressing transportation needs; maintaining economic competitiveness as a priority in setting policy; and developing a well-trained, educated, productive workforce.

The Richland MET and CIT programs address many components of these mandates by design and represent several of the industries targeted by the Governor's Texas Industry Cluster Initiative, offering the education and training support necessary to maintain and expand these industries. Without an adequate supply of qualified labor into these booming industries, the Dallas economy (which is currently in late expansion) is at a heightened risk of flattening growth and eventual recession. Efforts like the Richland MET and CIT programs' revision and expansion under TAACCCT can contribute to maintaining the economic boom Dallas has enjoyed since 2012.

Other Considerations for Sustainability

Linking grant efforts to wider college reforms was a smart strategy that worked well with the career navigators (whose roles influenced more general advising on campus) and the guided pathways reforms. Employer outreach is one area that could benefit from a similar but broader school-wide strategy; employing such a strategy would help to further develop, coordinate, and institutionalize Richland's existing employer outreach efforts

The state-of-the-art labs are beneficial, and fortunately, the majority of the investment in infrastructure upgrades is now a sunk cost. However, moving forward, these programs will require equipment maintenance and upgrades, which may eventually prove costly. Improved student outcomes (completion, retention, and job placement) would go a long way toward justifying these expenses. It will likely be a few years before these become major costs, and with the esteem the program currently enjoys among the employers with whom it has built connections, there are reasons to be hopeful that the program will gain steam in the next few years.

Now that the difficult work of building the program has been completed, Richland has considerable success to tout: showpiece labs, expanded faculty, new program offerings, greater student supports, and growing esteem in the community. The energy of these organizational successes must now propel the programs into the critical next phases: working to expand successful student outcomes.

APPENDIX A. RICHLAND COLLEGE (RLC) TAACCCT-EVALUATION LOGIC MODEL:
Veterans-Focused Engineering Technology Project (VFETP)

Inputs

Primary Financial Inputs
TAACCCT Funds

Funding from RLC & DCCCD for facility improvement & maintenance

Academic Inputs
Richland faculty & personnel

2 new faculty positions (Electronics, Manufacturing)

Pre-existing RLC programs in manufacturing & electronics technology

Pre-existing use of online modularized curricula (Mastercam University & Multi-Sim products).

Pre-existing strategies for contextualized remediation (Summer Bridge Program, Developmental Math, Writing Center, English Corner, Language Lab, ESOL)

Tutoring services (Learning Center, Science Corner, STEM Center, faculty requirements for tutoring support)

Student Services Inputs
General RLC student services & Veterans Affairs office

New navigator positions

RLC Communities
Workforce Programs:
-Transitions to Veterans Program (TVP)
-Workforce Solutions of Greater Dallas (WFS Dallas)
-Texas Workforce Commission (TWC)
-Texas Workforce Solutions (TWS)

Employer & industry representatives

NIMS & ISCET standards

Relationships with sister colleges throughout Dallas area (DCCCD), Community College Workforce Consortium (CCWC)

Relationships with Dallas Ind. School District (DISD)
TAACCCT Grantees

Activities

Install New Equipment & Technology for Classrooms/Labs
- Prepare physical program spaces.
- Integrate technology-enabled learning with new manufacturing/electronics & simulation equipment.
- Integrate use of online learning, including simulations.

Develop/Reform Curriculum Based on NIMS & ISCET Standards
- VFETP faculty enhance online modularized curricula with narrated video walkthroughs.

- Develop PLTL-based program for contextualized learning/remediation via peer instruction, starting with electronics.

-Add prior learning assessments to facilitate articulation of prior learning, such as noncredit courses and military experience.

Implement Student Navigator Model, Integrated with STEM/CTE Team, to serve Engineering Technology and CIT students
- Student navigator, Veterans Affairs, & Lakeside Counseling Center provide guidance & emotional/transition support for students.

- Student navigator provides intrusive advising & meets workers at Job Center to assist them through training programs & job placement.

Recruit Students, Esp. Veterans
- Design & implement marketing plan that includes general marketing & veteran-focused strategies.

- WFS Dallas qualifies TAA workers for services, informs qualified workers about VFETP, refers to student navigator/job developer at RLC, & maintains data on all VFETP students.

- Recruit through veteran-related CBOs, local Chambers of Commerce, & business councils.

- Track all VFETP students through RLC student management & TWIST systems.

Engage with Local Employers
- Topically focused EAC meetings
- Engagement with NIMS/ISCET certifying process
- Cognitive task analysis
- Develop co-ops and internships

Coordinate with the Public Workforce System & Align with Statewide Workforce Plans

Engage with Collaborating Institutions & Previously Funded TAACCCCT Grants

Outputs

Technology/equipment are used across programs.

Curriculum & resulting degrees & certificates are aligned with NIMS & ISCET competencies.

Stackable certificates in Electromechanical Maintenance, Advanced Design, SCADA

Enhanced services for CIT programs

Enhanced existing contextualized learning & remediation for VFETP

Organized process for using PLA through variety of strategies (CLEP exams, portfolio-based assessment, ACE Guides, DSST credit by exam, credit for military experience, & credit for life experience)

Increased # of students, particularly veterans & their spouses & children, entering advanced manufacturing & electronics programs, CIT programs

More engaged & supported students to promote retention & completion

Increase in number & activities of employers involved with programs

Outcomes

Participants complete program of study or are retained.

Participants complete credentials.

Participants earn credits.

Graduates find employment.

Graduates are retained in employment.

Graduates experience wage increases.

Increased presence of local manufacturing employers on campus

Students develop relationships with local employers.

Students have clear pathway to future education.

Demand met & future pipeline established for qualified workers to fill jobs in Dallas-area advanced manufacturing & electronics industry, computer and information technology.

Increased awareness among local employers about the VFETP program & its benefits

Students are ready & able to obtain associate-level CET certification or NIMS Machining Level I certification.

High school students receive technology endorsement.*

Impacts

Value of AAS degree enhanced by completion of certifications in demand by employers.

Participants continue along career pathways.

Long-term relationships with local business community established & maintained, increasing opportunities for students & for employers to fill workforce needs.

Contributing to community & economy by attracting growth for advanced manufacturing industry in the area; lower unemployment & less need for public assistance

Improved career trajectories & financial well-being of veterans & their spouses

Participants enrolled in future education.

Governor's Plan priority goals for higher education & economic development addressed.

* Not in DOL grant application but a college goal of this project. High school students enrolled in dual-credit option are not tracked by the evaluation

APPENDIX B. RICHLAND COLLEGE ENGINEERING TECHNOLOGY PATHWAYS

The Richland TAACCCT program was comprised of two subject areas: Engineering Technology (Electronics and Advanced Manufacturing) and Computer and Information Technology. Pathway reforms were limited to the Engineering Technology programs, and therefore we focus our curriculum review on these programs. At the conclusion of the grant, there are four TAACCCT-affected certificate programs currently in operation: the Advanced Manufacturing Certificate (CNC/CAD/CAM Certificate), the Electronics Technology Certificate, the Electromechanical Maintenance Certificate, and the Advanced Design Certificate. All four programs are advertised in the catalog as one-year programs, though it would be a very busy year; the semesters outlined go as high as 22 credits each. One additional certificate, Supervisory Control and Data Acquisition (SCADA) has been designed but not implemented. The school plans to use it in the Continuing Education program, so it will not be credit-bearing when implemented.

The CNC/CAD/CAM Certificate is 43 credits, all of which can be applied to the 60 credit Manufacturing AAS. To complete the AAS after earning a certificate, a student would need to take Engineering Graphics, DC Circuits, AC Circuits, an elective in Humanities/Fine Arts, English Composition I, and an elective in Social/Behavioral Science. In addition, the department site lists Skills Achievement Awards in CAD or CNC/CAM. Each of these is a subset of 9 specialty classes from the certificate/AAS program.

The Electronics Technology Certificate is 42 credits, all of which can be applied to the 60 credit Electronics Technology AAS. The Mechanical and Electrical Engineering Certificate is 32 credits, but includes 5 courses that do not apply toward the Electronics Technology AAS.

On the following pages, we present the requirements for these certificates and degrees.

Program: Engineering Technology
Degree Plan: CNC/CAD/CAM Certificate

(Level II Certificate) Richland only

		CREDIT HOURS
SEMESTER I		
INMT 1319	Manufacturing Processes	3
MCHN 1338	Basic Machine Shop I	3
DFTG 1309	Basic Computer-Aided Drafting	3
PHYS 1401	College Physics I	4
SPCH 1311	Introduction to Speech Communication **OR**	3
SPCH 1315	Public Speaking	(3)
MCHN 1326	Introduction to Computer-Aided Manufacturing (CAM)	3
MATH 1314	College Algebra **OR**	3
TECM 1341	Technical Algebra	(3)
		22
SEMESTER II		
MCHN 1352	Intermediate Machining I	3
DFTG 2332	Advanced Computer-Aided Drafting	3
DFTG 1345	Parametric Modeling and Design	3
MCHN 2338	Advanced Computer-Aided Manufacturing (CAM)	3
MCHN 2335	Advanced CNC Machining	3
HYDR 1345	Hydraulics and Pneumatics **OR**	3
ENTC 1391	Special Topics in Engineering Technology, General	(3)
MATH 1316	Plane Trigonometry **OR**	3
TECM 1317	Technical Trigonometry	(3)
		21

Minimum Hours Required 43

Program: Advanced Manufacturing/Mechatronics Technology
Degree Plan: Advanced Manufacturing and Design Certificate

(Level I Certificate) Richland only

		CREDIT HOURS
SEMESTER I		
DFTG 1309	Basic Computer-Aided Drafting	3
DFTG 1345	Parametric Modeling and Design	3
DFTG 2332	Advanced Computer-Aided Drafting	3
		9
SEMESTER II		
DFTG 2440	Solid Modeling/Design	4
DFTG 2335	Advanced Technologies in Mechanical Design and Drafting	3
		7
Minimum Hours Required		16

Program: Engineering Technology
Degree Plan: Electronics Technology Certificate

(Level I Certificate) Richland only

		CREDIT HOURS
SEMESTER I		
CETT 1403	DC Circuits	4
TECM 1341	Technical Algebra **OR**	3
MATH 1314	College Algebra	(3)
CETT 1429	Solid State Devices	4
DFTG 1309	Basic Computer-Aided Drafting	3
MCHN 1300	Beginning Machine Shop	3
		17
SEMESTER II		
CETT 1405	AC Circuits	4
CETT 1425	Digital Fundamentals	4
SPCH 1311	Introduction to Speech Communication **OR**	3
SPCH 1315	Public Speaking	(3)
TECM 1317	Technical Trigonometry **OR**	3
MATH 1316	Plane Trigonometry	(3)
		14
SEMESTER III		
INMT 1417	Industrial Automation	4
COSC 1436	Programming Fundamentals I	4
INTC 1307	Instrumentation Test Equipment	3
		11
Minimum Hours Required		42

Program: Engineering Technology
Degree Plan: Mechanical and Electrical Maintenance Certificate

(Level I Certificate) Richland only

		CREDIT HOURS
SEMESTER I		
TECM 1341	Technical Algebra **OR**	3
MATH 1314	College Algebra	(3)
CETT 1403	DC Circuits	4
HYDR 1345	Hydraulics and Pneumatics	3
INMT 1417	Industrial Automation	4
		14
SEMESTER II		
INTC 1457	AC/DC Motor Control	4
CETT 1405	AC Circuits	4
MFGT 2459	Industrial Automation II	4
INTC 1343	Application of Industrial Automatic Controls	3
INMT 2345	Industrial Troubleshooting	3
		18
Minimum Hours Required		32

Program: Advanced Manufacturing/Mechatronics Technology
Degree Plan: Advanced Manufacturing AAS

(Associate in Applied Sciences Degree) Richland only

		CREDIT HOURS
SEMESTER I		
INMT 1319	Manufacturing Processes	3
MCHN 1320	Precision Tools and Measurement	3
DFTG 1309	Basic Computer-Aided Drafting	3
MATH 1314	College Algebra **OR**	3
TECM 1341	Technical Algebra	(3)
SPCH 1311	Introduction to Speech Communication **OR**	3
SPCH 1315	Public Speaking	(3)
		15
SEMESTER II		
MCHN 1326	Introduction to Computer-Aided Manufacturing (CAM)	3
MCHN 1338	Basic Machine Shop I	3
DFTG 2332	Advanced Computer-Aided Drafting	3
MATH 1316	Plane Trigonometry **OR**	3
TECM 1317	Technical Trigonometry	(3)
+Elective	Humanities/Fine Arts	3
		15
SEMESTER III		
MCHN 1352	Intermediate Machining I	3
DFTG 1345	Parametric Modeling and Design **OR**	3
DFTG 2335	Advanced Technologies in Mechanical Design and Drafting	(3)
MCHN 2331	Operation of CNC Turning Centers	3
PHYS 1401	College Physics I **OR**	4
PHYS 1405	Elementary Physics I	(4)
		13
SEMESTER IV		
MCHN 2447	Specialized Tools and Fixtures	4
MCHN 2335	Advanced CNC Machining	4
INMT 2381	Cooperative Education-Manufacturing Technology/Technician **OR**	3
MCHN 1393	Special Topics in Tool and Die Maker/Technologist	(3)
ENGL 1301	Composition I	3
++Elective	Social/Behavioral Science	3
		17

Minimum Hours Required		60

Program: Engineering Technology
Degree Plan: Electronics Technology AAS

(Associate in Applied Sciences Degree) Richland only

		CREDIT HOURS
SEMESTER I		
DFTG 1309	Basic Computer-Aided Drafting	3
MCHN 1300	Beginning Machine Shop	3
CETT 1403	DC Circuits	4
TECM 1341	Technical Algebra **OR**	3
MATH 1314	College Algebra	(3)
		13
SEMESTER II		
ENGL 1301	Composition I	3
INTC 1307	Instrumentation Test Equipment	3
CETT 1405	AC Circuits	4
CETT 1425	Digital Fundamentals	4
TECM 1317	Technical Trigonometry **OR**	3
MATH 1316	Plane Trigonometry	(3)
		17
SEMESTER III		
INMT 1417	Industrial Automation **OR**	4
COSC 1436	Programming Fundamentals I	(4)
CETT 1429	Solid State Devices	4
HYDR 1345	Hydraulics and Pneumatics	3
PHYS 1401	College Physics I **OR**	4
PHYS 1405	Elementary Physics I	(4)
SPCH 1311	Introduction to Speech Communication **OR**	3
SPCH 1315	Public Speaking	(3)
		18
SEMESTER IV		
CETT 1357	Linear Integrated Circuits **OR**	3
CETT 2337	Microcomputer Control **OR**	(3)
ENTC 2380	Cooperative Education - Engineering Technology, General	(3)
+Elective	Social/Behavioral Science	3
++Elective	Humanities/Fine Arts	3
TECM 1349	Technical Math Applications	3
		12

Minimum Hours Required	60

APPENDIX C. SUPPLEMENTAL TABLES FOR STUDENT OUTCOMES EVALUATION

TABLE C-1. ONE- AND TWO-YEAR OUTCOMES OF FIRST-TIME STUDENTS IN CIT AND MET TAACCCT PROGRAMS

Number of students in CIT and MET				
Academic Outcome	CIT new students between Fall 2014 and Spring/Summer 2016 (N=294)		MET new students between Fall 2015 to Spring/Summer 2017 (N=114)	
	N	Cohorts Included	N	Cohorts Included
Total credits earned in one year	294	Fall 2014 to Spring/Summer 2016	114	Fall 2015 to Spring/Summer 2017
Immediate retention, if not graduated	276	Fall 2014 to Spring/Summer 2016	114	Fall 2015 to Spring/Summer 2017
Total credits earned in two years	294	Fall 2014 to Spring/Summer 2016	50	Fall 2015 to Spring/Summer 2016
Enrolled in more than two terms in two academic years	254	Fall 2014 to Spring/Summer 2016	49	Fall 2015 to Spring/Summer 2016

TABLE C-2. DISTRIBUTION OF COVARIATES AMONG FIRST-TIME TREATMENT (TAACCCT-TOUCHED) GROUPS AND CONTROL (PRE-TAACCCT CIT) GROUPS

Trait	Treated		Control	
	n	%	n	%
Sex				
Female	15	13.2	61	20.8
Male	99	86.8	233	79.3
Race				
White	48	42.1	105	35.7
African-American	24	21.1	60	20.4
Hispanic	22	19.3	58	19.7
Other	15	13.2	60	20.4
Not Reported	5	4.4	11	3.7
Financial aid				
Pell Recipient	12	10.5	27	9.2
Registration status				
Full-time student	25	21.9	82	28.1
Part-time student	89	78.1	210	71.9
Replacement Status				
Taking replacement course	33	29.0	12	4.1
Age				
Nontraditional student (25 and older)	72	63.2	170	57.8
Traditional student (Less than 25)	42	36.8	124	42.2
Total number of new students	***114***		***294***	

TABLE C-3. PROPENSITY SCORE MATCHING BALANCE CHECK FOR IMMEDIATE RETENTION OF TAACCCT STUDENTS AT RICHLAND

Outcome: Immediate Retention	**Logistic Regression**		**Standardized Difference**	
Covariates	**Coefficient**	**Standard Error**	**Pre-match**	**Post-match**
***Age* (ref: Non-traditional)**				
Traditional student	-0.14	0.26	-0.16	0.04
***Full/part-time student* (ref: Part-time)**				
Full-time	-0.34	0.31	-0.14	-0.05
***Race* (ref: White)**				
Black/African American	-0.22	0.34	0.01	-0.06
Hispanic	-0.35	0.34	-0.03	-0.03
Other	-0.76*	0.38	-0.20	-0.06
***Sex* (ref: Female)**				
Male	0.53	0.36	0.22	0.11
***Pell Status* (ref: No)**				
Pell Recipient	-0.72	0.51	0.05	0.01
***Replacement status* (ref: No)**				
Replacement courses	2.61***	0.43	0.73	0.00

*p<.05 **p<.01 ***p<.001

TABLE C-4. PROPENSITY SCORE MATCHING BALANCE CHECK FOR TOTAL CREDITS EARNED BY TAACCCT STUDENTS WITHIN ONE YEAR

Outcome: Total credit earned within one year	**Logistic Regression**		**Standardized Difference**	
Covariates	**Coefficient**	**Standard Error**	**Pre-match**	**Post-match**
***Age* (ref: non-traditional)**				
Traditional student	-0.07	0.26	-0.14	0.05
***Full/part-time student* (ref: Part-time)**				
Full-time	-0.36	0.30	-0.16	-0.07
***Race* (ref: White)**				
Black/African American	-0.20	0.33	0.02	-0.08
Hispanic	-0.30	0.33	-0.01	0.04
Other	-0.74*	0.37	-0.20	-0.10
***Sex* (ref: Female)**				
Male	0.46	0.35	0.20	0.04
***Pell Status* (ref: No)**				
Pell Recipient	-0.82	0.51	0.05	-0.02
***Replacement status* (ref: No)**				
Replacement courses	2.63***	0.43	0.73	0.00

*p<.05 **p<.01 ***p<.001

TABLE C-5: BALANCE CHECK FOR RETENTION OF TAACCCT STUDENTSS FOR LONGER THAN TWO TERMS

Outcome: Retained > two terms	Logistic Regression		Standardized Difference	
Covariates	**Coefficient**	**Standard Error**	**Pre-match**	**Post-match**
Age (ref: Non-traditional)				
Traditional student	-0.42	0.38	-0.26	0.08
Full/part-time student (ref: Part-time)				
Full-time	-0.12	0.43	-0.03	0.12
Race (ref: White)				
Black/African American	0.01	0.45	0.18	-0.06
Hispanic	-0.20	0.48	0.00	-0.03
Other	-0.92	0.59	-0.32	-0.04
Sex (ref: Female)				
Male	1.43*	0.69	0.43	0.15
Pell Status (ref: No)				
Pell recipient	-0.02	0.62	0.29	0.27
Replacement status (ref: No)				
Replacement courses	2.66***	0.53	0.85	-0.01

*p<.05 **p<.01 ***p<.001

TABLE C-6: BALANCE CHECK FOR TOTAL CREDITS EARNED WITHIN TWO YEARS

Outcome: Total credit earned within two years	Logistic Regression		Standardized Difference	
Covariates	**Coefficient**	**Standard Error**	**Pre-match**	**Post-match**
Age (ref: non-traditional)				
Traditional student	-0.29	0.37	-0.22	0.11
Full/part-time student (ref: Part-time)				
Full-time	-0.09	0.40	-0.04	0.02
Race (ref: White)				
Black/African American	0.00	0.44	0.17	-0.10
Hispanic	-0.19	0.46	-0.01	-0.09
Other	-0.89	0.58	-0.31	0.10
Sex (ref: Female)				
Male	1.48*	0.68	0.43	0.25
Pell Status (ref: No)				
Pell recipient	-0.25	0.61	0.25	0.19
Replacement status (ref: No)				
Replacement courses	2.71***	0.53	0.82	-0.03

*p<.05 **p<.01 ***p<.001

FOOTNOTES

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