



Vincennes University
Logistics Training and Education Center:
Final Evaluation Report

September 2016



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VU LTEC Final Evaluation Report

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EXECUTIVE SUMMARY

VU LTEC

The Logistics Training and Education Center (LTEC) Initiative was implemented to serve communities in Indiana's Economic Growth Regions 5 and 12, occupying nine counties in Central Indiana. The Initiative was funded by a four-year U.S. Department of Labor (USDOL) Trade Adjustment Assistance Community College and Career Training (TAACCT) grant totaling nearly \$3 million. At its inception in 2012, the Initiative aimed to prepare TAA-eligible workers and other participants for employment in the logistics industry. The intervention's purpose was to increase the number of qualified, employable candidates by providing them with increased opportunities to advance in their education and careers.¹

Many of the programs that LTEC focused on through this grant (i.e., Tractor-Trailer Driver Training, Fork-Lift Essentials, and Supply Chain Management), existed prior to the grant but required funding and investments for expansion and enhancement purposes. The remaining programs (i.e., Global Logistics Associate and Team Lead Essentials) were developed once the grant was awarded. The facility itself also existed prior to the grant because of investments made by community and employer partners (e.g., Town of Plainfield), but required funding to expand and develop the warehouse. The funds provided by USDOL and investments made by community partners made this expansion and enhancement possible.

This existing foundation afforded LTEC leadership, staff, and faculty the opportunity to utilize and enhance existing curriculum, expand the facility to include a state of the art warehouse, hire personnel, and purchase equipment currently used in the industry, expediting project start-up time. While project implementation was still a lengthy process due to the significant time required to launch a project such as the LTEC Initiative, the existing foundation provided LTEC with a framework from which to work.

Marketing and recruitment efforts began early in the grant, aided by the expedited project start-up time (see above), to increase awareness for the training programs. Individuals interested in LTEC received support from the Academic Advisor, faculty, and staff as they navigated initial assessment, enrollment, and post-program experiences. The following page identifies the ways participants moved through LTEC.

¹ The LTEC Initiative was designed based on USDOL-identified core elements, identified and defined in [Appendix A](#).



EXECUTIVE SUMMARY

VU LTEC Final Evaluation Report

<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Marketing and Recruitment</p>	<p>Marketing took place through billboards, brochures, websites, educational fairs, and wrapped trailers.</p> <p>Participants could enter into LTEC programs through a number of avenues including:</p> <ul style="list-style-type: none"> • Referrals from the workforce system; • Partnerships with local companies and funding agencies (e.g., FSSA and VOA); and • Word-of-mouth/walk-ins. 		
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Assessment</p>	<p>Once students expressed interest in LTEC programs, they were required to complete the following assessments:</p> <ul style="list-style-type: none"> • For academic programs, students were required to complete Accuplacer to measure math, reading, and writing skills. • For training programs, pre- and post-tests were implemented to measure initial skills and abilities as well as knowledge gained through the program. • The Tractor-Trailer Driver Training program plans to implement a skills assessment in the future. Currently, however, there are statewide requirements to obtain a permit prior to program enrollment (i.e., three tests are required to obtain a permit through the Bureau of Motor Vehicles in Indiana). <p>PLAs for individuals and military veterans with prior work experience</p>		
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Training</p>	<p>The following grant-funded programs and services were offered at LTEC:</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p style="text-align: center;">Academic Programs</p> <ul style="list-style-type: none"> • Supply Chain Logistics Management (30 credit hour certificate and 60 credit hour associate degree pathways) • Tractor-Trailer Driver Training (16 credit hours, 6 weeks) </td> <td style="width: 50%; vertical-align: top;"> <p style="text-align: center;">Training Programs:</p> <ul style="list-style-type: none"> • Global Logistics Associate (80 contact hours, online and in person) • Team Lead Essentials (12 contact hours in 6-session or 2-day format) • Fork-Lift Essentials (1 day, 6 hours for experienced participant and 2-day, 12 hours for beginners) </td> </tr> </table> <p style="text-align: center;">Support services available to students include the following:</p> <ul style="list-style-type: none"> • Academic Coach/Advisor-related tasks (i.e., résumé building, job searching, guidance throughout enrollment process, etc.) • VU Distance Education Advisors for students enrolled in online courses • VU Military Education Department for veterans • Student meetings with employers during class time • Learning Unlimited for tutoring and résumé building assistance • Job board (a free, local resource to students) • Soft skills incorporated into short-term training program courses 	<p style="text-align: center;">Academic Programs</p> <ul style="list-style-type: none"> • Supply Chain Logistics Management (30 credit hour certificate and 60 credit hour associate degree pathways) • Tractor-Trailer Driver Training (16 credit hours, 6 weeks) 	<p style="text-align: center;">Training Programs:</p> <ul style="list-style-type: none"> • Global Logistics Associate (80 contact hours, online and in person) • Team Lead Essentials (12 contact hours in 6-session or 2-day format) • Fork-Lift Essentials (1 day, 6 hours for experienced participant and 2-day, 12 hours for beginners)
<p style="text-align: center;">Academic Programs</p> <ul style="list-style-type: none"> • Supply Chain Logistics Management (30 credit hour certificate and 60 credit hour associate degree pathways) • Tractor-Trailer Driver Training (16 credit hours, 6 weeks) 	<p style="text-align: center;">Training Programs:</p> <ul style="list-style-type: none"> • Global Logistics Associate (80 contact hours, online and in person) • Team Lead Essentials (12 contact hours in 6-session or 2-day format) • Fork-Lift Essentials (1 day, 6 hours for experienced participant and 2-day, 12 hours for beginners) 		
<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Employment and Continuing Education</p>	<p>Once students completed the training and/or academic programs, there were a number of options including employment through the various partnerships that were established with LTEC for commitments to interview and internship opportunities. Additionally, students that completed the Supply Chain Logistics Management associate degree had the opportunity to continue their education at partnering four-year institutions through articulation and transfer agreements.</p>		



EXECUTIVE SUMMARY

VU LTEC Final Evaluation Report

In addition to participant services and training, LTEC also implemented the following:

- A partnership with First Book, a national book bank out of Washington D.C., to run product through a functioning warehouse – one of the few of its kind in the nation, as reported by LTEC leadership
- In-demand and relevant technology solutions (i.e., Voice-Pick, Pick-to-Light, and Radio Frequency Scanning) throughout the functioning warehouse
- Increased and intentional engagement with local companies, organizations, and educational institutions (e.g., creation of customized employer-driven Team Lead Essentials training to fill employer-specific needs)

Each element of the LTEC Initiative worked together to increase access to logistics career and training opportunities in Central Indiana.

PROGRAM EVALUATION

Vincennes University (VU) contracted with Thomas P. Miller & Associates, LLC (TPMA) to serve as an independent, third-party evaluator. TPMA, together with the Policy & Research Group (PRG), comprised the Evaluation Team. The evaluation's primary purpose was to assess the planning, implementation, and effectiveness of the intervention. The evaluation itself consisted of two components:²

Implementation Evaluation

The Implementation Evaluation began October 2012 and continued through March 2016 to document program progress, monitor program outcomes, and provide recommendations for continuous improvement of program operations. The Implementation Evaluation primarily focused on the training provided by LTEC, but also covered progress of all grant-funded initiatives. The Implementation Evaluation was primarily qualitative and included conference calls, in-person and phone interviews, document reviews, and pre-/post-participant assessment data. The Implementation Evaluation can be described in two parts – the formative, or ongoing analysis of the program, and the summative, or final cumulative program analysis.

Impact Evaluation

The purpose of the Impact Evaluation was to assess whether the implementation of specific TAACCCT-funded programs at LTEC had an effect on participants' short-term employment outcomes. The post-intervention outcomes assessed were employment status and quarterly wages earned in the first quarter after completion of a program. The programs that were assessed in the Impact Evaluation were the Fork-Lift Essentials (FLE) program and the Tractor-Trailer Driver Training (TTDT) program – both offered at LTEC. The Impact Evaluation included students who enrolled in these programs between April 1, 2013 and September 30, 2015.

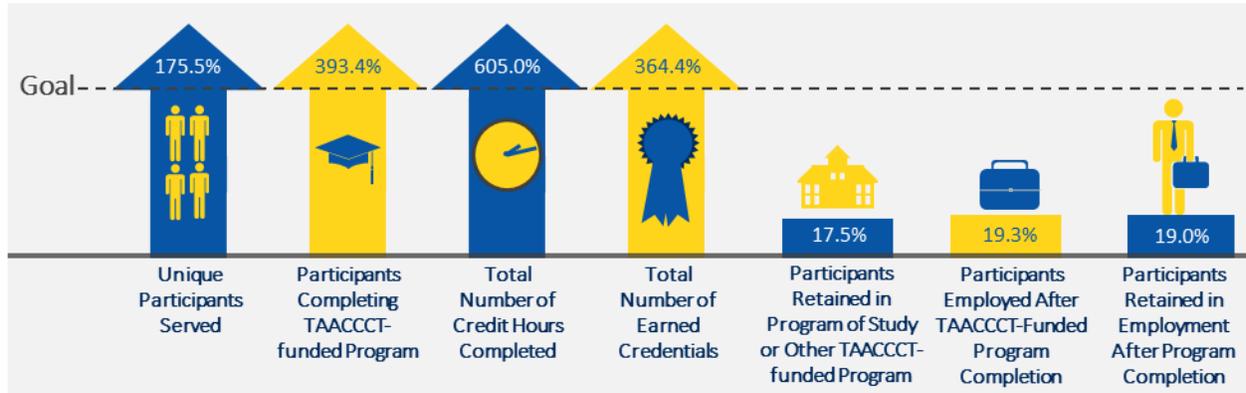
This Final Evaluation Report provides USDOL with evidence-based findings and lessons learned from LTEC, giving insight for future funding and program scaling decisions.

² For a detailed description of the methods used in the evaluation, see [Appendix B](#) and [Appendix C](#).



SUMMARY OF EVALUATION FINDINGS

Between October 2012 and March 2016, LTEC leadership developed and implemented an Initiative designed to increase the number of qualified, employable candidates in the logistics industry by providing them with increased opportunities to advance in their education and careers through a blended learning environment and reduced time to credential attainment. Outcomes from the grant, as identified by USDOL and highlighted in the *Program Outputs* section, are reflected below and highlighted throughout this section.



THEMES OF SUCCESSES

LTEC served nearly double the unique participants initially anticipated and nearly triple the number of earned credentials and participants completing a TAACCCT-funded program of study. Additionally, LTEC exceeded its goal five-fold in regards to the number of credit hours completed, which was over 1,000 by the end of Year 3.³ When examining LTEC’s Fork-Lift Essentials (FLE) program through a treatment-only pre/post design, the FLE program tended to enhance wages among those who participated in the program but did not improve the likelihood of employment itself relative to what was expected in the absence of treatment.⁴

Important themes around LTEC program success include:

Flexibility

The LTEC Initiative was designed to be flexible, to allow for adaptation in a variety of educational institution structures, employer needs, participant skill levels, and economic conditions. LTEC was able to implement programs that were flexible through use of block scheduling, open warehouse time, customizable employee training programs for different employers, and online components for accessibility. As the staff learned through trial-and-error, the methods of communication with employers were adjusted, programs were modified to better reflect the needs of participants and the region, and, as staff and faculty experimented with different approaches to employer engagement and participant training, the actual training offerings were different than anticipated.

³ See *Program Outputs* section.

⁴ Several sensitivity studies were conducted to assess the robustness of the impact estimates. These analyses tended to support the conclusions. See *Impact Evaluation* and *Appendix C* for more information.



EXECUTIVE SUMMARY

VU LTEC Final Evaluation Report

Innovation

LTEC's most significant objective was to implement an innovative blended learning environment that combines traditional, hands-on, and online learning to provide an all-encompassing approach to education. Because the facility targeted non-traditional students, their needs required innovative strategies that empowered students to directly apply classroom material in a meaningful way. LTEC staff emphasized that this model, as well as the development of short-term training programs, enabled students to receive industry-recognized credentials in a shorter amount of time. Students were also successful in the blended learning environment, showing knowledge gains from pre- to post-assessments within the programs⁵ and showing enhanced wages for participants in the FLE program.⁶ With the implementation and success of this structure, LTEC is now able to contribute to the evidence base surrounding the need for more innovative approaches to education, especially for non-traditional students.

Partner Investments

Partner investments from employers, community organizations, high schools and high school programs, educational institutions, the Town of Plainfield, and the USDOL TAACCCT grant enabled LTEC to enhance and expand the existing programs at the facility. Through the investments made, LTEC purchased up-to-date equipment, hired personnel, established a fully functional warehouse, and enhanced existing curriculum to reflect industry needs. Without the investments made by LTEC's partners, including the award of the USDOL TAACCCT grant, LTEC would not have been able to provide the competitive logistics training that is currently offered.

Sustainability

Early in the grant, LTEC focused on establishing a formal sustainability plan to guide future programmatic development and implementation. While this plan was continually revised to reflect changes in revenue and enrollment trends, the early focus on sustainability allowed leadership and staff to establish a goal-oriented approach to programmatic development. In other words, staff and leadership set tangible goals that ensured future sustainability of all programs and programmatic development was approached with these goals in mind. Because of this approach, all LTEC programs will be sustained beyond the grant⁷, including the possible addition of other programs (i.e., Industrial Maintenance).

THEMES OF CHALLENGES

Participant numbers fell below initial goals in areas tied to retention/pathway utilization and post-program tracking. Low outcome numbers within program retention and continuing education reflected the short-term training needs of students and employers. Participant numbers were low within post-program employment, employment retention, and post-program wage increases due, in part, to challenges associated with post-program data tracking.⁸ Data quality and availability also limited the Evaluation Team's

⁵ Average test scores for Fork-Lift Essentials, Team Lead Essentials, and Global Logistics Associate increased from pre- to post-assessment. See [Appendix F](#) for more information.

⁶ See [Impact Evaluation](#) and [Appendix C](#) for more information.

⁷ While all programs will be sustained beyond the grant, it is important to note that LTEC leadership anticipate focusing on the programs that bring in the most participants and revenue for the facility. All programs will continue to be offered but different programs will be targeted (e.g., TTDT).

⁸ See [Program Outputs](#) section.



EXECUTIVE SUMMARY

VU LTEC Final Evaluation Report

analysis for LTEC programs. For example, results indicated that the Tractor-Trailer Driver Training (TTDT) program did not have an impact on participants' short-term economic outcomes; however small sample sizes and the short duration available for examination post program completion may have constrained the evaluators' capacity to capture more medium and long term effects of TTDT program completion.⁹

Helpful background around LTEC program challenges include:

Recruitment and Retention

Recruiting students for and retaining students in LTEC academic programs was an ongoing challenge throughout the grant. Due to a number of challenges around marketing, lack of workforce system referrals, the avenues students were entering the program (e.g., employee training programs), and the recognition of student and employer needs for short-term training programs, recruiting and retaining students beyond their short-term training needs became difficult. Rather than continue into longer training programs and, subsequently, academic degree programs, students would enroll in LTEC to obtain a specific certification and either return to their current employer or find employment elsewhere. Students entering LTEC programs were typically looking to enter the workforce as quickly as possible, encouraging ongoing changes in how LTEC recruited and retained students. This trend was reflected in LTEC's outcomes with lower participant numbers seen in areas tied to program retention (outcome #3) where numbers were well below the goal of 200 participants. See *Program Outputs* section for more information.

Turnover

Throughout the course of the grant, LTEC experienced turnover in LTEC personnel, workforce system personnel, and employers. Personnel turnover was due, in part, to the challenges associated with finding qualified faculty and staff. LTEC leadership needed staff and faculty with industry and teaching experience, and faculty with program development experience – combinations that were challenging to find. Workforce system staffing turnover hindered progress in establishing relationships with WorkOne agencies. This ongoing obstacle made it difficult to recruit TAA-eligible participants as those individuals are normally referred by WorkOne agencies. Finally, employer turnover affected partner relationships, especially when there were transitions in LTEC's main points of contact. This loss resulted in delays as LTEC leadership and staff would have to locate a new point of contact and start the process of establishing a partnership over again. The general turnover experienced throughout the grant within the workforce system, employers, and LTEC personnel hindered programmatic progress.

Career Pathways

Establishing career pathways that move students through training and degree programs toward employment was a significant priority of the grant. While LTEC leadership drafted career pathways early in the grant, implementation of these pathways did not occur. This was due to a number of reasons including the recognition of student needs (to enter the workforce as quickly as possible through certification attainment) and the needs of employers (to certify current employees and hire individuals with hands-on work experience and certifications). This finding was reflected in TAACCCT outcome numbers around continuing education (outcome #7), where participant

⁹ Several sensitivity studies were conducted to assess the robustness of the impact estimates. These analyses tended to support the conclusions. See *Impact Evaluation* and *Appendix C* for more information.



EXECUTIVE SUMMARY

VU LTEC Final Evaluation Report

numbers only reached one third of the goal.¹⁰ LTEC leadership recognized early that their anticipated approach to career pathways with stacked and latticed credentials was not practical due to the student population participating in the grant. Throughout the grant, LTEC leadership examined different options and approaches for adjusting the pathways, finally deciding to serve the needs of employers and students through a shifted focus on short-term training programs during the grant.

Employer Coalition

In addition to employer turnover (listed above), LTEC progress was hindered by the lack of an ongoing, established committee of key decision makers from logistics companies interested in LTEC programs and partnerships. Initially, LTEC anticipated establishing an Employer Leadership Group (ELG) that would gather together to provide input on curriculum, identify skill and training needs, and discuss resource and partner opportunities. The meetings that were held – three in total – were reported as productive and beneficial meetings by LTEC leadership. However, because of scheduling constraints,¹¹ this group did not progress as anticipated and LTEC began reaching out to employers individually. While this revised approach yielded strong partnerships and opportunities to provide customized employee training programs, the lack of a strong coalition like the ELG decreased opportunities for efficiency¹².

BEYOND THE GRANT

LASTING EFFECTS

One of many findings within this evaluation report is projects like the LTEC Initiative take time to implement, to re-examine, and to improve upon. In the early stages of the Initiative, success and progress has been made toward increasing relevant and employable educational offerings in the logistics field. As the grant period concludes, LTEC leadership are sustaining current programs and pursuing partnerships and funding to continue growing LTEC's programs. Effects of the LTEC Initiative grant project are anticipated to continue through the end of the grant and beyond,¹³ including:

- Sustaining all training and academic programs as well as the warehouse and facility post-grant.
- Establishing additional partnerships (i.e., Toyota Material Handling) for employee training programs finalized post-grant that will likely expand in the future.
- Utilizing other funding streams and grants (i.e., potentially the Town of Plainfield, Department of Corrections, and Department of Transportation grants) to continue LTEC expansion and enhancement.
- Revising academic degree program options (see *Accelerators and Strengths* section) as well as the potential addition of programs (i.e., Industrial Maintenance).

¹⁰ See *Program Outputs* section for more information.

¹¹ Because LTEC targeted key decision makers from logistics companies, many of these individuals were in leadership positions, thus; constraining scheduling for group meetings.

¹² LTEC leadership attempted to incentivize ELG participation by offering one free seat in the Global Logistics Associate program. Despite being well-received in meetings, only one employer took advantage of that opportunity.

¹³ Quantitative analysis included within this report is as of June 2016. Training funds ended in March 2016 and all other grant funding ends in September 2016.



EXECUTIVE SUMMARY

VU LTEC Final Evaluation Report

Through the funding provided by USDOL, donations made by employers, and investments made by other partners, LTEC was able to successfully implement the LTEC Initiative and solidify a framework for future success.

REPLICATION STRATEGIES

Throughout the grant, LTEC leadership, staff, and faculty identified recommendations for an educational institution considering implementing programs similar to those at LTEC. These recommendations, at a high level, included¹⁴:

Remain Flexible – The needs of employers and students can change as the grant moves forward, so remaining flexible is critical in grant implementation. Staff should be aware of demand throughout the project to ensure sustainability and success of programs.

Focus on Sustainability – An early focus on sustainability enables staff to consider sustainable practices when making decisions regarding program development and implementation through development of program goals (i.e., enrollment and revenue). Setting sustainability goals early in the grant facilitates staff accountability and provides tangible goals to work toward. Challenges meeting these goals can then prompt adjustments needed for long-term success.

Early Planning – Implementing a grant project requires coordination of a number of different mechanisms including, but not limited to, establishing: onboarding policies and practices, clear communication expectations for program staff and faculty, a marketing approach, and a general implementation plan. Ensuring these plans, policies, and protocols are in place early in the grant is critical to successful implementation.

Consider Innovative Delivery Models – Consider the best delivery methods for the college's student body. For LTEC's non-traditional and technically-focused students, blended learning models better address student needs than traditional instruction (i.e., lecture style). Students are able to access content easily through the online components, integrate with traditional classroom content, and apply it directly through the hands-on component. This type of learning is also a draw for employers as students can learn applicable job training, saving companies on training time and money.

Hire Specialty Staff – Hiring staff at the beginning of program start-up allows a program to streamline and expedite business processes and operations. Additionally, this allows for specialization of staff roles early in the grant (e.g., database specialist, program coordinators, etc.), which can increase staff capacity and reduce program start-up time.

Engage the Community – Recognizing potential partners in the community (e.g., city councils, high schools, and other organizations) can be beneficial in generating community buy-in for educational programs, aiding in student enrollment, and program development and sustainability (e.g., through financial assistance). Establishing these partnerships early in the grant affords community partners the opportunity to participate in program design, development, and implementation, which can increase investment in the programs (i.e., increased investment through strong participation).

¹⁴ See [*Implementation Evaluation: Future Program Implementation*](#) section for more details.



FUTURE RESEARCH

A review of study findings and study limitations suggests several avenues for future research. The Evaluation Team has identified three areas where further research may yield greater insight into the effects of the TAACCCT-funded FLE and TTDT programs. These are: 1) whether a longer post-program observational window would reveal impacts of greater magnitude; 2) how and why FLE program completion appeared to impact wages but not the probability of employment; and 3) whether the results of models estimating employment impact for TTDT completers were driven by a small sample size.

While exploring additional research in this field of technical education, it is strongly recommended that additional exploration on the use of a mixed-methods approach be conducted, especially in regards to its usefulness in large-scale grant projects. Key information gathered through the formative Implementation Evaluation in this study was used to inform the Impact Evaluation design.¹⁵ Understanding real time changes to the program model allowed for increased relevance and applicability of design for impact-related analyses. However, in order to implement a successful mixed-methods strategy, a significant amount of time is required to collect data from both the implementation and outcomes/impact analyses.¹⁶ Future researchers could examine the effectiveness of this approach in greater depth, yielding more conclusive evidence on whether this approach is the best suited for large-scale, grant-funded projects.

¹⁵ See the *Informing Impact Evaluation* section for more information.

¹⁶ Creswell, J. (2009). *Research design: Qualitative, quantitative, and mixed-methods approaches*. SAGE: Thousand Oaks, CA. Retrieved by: <http://www.ceil-conicet.gov.ar/wp-content/uploads/2015/10/Creswell-Cap-10.pdf>



TABLE OF CONTENTS

Executive Summary	i
LTEC Initiative	2
Purpose and Scope.....	2
Grant Elements and Activities	2
Participant Flow.....	6
Logic Model.....	10
Evidence Base.....	11
The Evaluation	15
Implementation Evaluation	18
Design Summary.....	18
Findings Overview	19
Program Implementation.....	20
Program Elements.....	28
Student Progress	37
Program Partners	39
Beyond the Grant.....	42
Future Program Implementation	45
Impact Evaluation	50
Design Summary.....	50
Research Questions.....	51
Findings Overview	52
Conclusions	59
Lasting Effects of the Grant.....	59
Looking Beyond the Grant.....	59
Future Research Opportunities	61
Appendix A. USDOL-Identified Core Elements	63
Appendix B. Implementation Evaluation Methods	64
Research Questions.....	64
Data Sources and Collection.....	65
Analysis Methods	68
Limitations.....	69
Informing Impact Evaluation	70



REPORT CONTENTS

VU LTEC Final Evaluation Report

Appendix C. Impact Evaluation Methods	72
Introduction	72
Data Methods.....	77
Analysis Methods	85
Analytic Samples.....	100
Benchmark Analytic Results	103
Sensitivity Studies.....	105
Appendix D. Stakeholder Contributions	112
Appendix E. LTEC Program Descriptions	114
Appendix F. LTEC Pre-/Post-Assessment Trends	115



LTEC Initiative



LTEC INITIATIVE

PURPOSE AND SCOPE

In 2012, Vincennes University¹⁷ (VU) received a grant of \$2,931,354 through the U.S. Department of Labor (USDOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) program to fund the Logistics Training and Education Center (LTEC) Initiative. The purpose of LTEC was to prepare TAA-eligible workers and other participants for employment in the logistics industry. Ultimately, LTEC sought to increase the number of qualified, employable candidates by providing them with increased opportunities to advance in their education and careers. Those following the career path developed through the program would progress to middle-skill and high-skill jobs and earn higher wages. The TAACCCT grant provided an opportunity for the main campus to expand to Indianapolis, Indiana, where the logistics industry is most prevalent, to serve a larger number of students and carry out a comprehensive evaluation of program activities, outputs, and outcomes.

The LTEC Initiative served communities in Indiana’s Economic Growth Regions 5 and 12, occupying the Central Indiana counties of Boone, Hamilton, Hancock, Hendricks, Johnson, Madison, Marion, Morgan, and Shelby. See *Figure 1* for a map of these counties.

LTEC’s strategy for transforming its existing logistics education and training to more effectively meet the needs of TAA-eligible workers and employers in Central Indiana was twofold. First, a blended learning environment would be created by combining classroom instruction and online courses with a hands-on logistics lab that simulated the 26 million square feet of logistics companies surrounding LTEC. Second, the time to attainment of industry-recognized credentials would be compressed by embedding certifications into components of curriculum, developing a career pathway design, and providing rigorous academic and career guidance.

Figure 1: LTEC Service Area



Source: LTEC Technical Proposal

GRANT ELEMENTS AND ACTIVITIES

The core elements¹⁸ of the intervention were developed to build training and educational programs that meet industry needs. These elements, with associated activities explained below, included: 1) evidence-based design; 2) stacked and latticed credentials; 3) online and technology-enabled learning; 4) transferability and articulation; and 5) strategic alignment. For the progression and changes to these elements throughout the life of the project, see *Program Changes* section.

Evidence-based design – The primary objectives within this element were: 1) to create a blended learning environment by combining classroom instruction and online courses with a hands-on logistics lab; and 2) compress time to attainment of industry-recognized credentials by embedding certifications into components of curriculum, developing a career pathway design, and providing rigorous academic and career guidance. To begin to meet these objectives, a warehouse was developed and outfitted with in-demand technology solutions. LTEC also established a partnership with First Book, enabling the facility to function as a live warehouse. Warehousing activities were incorporated into the Global Logistics Associate (GLA), Fork-Lift Essentials (FLE), Tractor-Trailer

¹⁷ Vincennes University (VU) is referred throughout the evaluation report as the “main campus”

¹⁸ The referred to “core elements” were drawn from the USDOL-issued Solicitation for Grant Applications document. See *Appendix A* for definitions.



Driver Training (TTDT), Supply Chain Logistics Management, and Team Lead Essentials (TLE) programs to provide students with hands-on experience in the warehousing process. The GLA program also incorporated online components to enhance delivery methods within the program. In addition, LTEC staff moved academic programs fully online to accommodate student's flexibility needs and low academic program enrollment. The diversity in course delivery modalities, as well as the structure of the programs, allowed LTEC to meet the blended learning objective. While attempts were made to embed certifications into curriculum and develop career pathways, these methods were discontinued due to the shifting needs of the students and employers in the region. See the following section for more details.

Stacked and latticed credentials – Within this element, LTEC staff anticipated developing stacked and latticed credentials that would lead to specific career pathways. During the initial phase of the grant, LTEC staff worked to establish the Employer Leadership Group¹⁹ to determine the skill needs in the industry. However, as the grant moved forward, LTEC staff relied more heavily on individual partnerships with employers as establishment of the ELG did not progress. LTEC staff also anticipated partnerships with Purdue University to establish streamlined career pathways with stackable credentials. However, because articulation agreements with Purdue University were not able to be established and LTEC staff began to better recognize the needs of the students in the region, career pathways with stacked and latticed credentials were not feasible.²⁰ Additionally, following ongoing discussions with employers, short-term training programs were valued more than academic programs. While career pathways are still a priority for LTEC staff and leadership (i.e., degree options are available and advising services ensure employment), the focus on stacked and latticed credentials became irrelevant.

LTEC leadership determined that there were two populations of students enrolling in LTEC programs: 1) students interested in short-term training programs that expedite time back to the workplace, and 2) students that are looking to complete a degree (this group was much smaller than those requesting short-term training programs). It was uncommon to find students that wanted to start with a short-term program and continue into the degree programs. With this in mind, staff, faculty, and leadership focused on developing functional and practical short-term and degree programs to meet the needs of the students in the region and increase enrollment through relevant training and online degree options. LTEC was able to recognize the need to shift priorities, identify the needs of the adult learners enrolling in the programs, and target those needs through specific program offerings that allowed students to expedite the time to credential attainment.

Prior learning experience – While stacked and latticed credentials may not be as practical for LTEC, staff and leadership worked to establish formal prior learning agreements for those with military experience.²¹ LTEC worked with the Military Education department at the main campus to identify the top ten common Military Occupational Specialties that were logistics-related and determine how those overlapped with LTEC and main campus

¹⁹ See *Accelerators: Stakeholder Investments and Partnerships* for more information on the Employer Leadership Group.

²⁰ As indicated by Purdue, agreements were not established between Purdue University and LTEC due to the misalignment of course-level rigor found in LTEC's 100 and 200-level courses and Purdue's 300 and 400-level courses.

²¹ Prior learning experience was a sub-element within the stacked and latticed credentials core element, as identified by USDOL.



courses.²² Individuals with military experience could work with the Military Education Department to complete a prior learning assessment prior to entering LTEC and main campus programs. The recognition of military experience was already in place at the main campus but the formal agreement established with LTEC enabled staff to assess prior learning experience as it related to LTEC programs. Prior learning credit was also established for prior learning experience. Potential students could fill out the appropriate paperwork to determine if their prior working experience could articulate to credit.

Online and technology-enabled learning – Implementing technology-enabled learning was a significant priority for LTEC as the logistics industry has been shifting to more sophisticated technology solutions in recent years.²³ Throughout the grant, LTEC staff and faculty outfitted the warehouse with the latest technology, including Voice-Pick, Pick-to-Light, and Radio Frequency Scanning. The implementation of these solutions enabled the fully functioning warehouse to provide students with meaningful work experience.²⁴ LTEC courses were structured to allow students to apply traditional classroom content to hands-on experience through use in the warehouse.

Staff incorporated online learning into LTEC programs as well, notably for the academic programs. Because enrollment was low in academic programs, as most students were requesting short-term training programs, and students enrolled in these programs were already taking online courses, it was logical for LTEC staff to transfer all LTEC academic programs online.²⁵ Online components²⁶ were also incorporated into other programs (i.e., Global Logistics Associate) to increase accessibility and flexibility of the programs.

Transferability and articulation – To encourage students to continue their education at other four-year institutions, LTEC staff worked to establish transfer and articulation agreements with a number of local universities. These private institutions offered LTEC more flexibility with the courses that could transfer than other public institutions in the region. For all of the institutions, 60 credits were transferrable from the Supply Chain Logistics Management associate degree into degrees at the universities (i.e., Bachelors of Applied Science in Operations Management, Bachelors of Applied Management, and Bachelors of Science in Logistics and Supply Chain Management).²⁷ While the academic programs offered at LTEC had low enrollment, LTEC staff anticipate these transfer opportunities will be beneficial lest students wish to continue their

²² The VU Military Education Department has the capability to articulate any prior experience to credit, not just those that fall within the top ten Military Occupation Specialties.

²³ Employers and LTEC leadership identified enhanced and more sophisticated technology solutions as a need, as outlined in the original Technical Proposal submitted to USDOL.

²⁴ See [Partner Contributions](#) section for more information on the work experience provided to students in each LTEC program.

²⁵ The online programs were housed within the Distance Education Department at the main campus and offered through the Blackboard learning management system. Support services associated with online courses are outlined in the [Participant Flow](#) section.

²⁶ Pre-coursework was offered online for the Global Logistics Associate program. Additionally, the OSHA 10 General Industry certification was offered online within this program.

²⁷ Transfer and articulation agreements were established with the following institutions: Oakland City University, Trine University, and Embry-Riddle Aeronautical University.



education, especially for the LTEC academic program students, as they still have access to the articulation and transfer opportunities despite being housed at the main campus.²⁸

Strategic alignment – From the beginning of the grant, LTEC worked to establish partnerships with employers, organizations, workforce systems, education institutions, and high schools to encourage participation in LTEC development and implementation.²⁹

LTEC established partnerships with **employers and organizations** for equipment donations, curriculum input and feedback, identifying skill needs in the industry, establishing commitments to interview and internship opportunities, and customized employee training programs (i.e., programs for company employees to obtain additional certifications/training). One of the most notable partnerships established throughout the grant period was that with First Book, enabling LTEC to run a fully functioning warehouse.³⁰

Partnerships with **local high schools and high school programs** were established to send cohorts of students through customized LTEC programs. See *Partner Contributions* section for more information.

The **workforce system** was engaged to participate in marketing and refer students to LTEC programs. While there were challenges in engaging the workforce system³¹, LTEC staff consistently attempted to partner with WorkOne agencies to increase enrollment, notably Trade Adjustment Assistance (TAA) enrollment.

²⁸ The academic programs offered at LTEC are housed within the main campus's Distance Education department.

²⁹ For a complete list of stakeholder contributions, see *Appendix D*.

³⁰ See *Partner Contributions: First Book* for more information on the nature of this partnership.

³¹ For more information on the challenges associated with workforce system engagement, see *Barriers: Lack of Workforce System Referrals* and *Environmental Factors: TAA Regional Presence* sections.



PARTICIPANT FLOW

For the LTEC Initiative participants, LTEC leadership, staff, and faculty developed a series of marketing and recruitment strategies designed to guide participants to LTEC programs. Once enrolled, assessments, diverse training and academic program offerings, and a wide array of student support services were intended to increase retention in programs and subsequent completion. Relationships and connections with employers, and articulation and transfer agreements enabled participants to obtain employment or continue their education.

Figure 2 represents the marketing, recruiting, assessment, programs, and post-program opportunities for a participant going through an LTEC program.

Figure 2. LTEC Initiative Participant Flow

Marketing and Recruitment	<p>Marketing took place through billboards, brochures, websites, educational fairs, and wrapped trailers.</p> <p>Participants could enter into LTEC programs through a number of avenues including:</p> <ul style="list-style-type: none"> • Referrals from the workforce system; • Partnerships with local companies and funding agencies (e.g., FSSA and VOA); and • Word-of-mouth/walk-ins. 		
Assessment	<p>Once students expressed interest in LTEC programs, they were required to complete the following assessments:</p> <ul style="list-style-type: none"> • For academic programs, students were required to complete Accuplacer to measure math, reading, and writing skills. • For training programs, pre- and post-tests were implemented to measure initial skills and abilities as well as knowledge gained through the program. • The Tractor-Trailer Driver Training program plans to implement a skills assessment in the future. Currently, however, there are statewide requirements to obtain a permit prior to program enrollment (i.e., three tests are required to obtain a permit through the Bureau of Motor Vehicles in Indiana). <p>PLAs for individuals and military veterans with prior work experience</p>		
Training	<p>The following grant-funded programs and services were offered at LTEC:</p> <table border="0" style="width: 100%;"> <tr> <td style="vertical-align: top;"> <p>Academic Programs</p> <ul style="list-style-type: none"> • Supply Chain Logistics Management (30 credit hour certificate and 60 credit hour associate degree pathways) • Tractor-Trailer Driver Training (16 credit hours, 6 weeks) </td> <td style="vertical-align: top;"> <p>Training Programs:</p> <ul style="list-style-type: none"> • Global Logistics Associate (80 contact hours, online and in person) • Team Lead Essentials (12 contact hours in 6-session or 2-day format) • Fork-Lift Essentials (1 day, 6 hours for experienced participant and 2-day, 12 hours for beginners) </td> </tr> </table> <p>Support services available to students include the following:</p> <ul style="list-style-type: none"> • Academic Coach/Advisor-related tasks (i.e., résumé building, job searching, guidance throughout enrollment process, etc.) • VU Distance Education Advisors for students enrolled in online courses • VU Military Education Department for veterans • Student meetings with employers during class time • Learning Unlimited for tutoring and résumé building assistance • Job board (a free, local resource to students) • Soft skills incorporated into short-term training program courses 	<p>Academic Programs</p> <ul style="list-style-type: none"> • Supply Chain Logistics Management (30 credit hour certificate and 60 credit hour associate degree pathways) • Tractor-Trailer Driver Training (16 credit hours, 6 weeks) 	<p>Training Programs:</p> <ul style="list-style-type: none"> • Global Logistics Associate (80 contact hours, online and in person) • Team Lead Essentials (12 contact hours in 6-session or 2-day format) • Fork-Lift Essentials (1 day, 6 hours for experienced participant and 2-day, 12 hours for beginners)
<p>Academic Programs</p> <ul style="list-style-type: none"> • Supply Chain Logistics Management (30 credit hour certificate and 60 credit hour associate degree pathways) • Tractor-Trailer Driver Training (16 credit hours, 6 weeks) 	<p>Training Programs:</p> <ul style="list-style-type: none"> • Global Logistics Associate (80 contact hours, online and in person) • Team Lead Essentials (12 contact hours in 6-session or 2-day format) • Fork-Lift Essentials (1 day, 6 hours for experienced participant and 2-day, 12 hours for beginners) 		
Employment and Continuing Education	<p>Once students completed the training and/or academic programs, there were a number of options including employment through the various partnerships that were established with LTEC for commitments to interview and internship opportunities. Additionally, students that completed the Supply Chain Logistics Management associate degree had the opportunity to continue their education at partnering four-year institutions through articulation and transfer agreements.</p>		



The LTEC Initiative was designed to walk participants through a set of activities that would prepare them for employment in the logistics industry. Because previous education, employment history, and job readiness varied among participants, there was no standard timeframe for an individual to be involved in activities.

Marketing and Recruitment

There were multiple avenues from which a participant could be marketed and, thus, enter into an LTEC program. LTEC leadership reported that students entering LTEC programs typically came from some sort of funding stream (i.e., workforce funding, company funding, and high school/other organization funding). The specific avenues include:

Marketing

Participants could be marketed LTEC programs through brochures, billboards, websites, radio ads, educational fairs, and wrapped trailers that TTDT students drove, which advertised the programs at LTEC. There were three designs on six trailers with two targeting military veterans. These promotional materials briefly outlined LTEC's programs and stressed the importance and presence of the logistics industry in Central Indiana.

Recruitment

Workforce System Referrals – Participants could enter into an LTEC program just by coming into a WorkOne agency within the LTEC region and requesting training options in the area. WorkOne agencies could refer participants to LTEC programs based on their interests and TAA needs.

Partnerships with Local Companies and Funding Agencies – Employers could work with LTEC to develop customized training programs for their employees. These employers would then offer the program to the employees at no cost to allow the employees to advance in the company and/or further develop their skills. Additionally, employers distributed LTEC brochures to employees and advertised LTEC programs through posters in their facilities.

Funding agencies such as Volunteers of America (VOA) and Family Subsistence Supplemental Allowance (FSSA) for military veterans also referred individuals using their services to LTEC programs.

Word-of-Mouth/Walk-Ins – The third form of recruitment came from student walk-ins and word-of-mouth. LTEC leadership reported that this form of recruitment was fairly common as many of the students that completed LTEC programs would share their positive experience with peers, encouraging others to inquire. For students that simply walked into LTEC and inquired about program offerings, LTEC staff reported the ability to better promote LTEC programs through facility tours, in-depth program descriptions, and real-time assistance with applications.



Assessment

All potential program participants received some sort of assessment, which was administered by the main campus and/or LTEC staff. The purpose of the assessments was to review the student's work and educational background to:

- Determine if the student required remedial courses;
- Ensure the student was aware of the program's expectations (e.g., necessary skills and abilities, etc.); and
- Measure future knowledge and skill gains through the use of a post-test.

For the academic programs, students were required to complete the Accuplacer test to measure reading, writing, and math skills. Once this assessment was complete, students were either placed in college-level courses or remedial courses.

For training programs, pre-tests were administered by the faculty teaching those programs. For instance, the Global Logistics Associate, Team Lead, and Fork-Lift programs developed a pre-test to measure initial knowledge related to the programs. The Tractor-Trailer Driver Training program, however, currently does not have a pre-test but utilized the state requirement to have a permit prior to receiving behind-the-wheel instruction. The student had until the end of the first week of class to obtain their permit.³²

For military veterans and individuals with prior work experience, a prior learning assessment could be completed to determine if the individuals' experience could articulate to credit at LTEC. For more information, please see the *Prior Learning Assessment* section.

Training

The following academic and short-term training programs, and student support services are currently being offered and sustained at LTEC³³:

Academic Programs

The academic, for-credit programs offered at LTEC include:

Supply Chain Logistics Management – 30 credit hour certificate and 60 credit hour associate degree pathways for students. These courses are offered entirely online through the main campus's Distance Education department.

Tractor-Trailer Driver Training – a 16 credit hour, six week training program. Students receive a Class A CDL license upon passing the certification exam.

Training Programs

The short-term, non-credit training programs offered at LTEC include:

Fork-Lift Essentials – a one-day, six hour training for an *experienced* participant and two-day, 12 hour training for *beginners*.

³² The Indiana Bureau of Motor Vehicles requires an individual to pass three tests prior to obtaining a permit to drive a tractor-trailer.

³³ For program descriptions, see *Appendix E*.



Global Logistics Associate – a training program requiring 80 contact hours, offered with online and in-person components.

Team Lead Essentials – a training program requiring 12 contact hours in either a six-session or two-day format.

Student Support Services

To ensure students are receiving adequate support throughout their educational experience at LTEC, the following support and career services are provided through the main campus and LTEC:

- Academic Coach³⁴/Advisor-related tasks (e.g., enrollment responsibilities, résumé building, job searching, etc.)
- VU Distance Education Advisors for students enrolled in online courses³⁵
- VU Military Education Department for veteran support services
- Student meetings with employers during class time
- Learning Unlimited³⁶ for tutoring and résumé building assistance
- Job board (a free, local resource to students)
- Soft skills incorporated into short-term training program courses (e.g., time management, team building, and timeliness)

Employment or Continuing Education

Once students complete LTEC academic and/or training programs, they have two options:

1. Obtain employment in the logistics industry through the partnerships LTEC has established with local employers for internships and commitments to interview; or
2. Continue education to a four-year institution through the transfer and articulation agreements between LTEC and local, private universities.³⁷

³⁴ While the Academic Coach is no longer at LTEC, advising services are still provided through the staff that are available as well as through the Distance Education department on the main campus for students enrolled in academic programs.

³⁵ All students enrolled in the Supply Chain Logistics Management academic program (certificate or degree track) complete the program online; thus, receiving the support services from the main campus's Distance Education department.

³⁶ Learning Unlimited is a program offered at the main campus in collaboration with local libraries to help support students in academic programs. For more information, please see: <https://my.vinu.edu/web/distance-education/learning-unlimited>

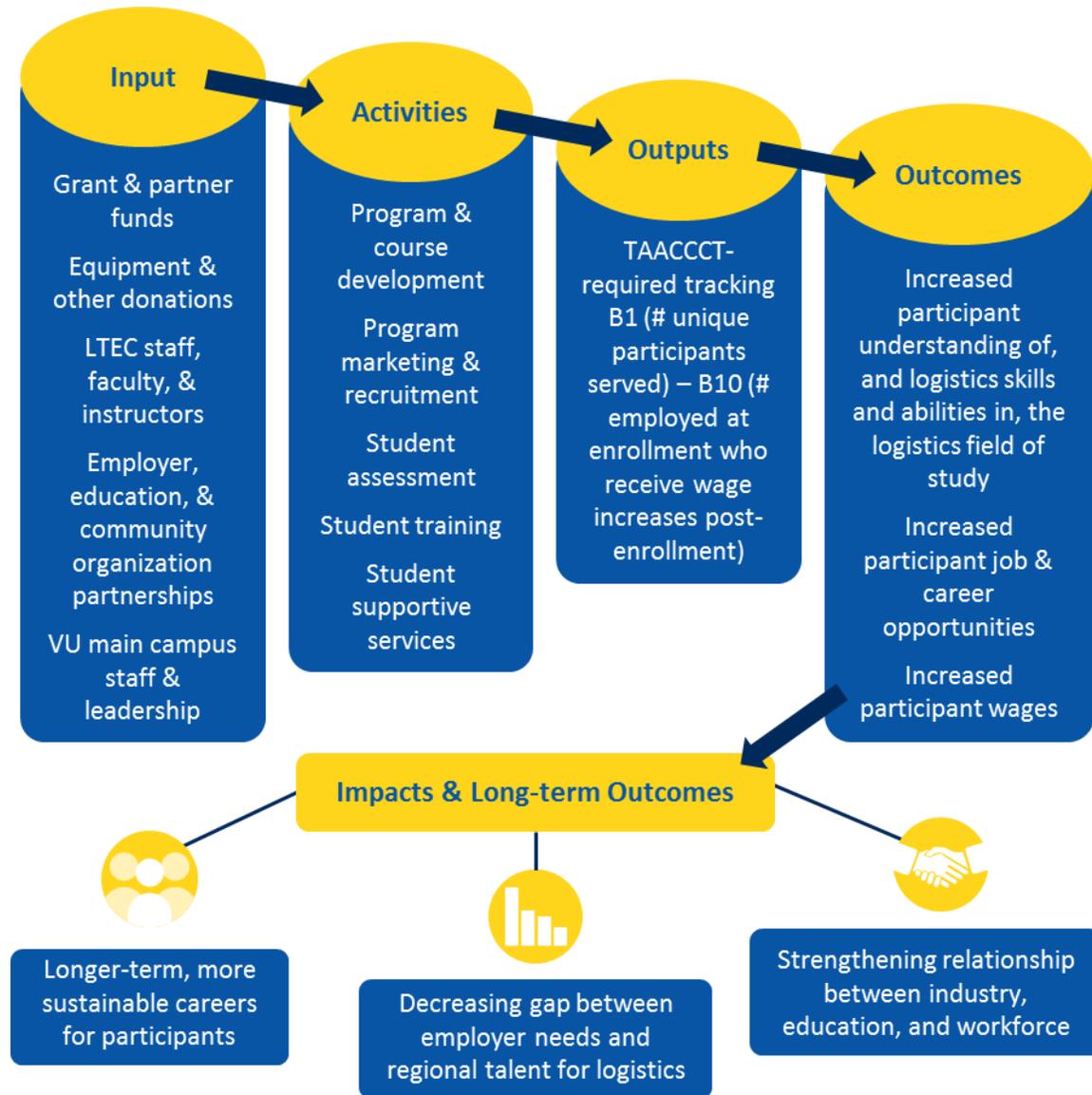
³⁷ See *Transferability and Articulation* section for more details on the agreements that have been established.



LOGIC MODEL

The logic model that follows in Figure 3 outlines the resources utilized, activities undertaken, target outputs, and program outcomes that resulted from the LTEC Initiative. The goal of LTEC was to increase the number of high-skill, high-wage workers in the logistics industry. This was accomplished by offering blended learning environments that incorporate online, hands-on, and traditional classroom content as well as short-term training programs to meet the needs of employers and students in the region.

Figure 3: LTEC Initiative Logic Model





EVIDENCE BASE

The activities that occurred under the LTEC Initiative represented an emerging strategy, one that brought together different learning models (i.e., online, traditional, and hands-on) to create a new hybrid model that had the support of businesses, Vincennes University (VU), and research on TAA-eligible and other non-traditional participants during the time of the grant application in 2012. The hybrid learning model was new to the region, especially within the logistics industry.

As a new and untested idea, the proposed strategy was based on evidence that there will not be enough logistics workers for the middle-skill and high-skill jobs in Central Indiana in the coming years. A number of employers in the region confirmed the need for more qualified employees, especially those that are TAA-eligible as these individuals are primarily employed in logistics industry positions.³⁸ This challenge in producing logistics workers was coupled with the belief that logistics training programs were not meeting the needs of employers in the area, which was also confirmed by employers in the region.³⁹

Given the evidence and assumptions, the Initiative's hypothesis to incorporate blended learning and expedited credential attainment⁴⁰ into the LTEC Initiative was based on the following:

- Blended learning environments increase persistence as well as achievement and attainment rates among students;⁴¹
- Fully online courses, especially for low-income, underprepared students may hinder student success so a blended learning environment is necessary;⁴²
- The creation of career pathways is widespread and has been recognized as a very promising strategy to link occupational and academic programs by offering students a clear direction toward employment;⁴³ and
- Existing research suggests that comprehensive and integrated designs to restructure education and institutional practices will have a positive impact – compared to traditional practices – on retention and completion for TAA-eligible workers.⁴⁴

With this evidence in mind, LTEC leadership designed the LTEC Initiative to incorporate blended learning models for reduced time to credential attainment to provide participants with clear and concrete benefits

³⁸ Drawn from original Technical Proposal submitted to USDOL and the Indiana Department of Workforce Development, *Indiana Trade Adjustment Assistance*. April 2012. <http://www.in.gov/dwd/2422.htm>

³⁹ VU and LTEC met with employers prior to the grant to determine the need of more qualified employees in the logistics industry, as outlined in the original Technical Proposal submitted to USDOL.

⁴⁰ See the *Program Changes* section for information on the changes that took place to the original project plan.

⁴¹ Ausburn, L. J. (2004). Course design elements most valued by adult learners in blended online education environments; An American perspective. *Educational Media International*, 41, 4. Retrieved by: <http://www.informaworld.com/smpp/ftinterface`content=a713721963`fulltext=713240930`frm=section>

⁴² U.S. Department of Education, Office of Planning, Evaluation, and Policy Development (2010). *Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies*. Washington, D.C. Retrieved by: <http://ccrc.tc.columbia.edu/Publication.asp?UID=796>.

⁴³ See example: Pathways in Oregon: A descriptive study of the statewide initiative and initial cohort of completers. (2013). *Community Colleges and Workforce Development*. Retrieved by <https://www.oregon.gov/ccwd/pdf/PATHWAYS/PathwaysDescriptiveStudy.pdf>

⁴⁴ Matus-Grossman, L & Tinsley-Gooden, S. (2001). Opening doors to earning credentials: Impressions of community college access and retention from low-wage workers. *Manpower Demonstration Research Corporation*, Washington D.C.



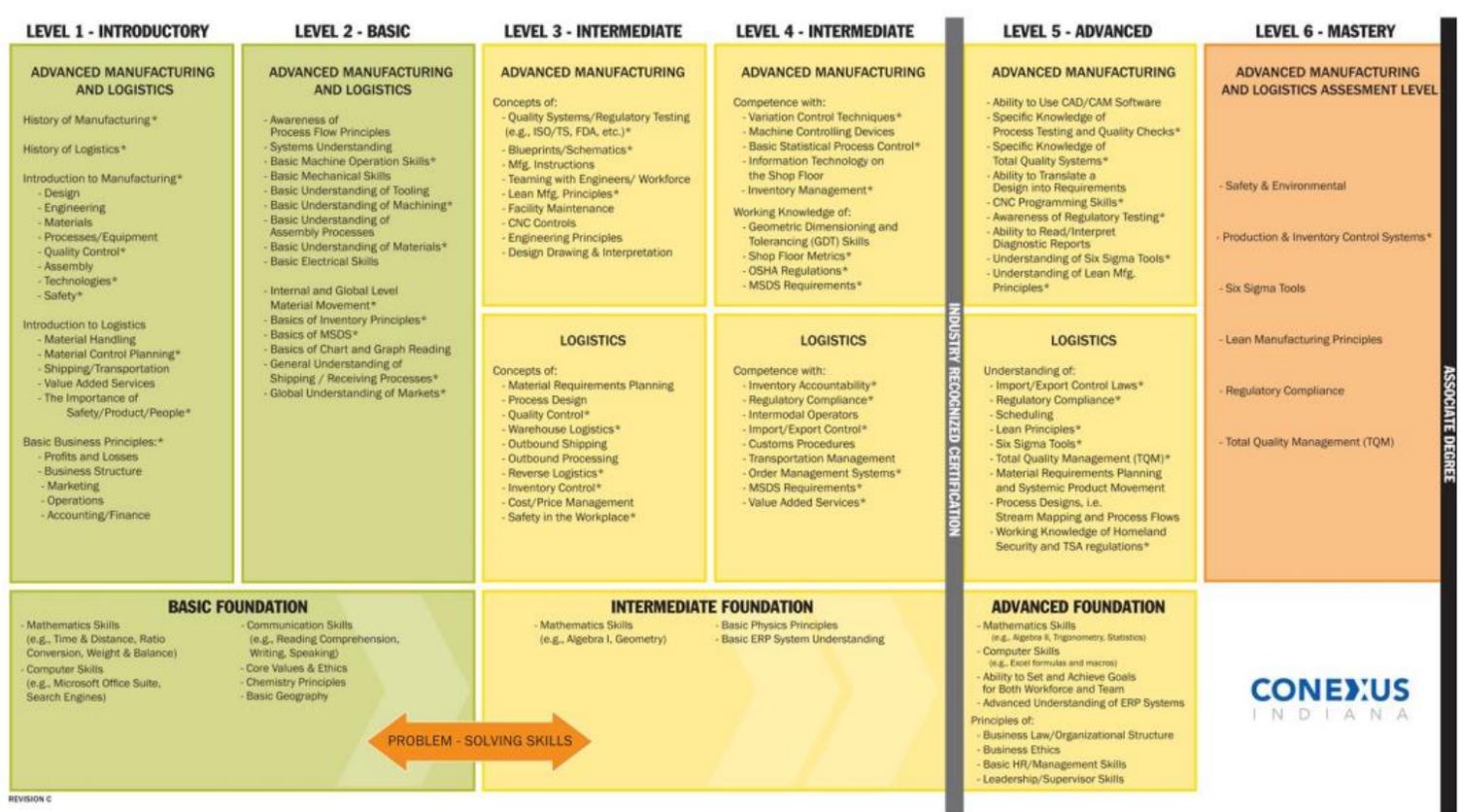
LTEC INITIATIVE

VU LTEC Final Evaluation Report

for completing training, through employment and increases in wages. The LTEC Initiative was designed to lead to better trained candidates who are able to retain or obtain jobs, advance, experience higher wages, and be more productive for their employers, notably in the logistics industry.

To understand the skills required in the logistics industry, the main campus utilized their partnership with Conexus Indiana⁴⁵ to conduct a number of studies, surveys, and reports identifying the skills, credentials, and certificates that would be best to implement at LTEC. Conexus Indiana assembled a group of 35 human resource and operation executives from companies across Indiana to determine the skills required for a successful middle-level logistics employee. The taskforce identified the highest demand positions, and then determined the knowledge required of successful employees in the area. The results, which were then validated by over 150 employers⁴⁶, were identified in the Indiana Logistics Skills Map below, Figure 4⁴⁷:

Figure 4: Logistics Skills Map



⁴⁵ Conexus Indiana is a private sector-led initiative focused on the advanced manufacturing and logistics sectors. For more details, see: http://www.conexusindiana.com/about_overview

⁴⁶ Information drawn from the original Technical Proposal submitted to USDOL.

⁴⁷ For more details, see:

http://www.themanufacturinginstitute.org/~media/01B547C80E854B17AC8783C3AF2D5415/Conexus_Advanced_Manufacturing_and_Logistics_Skills_Map.pdf



The main campus also partnered with the Hendricks County Economic Development Partnership to survey 21 logistics employers in Central Indiana on the topic of necessary skills for their workforce. The most common message from employers continued to be that students need more training on the use of the equipment and technologies used in the logistics industry.⁴⁸

As the intervention was developed, the following strategies, designed to align with USDOL’s core elements, were anticipated:

Table 1: LTEC Initial Strategies and Expected Impact within USDOL-Identified Core Elements

Core Element	LTEC Initial Strategy ³⁸	Expected Impact
Evidence-Based Design	Create a blended learning environment and compress time to attainment of industry-recognized credentials.	Increase persistence, achievement, and attainment of TAA-eligible students.
Stacked and Latticed Credentials	Partner with employers and industry representatives to identify the credentials that are most valuable and how the credentials can be made stackable and portable.	Stacked and latticed credentials will expedite participant time to credential attainment.
Online and Technology-Enabled Learning	Implementing hands-on, hybrid programs that allow students to use cutting edge technology as well as higher level electronics used in the warehousing and distribution environments.	Improved access to hybrid training programs will allow students to work around current work or family schedules, removing potential barriers to success.
Transferability and Articulation	Finalizing transferability and articulation agreements with four-year institutions to continue education and expedite time to completion.	Transferability agreements will ensure that students are able to retain their earned credits, which will lead to a compressed schedule of attainment of new certificates.
Strategic Alignment	Coordinating with employers and industry, the public workforce system, and education institutions and other organizations to assist/facilitate program development and implementation.	Coordinating with these entities will ensure industry-recognized credentials, continuing education opportunities, resources, and TAA-eligible participants.

⁴⁸ Information drawn from the original Technical Proposal submitted to USDOL.



The Evaluation



THE EVALUATION

Vincennes University (VU) contracted with Thomas P. Miller & Associates, LLC (TPMA) to serve as an independent, third-party evaluator. Within the evaluation there are two main components:

IMPLEMENTATION EVALUATION

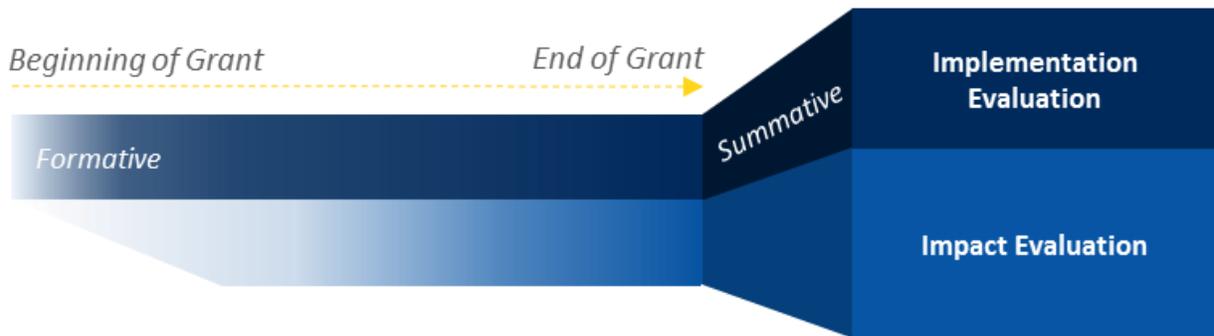
The Implementation Evaluation began October 2012 and continued through March 2016, to document program progress, monitor program outcomes, and provide recommendations for continuous improvement of program operations. The Implementation Evaluation primarily focused on the training provided by LTEC, but also evaluated progress of all grant-funded components. The Implementation Evaluation was primarily qualitative, including conference calls, phone and in-person interviews, document reviews, and pre-/post-participant assessment data. The Implementation can be described in two parts – the formative, or ongoing analysis of the program, and the summative, or the final, cumulative program analysis.

IMPACT EVALUATION

The purpose of the Impact Evaluation was to assess whether the implementation of specific TAACCCT-funded programs at LTEC had an effect on participants' short-term employment outcomes. The post-intervention outcomes assessed were employment status and quarterly wages earned in the first quarter after completion of the program. The programs that were assessed in the Impact Evaluation were the Fork-Lift Essentials (FLE) program and the Tractor-Trailer Driver Training (TTDT) program - both offered at LTEC. The Impact Evaluation included students who enrolled in these programs between April 1, 2013 and September 30, 2015.



Figure 5: Formative and Summative Evaluation



The formative Implementation Evaluation was conducted throughout the delivery of the LTEC Initiative. Through this evaluation, the Evaluation Team documented program progress, successes, challenges, and provided ongoing recommendations to LTEC staff. Additionally, the formative Implementation Evaluation provided context for the Impact Evaluation by documenting the timing and nature of adjustments to program design. The Impact Evaluation used this documentation to understand whether changes to the program might impact various participants.

At the conclusion of the evaluation, and presented within this report, are the findings from the summative (cumulative) Implementation Evaluation and Impact Evaluation.



Implementation Evaluation



IMPLEMENTATION EVALUATION

DESIGN SUMMARY

The Implementation Evaluation began October 2012 and continued through March 2016 to document program progress, to monitor program outcomes, and to provide recommendations for continuous improvement of program operations. The Evaluation Team conducted a formative and summative evaluation, primarily focused on the training provided by the Logistics Training and Education Center (LTEC). Because LTEC's purpose was to train participants for high-skill, high-wage jobs in logistics, the Implementation Evaluation proved to be a key element in establishing lessons learned to enhance program implementation and results in real-time. Evaluation feedback was provided through analysis of the following primary themes:⁴⁹

- Progress toward achieving certain program outcomes or milestones
- Program accelerators and barriers
- How unsuccessful strategies or activities could be adapted or modified to the realities surrounding the project
- Context for sustaining certain project activities

To gather information on the themes above, the Evaluation Team used a combination of conference calls, phone and in-person interviews, and program artifact reviews including:⁵⁰

- Monthly implementation update calls with LTEC leadership
- Phone and in-person interviews with LTEC leadership; LTEC staff, faculty, and instructors; regional employers; and LTEC participants⁵¹
- LTEC documents and artifacts, including quarterly program reports, annual performance reports to USDOL, program-related brochures, and other documents
- Pre-/post-participant assessment data

The Implementation Evaluation allowed the Evaluation Team, LTEC leadership, and LTEC staff, faculty, and instructors to better understand the program's core activities and the outputs produced by each activity. The analysis qualitatively evaluated how the operations of LTEC functioned (before and through the grant), placing the outcomes of the intervention into context with the implementation process and determining whether the program was implemented as designed. This allowed the Evaluation Team to uncover potential threats to the validity of the study⁵² and helped program staff understand how the process might be modified to produce better results.

⁴⁹ For a description of analysis methods and data sources, see [Appendix B](#).

⁵⁰ [Appendix B](#) contains descriptions of each Implementation Evaluation data source. Triangulating results from these varying sources was used as an attempt to address the limitation of partial and biased findings.

⁵¹ The Evaluation Team used purposive and convenience sampling for employer and participant interviews coordinate by LTEC leadership. See [Appendix B](#) for a discussion on various limitations to the study.

⁵² See the [Appendix B: Informing Impact Evaluation](#) section.



FINDINGS OVERVIEW

Findings for the Implementation Evaluation were grouped by research question themes. Every Implementation Evaluation research question is represented within this section. Overall themes within the Implementation Evaluation findings include:

Balance of Student Needs and Programmatic Development	An ongoing success and challenge throughout the project was the balance of student needs and programmatic development. Initially, LTEC leadership anticipated heavy development in academic programs with career pathways. However, as the grant progressed, LTEC began to better recognize the needs of students and the kinds of programs that employers were valuing, which led LTEC to focus more on short-term training program implementation. While these short-term programs resonated with the students and employers, LTEC leadership ensured that academic program options were available to encourage continuing education and degree attainment, a focus of the main campus. This balance between the needs of the students, the needs of employers, the needs of the main campus, and programmatic development was critical and afforded LTEC the opportunity to offer relevant and in-demand programs.
Importance of Stakeholder Engagement	Success within the grant was relationship-driven. LTEC leadership, staff, and faculty needed to have, or build, close relationships with employers, educational institutions, and the workforce system to gain meaningful investments and partnerships in order to provide adequate and relevant training. LTEC leadership relied on close connections with employers to facilitate programmatic developments through equipment donations, established internships, and commitments to interview student program completers. While partnerships with the workforce system were difficult to establish, LTEC leadership recognized early that project success came easier when employers, educational institutions, and the workforce system bought into the grant early and were aided when there were existing industry collaborations or strong company needs.
Capacity Building	The TAACCCT grant allowed LTEC leadership, staff, and faculty to experiment with programming innovations. While elements of these innovations will last, including the blended learning environment and presence of short-term training programs; even more-so, the impact will be on the capacity of LTEC to support and enhance program offerings moving beyond the grant. Grant-funded activities that contributed to the capacity building of the facility are detailed in the <i>Implementation Evaluation: Beyond the Grant</i> section and include: demand-driven approach, stronger employer relationships, credential attainment, blended learning environment, state of the art warehouse, refined and focused programs, and logistics industry understanding.
Flexibility	An overarching theme throughout the project was the struggles associated with, and the benefits of, flexibility. The LTEC Initiative was designed to be flexible and adaptable through the blended learning environment incorporating traditional, online, and hands-on delivery models, allowing each student to customize their educational experience at LTEC. With this flexibility, however, came challenges of coordinating classes and increasing enrollment. LTEC leadership attempted to hire faculty and instructors to teach programs and recruit students but accommodating all student needs through online, traditional, and varied schedule offerings (i.e., evening and longer classes) was reportedly difficult. However, it was through this struggle with flexibility that LTEC leadership, staff, and faculty were able to create real-time program innovations and customized employer-specific training approaches.



PROGRAM IMPLEMENTATION

The content within this section of findings focuses on research questions grouped around the common elements of program implementation. These findings discuss the overall grant rollout, changes, and program outputs.

Research Questions

- What LTEC program implementation has taken place to date?
- How were training strategies developed and implemented?
- How can program processes, tools, and/or systems be modified to improve performance?

Annual Activities

Year 1 (October 1, 2012 – September 30, 2013)

Logistics Training and Education Center (LTEC) staff dedicated the first year to administrative tasks such as program development and staff hiring. The number of LTEC staff from the beginning of the grant through Year 1 increased five-fold, with the Director hiring a Project Manager, Grant Fiscal Analyst, Academic Advisor, and faculty member. These staff facilitated initial discussions around sustainability, marketing, recruitment, and course/curriculum development and implementation.

LTEC staff worked from the existing facility and programmatic foundation to develop or enhance pre-existing logistics-related courses in Year 1. The increased capacity from the additional staff allowed LTEC to begin the shift to hybrid teaching models for courses/programs that already existed at the facility (i.e. Fork-Lift Essentials). This model, which would eventually be adapted to all logistics-related courses/programs, introduced students to classroom material and reinforced that material through hands-on warehouse work.

A major activity in Year 1 was the establishment of a contract with First Book, which generated a profit to aid in future sustainability of LTEC programs. Additionally, students were required to assist in the warehouse, allowing them to gain meaningful experience that could increase their marketability to employers. See *Partner Contributions* section for more information on this partnership.

Year 1 saw fewer referrals from and connections with the workforce system, despite attempts to connect with WorkOne agencies about the programs and access to participants. LTEC staff presented at WorkOne facilities to improve awareness of the opportunities at LTEC but did not receive any referrals or responses to the presentations afterward. To counteract the lack of referrals, LTEC staff focused on the establishment of the Employer Leadership Group, making connections with local industry employers. The Employer Leadership Group (ELG) was designed to encourage input and feedback on curriculum development and program pathways, equipment donations, and hiring commitments. While there were delays in ELG development due to scheduling challenges, LTEC leadership continued attempts to bring employers together in a formal setting.

Following program start-up, LTEC staff began to recognize the challenges associated with operating at a different location than the main campus – Vincennes University (VU)⁵³. The distance created disconnect, limiting LTEC's ability to leverage VU's relationships, partnerships, and influence throughout the project. LTEC continually reported challenges (i.e., receiving approval for hiring and spending/reallocating funds) in

⁵³ Vincennes University is located more than 100 miles away from LTEC in Vincennes, Indiana (southwest Indiana).



locating points of contact and expediting internal processes throughout the grant due, in part, to the distance between campuses. While the main campus and LTEC attempted to alleviate these challenges in the following years of the grant, LTEC staff recognized that the distance between LTEC and the main campus would likely always facilitate some form of disconnect.

Year 2 (October 1, 2013 – September 30, 2014)

The second year of the grant included a variety of program development and implementation activities. Many of the activities that were being developed in Year 1 launched in Year 2 including the Employer Leadership Group, which held meetings in May and September 2014. The meetings served as a way to introduce LTEC programs and determine how employers could best engage with LTEC moving forward. The launch of the First Book within the LTEC warehouse also occurred in Year 2, providing a work-based learning component to students. LTEC staff also developed a sustainability plan that accounted for expected revenue generated by the First Book and other training programs.

Enhanced and expanded academic and training programs⁵⁴ were launched at LTEC, including Global Logistics Associate (GLA) and Team Lead Essentials (TLE) training (non-credit) programs as well as Supply Chain Logistics Management (for-credit) program. Budget modifications to add the Tractor-Trailer Driver Training (TTDT) training program was submitted to USDOL for approval in Year 2. Additional faculty were hired to instruct the academic and training programs and an online registration software – Aceweb – was purchased to streamline the student registration process. This software allowed students to view course schedules, register, and pay for training courses online.

LTEC staff focused on implementing technology solutions in July 2014, including Voice-Pick, Pick-to-Light, and Radio Frequency (RF) Scanning capabilities. These technology solutions, a significant objective of the TAACCCT grant, afforded LTEC with the capacity to generate revenue from the First Book partnership for program sustainability, provide students with hands-on experience, and become more competitive in logistics education. To increase awareness of these opportunities, LTEC staff launched a billboard campaign with eight different billboard designs at 24 different locations.

Finally, LTEC staff continued to reach out to the workforce system to increase awareness of LTEC programs and increase the number of student referrals. Connections were made with the Marion County WorkOne to establish a cohort of students to complete the Global Logistics Associate Training certificate, EmployIndy to attend Rapid Response events, Vocational Rehabilitation, and the Director of Dislocated Workers to explore ways to reach out to TAA-eligible participants. Despite these connections, however, LTEC received few referrals from the workforce system.

⁵⁴ Many of the academic and training programs offered at LTEC existed prior to the grant but were enhanced and expanded through grant funds with updated equipment, updated curriculum, and additional personnel.



Year 3 (October 1, 2014 – September 30, 2015)

By Year 3 of the grant, LTEC staff targeted streamlining programmatic components and expanding partnerships with local employers, organizations, four-year institutions, and high schools/high school programs. These partnerships resulted in articulation and transfer agreements, donated equipment, employee and high school student training cohorts, and internships.

The fully launched Tractor-Trailer Driver Training (TTDT) program was a significant accomplishment in January 2015, with the TTDT program enrolling nearly 70 students by the end of Year 3. The rapid growth of the program contributed to the expansion of classroom space through the addition of a mobile teaching space containing one classroom, computer lab, and offices; warehouse capabilities through equipment donations; and student enrollment through the significant student interest in the program.

TTDT program faculty and a CDL Coordinator were also hired to instruct courses in this program, recruit students, and purchase equipment. Although staff and faculty turnover occurred in Year 3, additional staff and faculty were hired to fill the gaps.

LTEC leadership attempted to hold additional ELG meetings in Year 3 but were unsuccessful due to scheduling conflicts by employers. The meetings that were held – three in total – were reported as productive and beneficial by LTEC leadership. Despite attempts to incentivize participation by offering one free seat in the GLA program, ELG did not progress. Rather, LTEC leadership began reaching out to employers individually to establish partnerships, generating greater buy-in and investments through this approach.

Extension (October 1, 2015 – March 30, 2016)

LTEC continued with program implementation during the extension of the TAACCCT grant. LTEC staff continued to make significant changes to the programs, career pathways, and delivery models to ensure future sustainability of the programs moving forward. Unique successes that occurred during the extension included:

- Additional faculty turnover and hiring;
- Partnerships with local employers for employee training (i.e., Amazon and Toyota⁵⁵);
- Ongoing consideration of the sustainability plan including revisions made to the original plan; and
- Continued replication and enhancement of the LTEC programs, curriculum, warehouse process flow, and delivery models.

⁵⁵ The partnership with Toyota was finalized post-grant but contributed to sustainability of LTEC programs through the establishment of customized employee training programs and donated equipment.



Program Changes

As highlighted in the Implementation Evaluation narrative above, throughout the course of the grant, changes and adjustments were made to the original project model. Reflecting on the original project design created for the grant application, several adjustments were made to account for actual program roll-out and implementation. These adjustments were modifications to grant concepts/activities, which are outlined in Table 2.

Table 2. LTEC Program Changes and Associated Rationale

Item (Change)	Rationale
Programmatic Development	
Stacked and Latticed Credentials <i>(removed)</i>	While establishing career pathways with stackable and latticed credentials was a core element of the grant, LTEC staff recognized early in the grant that this strategy would not meet the needs of the students enrolling in LTEC programs. Initially, staff developed career pathways with specific stacked and latticed credentials but students were not interested in following a pathway. Most students fell into two categories: <ol style="list-style-type: none"> 1. <i>(Most common)</i> Students interested in short-term training programs so they can reenter the workforce as quickly as possible; and 2. Students interested in associate degree programs Because of this, LTEC staff discontinued the development of stacked and latticed credentials until significant student interest is generated, which will likely be post-grant.
Compressed Time to Credential Attainment Strategies	Part of the initial plan to compress time to credential attainment was through embedding certifications into curriculum and creating career pathway designs. While career pathways maps and plans to embed certifications into curriculum were developed during the initial stages of the grant, as the grant progressed, LTEC leadership began to better recognize the “types” of students that were entering LTEC programs (see above). LTEC leadership determined that students entering the programs were targeting specific training (i.e., TTDT and FLE) rather than pathways. LTEC leadership focused on short-term training programs to meet these needs; thus, shifting focus from the strategies within the core element of compressing time to credential attainment. Rather, this objective was met through the establishment of short-term training programs. These programs still compressed time to credential attainment, but in a way that was not originally envisioned.
Target Academic and Training Programs <i>(added)</i>	During the initial stages of the grant, LTEC staff anticipated focusing on the establishment of academic pathways with industry-identified certification programs implemented to supplement the pathway and create stack-ability. However, as the grant progressed, staff recognized that academic programs were not as “in-demand” as short-term training programs. Because of this, LTEC staff began to focus on refining the short-term training programs, as students and employers identified interests in those areas. To further meet the needs of students and employers, LTEC added an existing TTDT to the grant-funded



IMPLEMENTATION EVALUATION

VU LTEC Final Evaluation Report

	programs offered at LTEC, which has been identified as one of the most successful programs currently offered at LTEC. ⁵⁶
Online Integration	Due to low enrollment and student interest, LTEC academic programs were embedded online. LTEC staff initially anticipated embedding academic course content online but eventually decided to embed all course content within the academic programs online to increase accessibility and flexibility of the academic course offerings, and account for the low enrollment (i.e., no need for on-site instructor/faculty).
Internal Operations	
LTEC Staff and Faculty (added)	Initially, LTEC anticipated hiring a Project Manager, Grant Fiscal Analyst, Student Career Coach, two faculty, and one adjunct for the facility. However, as the grant progressed and LTEC experienced staff and faculty turnover and added training programs (i.e., TTDT), this model shifted. For instance, the implementation of the warehouse required a technician to supervise that area, which was not accounted for in the original grant proposal. Furthermore, the addition of the TTDT program required a Coordinator to manage the growth within that program. Some of the adjunct, faculty, and academic advisor/coach staff that were outlined in the original proposal were not rehired once turnover was experienced. However, there are currently more staff and faculty that are on board at LTEC than originally anticipated. While LTEC still requires additional staff to increase capacity (e.g., additional faculty and administrative staff), the staff and faculty on board are dedicated to their work and the success of the facility. Currently, LTEC has a Director of Logistics, Project Manager, Finance Specialist, Program Specialist, Warehouse Technician, CDL Coordinator and instructor, two part-time TTDT instructors, and Training Instructor on staff.
Program Sustainability	Early in the grant, LTEC leadership worked to establish a sustainability plan. The sustainability plan outlined the number of participants and revenue required to sustain LTEC and the programs post-grant. However, due to the addition of training programs, lower revenue than expected from the First Book, and faculty/staff turnover, the sustainability plan was continually revised. LTEC leadership ensured this document was up-to-date throughout the course of the grant, dependent upon changes in revenue and participant trends, in an effort to guarantee sustainability post-grant. Because LTEC leadership were proactive in considering sustainability, and experienced better-than-expected outcomes for specific programs (i.e., TTDT), LTEC leadership will be sustaining all training programs that were enhanced through the grant. ⁵⁷ Additionally, LTEC leadership expect to develop additional programs outside of the grant that will be housed at the facility (e.g., Industrial Maintenance).

⁵⁶ The Tractor-Trailer Driver Training (TTDT) program existing prior to the grant but grant funds were used to expand and enhance the program through up-to-date equipment and refined curriculum. Success is being measured by student enrollment.

⁵⁷ The academic programs offered at LTEC will be sustained and housed at the main campus through the Distance Education department.



External Engagement	
Employer Engagement Strategies	After the initial launch of the grant, LTEC leadership planned to establish an Employer Leadership Group that would guide curriculum changes and engage/participate in LTEC programmatic development and implementation throughout the life of the grant. However, LTEC staff found it difficult to convene the employers due to scheduling constraints. LTEC staff found it more practical to reach out to individual employers that were interested in being heavily engaged in LTEC's program development and implementation, rather than host a group meeting. The one-on-one interactions with employers resulted in strong partnerships with a number of stakeholders. ⁵⁸
New Employer Relationships	Through employer outreach accomplished by LTEC leadership, staff, and faculty, and the necessity to match employability skills with employment opportunities as well as partnerships for sustainability purposes, LTEC staff formed relationships with new employers. These employers donated equipment, worked with LTEC staff to establish employee training programs, and committed to interviewing LTEC graduates. While some of these employers did not participate in the LTEC Initiative grant, staff felt the new connections will be beneficial to better serving students moving forward. ⁵⁹
Workforce System Engagement	While no specific parameters were set around workforce engagement initially, LTEC leadership anticipated deeper participation and more student referrals, especially around TAA individuals, than were received. LTEC continually recognized the importance of engaging the workforce system, and attempted to do so, but could never establish strong relationships with Central Indiana's workforce system. A few partnerships were made with key WorkOne agencies, but these partnerships yielded few student referrals. For more on the challenges LTEC faced in engaging the workforce system, see <i>Barriers and Challenges</i> section.

⁵⁸ See [Appendix D](#) for a complete list of stakeholders and contributions

⁵⁹ See [Appendix D](#) for a complete list of stakeholders and contributions.



Program Outputs

Throughout grant implementation, LTEC leadership and staff made steady progress toward each targeted outcome. With over 1,000 credit hours completed by the end of Year 3, LTEC exceeded its goal five-fold. Additionally, LTEC served nearly double the unique participants initially anticipated and nearly triple the number of earned credentials and participants completing a TAACCCT-funded program of study.

Participant numbers fell below initial goals in areas tied to retention/pathway utilization and post-program tracking. Low outcome numbers within program retention (outcome #3) and continuing education (outcome #7) can be explained by the training needs of students. More specifically, and as reflected throughout the report, students would enter LTEC for specific training certifications (i.e., TTDT and FLE) and would leave the program upon certificate award and/or employment. Furthermore, LTEC leadership reported that many of the students enrolled in LTEC programs were sent by local employers or other funding streams for short-term employee training (e.g., Volunteers of America, high schools, etc.) so were only enrolled to obtain a specific certification. These funders (e.g., employers, community groups) typically covered the individuals’ training. Once the short-term program was complete, students would not return for additional training.⁶⁰

Additionally, participant numbers were low within post-program employment (outcome #8), employment retention (outcome #9), and post-program wage increases (outcome #10) due to the challenges associated with post-program tracking that LTEC continually reported throughout the grant. More specifically, it was difficult to obtain information from program completers about their employment and wage outcomes so many participants were not included in these measures. While LTEC leadership, staff, and faculty attempted to find effective ways to reach students post-program, challenges were faced throughout the grant period.⁶¹ Challenges for tracking this data is also reflected in the Impact Evaluation, which was heavily dependent on post-program student data for employment and wage analyses.⁶²

Overall, LTEC enrolled and served significantly more students than originally anticipated. Despite challenges associated with post-program data tracking, student retention in programs, and continuing education due to unforeseen differences in the students’ needs in the region, LTEC exceeded enrollment goals and continues to modify and enhance programs to increase enrollment beyond the grant.

Table 3: TAACCCT Outcomes

	TAACCCT Outcome Measure ⁶³	Goal by Year	Total as of 9/30/2015	Total Remaining
1	Total Unique Participants Served	Year 1: 30	544	+234
		Year 2: 90		
		Year 3: 190		
		Total: 310		
2	Total Number of Participants Completing a TAACCCT-Funded Program of Study	Year 1: 0	480	+358
		Year 2: 32		

⁶⁰ For more specific information on this topic, see the *Barriers and Challenges* section as well as *Program Changes* section.

⁶¹ For more specific information on this topic, see the *Barriers and Challenges* section and *Program Changes* section.

⁶² See *Appendix C* for more information on the impact’s challenges.

⁶³ It is important to note the challenges LTEC had with data collection, outlined in the *Barriers and Challenges* section.



IMPLEMENTATION EVALUATION

VU LTEC Final Evaluation Report

	<i>a. Total Number of Grant-Funded Program of Study Completers Who are Incumbent Workers</i>	Year 3: 90 Total: 122		
3	Total Number of Participants Still Retained in Their Program of Study or Other TAACCCT-Funded Program	Year 1: 25 Year 2: 61 Year 3: 114 Total: 200	35	-165
4	Total Number Retained in Other Education Program(s) ⁶⁴	N/A	2	
5	Total Number of Credit Hours Completed <i>a. Total Number of Students Completing Credit Hours</i>	Year 1: 25 Year 2: 61 Year 3: 114 Total: 200	1,210	+1,010
6	Total Number of Earned Credentials <i>a. Total Number of Students Earning Certificates (Less than One Year)</i> <i>b. More than One Year</i> <i>c. Degrees</i>	Year 1: 0 Year 2: 32 Year 3: 100 Total: 132	481	+349
7	Total Number of Participants Enrolled in Further Education After TAACCCT-Funded Program of Study Completion	Year 1: 0 Year 2: 11 Year 3: 26 Year 4: 26 Total: 63	21	-42
8	Total Number of Participants Employed After TAACCCT-Funded Program of Student Completion	Year 1: 0 Year 2: 19 Year 3: 57 Year 4: 59 Total: 135	26	-109
9	Total Number of Participants Retained in Employment After Program of Study Completion	Year 1: 0 Year 2: 17 Year 3: 51 Year 4: 53 Total: 121	8	-113
10	Total Number of Those Participants Employed at Enrollment Who Received a Wage Increase Post-Enrollment	Year 1: 0 Year 2: 10 Year 3: 28 Year 4: 30 Total: 68	23	-45

⁶⁴ LTEC did not specify goals for this TAACCCT outcome as it was not originally required by TAACCCT Round 2 applicants.



PROGRAM ELEMENTS

The content within this section of findings focuses on research questions grouped around the common elements of program factors. These findings discuss the accelerators, barriers, and external factors that impacted grant success and progress.

Research Questions

- What have been successes and obstacles to program performance? Why?

Accelerators and Strengths

Strengths and accelerators are defined as elements of the Logistics Training and Education Center (LTEC) Initiative that have positively impacted program outputs, outcomes, and/or implementation. Program accelerators include:

- LTEC Leadership
- Existing Programmatic Foundation and Facility
- Early Focus on Sustainability
- Purchasing Power of the Grant
- LTEC Flexibility
- Stakeholder Investments and Partnerships
- Ongoing Recognition of Student Needs
- Blended Learning Environment and Technology Solutions
- Training Program Ties to Industry Needs

LTEC Leadership

LTEC leadership were engaged with all aspects of the grant from the beginning. Leadership committed to consistently modifying the programs' structure, design, and content to ensure that non-traditional student needs were being met. LTEC leadership also continually reached out to employers and the workforce system to make connections and countlessly took on the workload of staff to assist and/or account for turnover. For instance, LTEC leadership assisted with instructing LTEC courses in the final year of the grant to ensure that the courses could be offered at the facility. The foundation of cooperation and communication established among LTEC leadership likely reduced start-up time.

Existing Programmatic Foundation and Facility

Although grant funds provided the means to expand and formalize LTEC programs, the main campus first launched the Supply Chain Logistics Management program in 2008. Many of The programs that LTEC focused on (e.g., Tractor-Trailer Driver Training, Fork-Lift Essentials, etc.) existed prior to the grant but required grant funds for expansion and enhancement opportunities. This existing foundation enabled LTEC staff, faculty, and leadership the opportunity to utilize existing curriculum, expediting curriculum approval processes. While the curriculum was revamped through the use of grant funds to ensure it aligned with industry needs, it provided LTEC with a framework from which to work.

Prior to grant award, a funding application during the first round of the TAACCCT grant program was submitted by the main campus but unsuccessful, however, allowed the main campus to formulate ideas and gain buy-in from the town of Plainfield, Indiana, where LTEC is located. These activities afforded LTEC the opportunity to gain traction and community support prior to the award of TAACCCT Round 2 funds, which led to the successful opening of the building in 2012. The expedited program start-up, despite the



challenges that followed (i.e., student enrollment and retention and internal staff capacity), provided existing LTEC staff with the ability to establish a foundation of involvement and support early in the grant.

Early Focus on Sustainability

A full sustainability plan for LTEC programs was developed early in Year 1 of the grant. While this plan has experienced significant modifications, the early focus on sustainability afforded LTEC staff the opportunity to structure program development and implementation around sustainability goals. The sustainability plan outlined goals for each program with the participant and revenue numbers that would be necessary to sustain LTEC programs and maintain profitability. LTEC staff reported a number of modifications to the sustainability plan throughout the grant including changes to revenue goals based on decreased profitability of the First Book but also increased student enrollment and revenue goals for the Tractor-Trailer Driver Training program, based on the success the program was experiencing. Discussing sustainability early in the grant kept LTEC staff aware of and accountable for program success and encouraged a goal-oriented approach to programmatic development and implementation.

Purchasing Power of the Grant

The grant funds that LTEC received enabled the facility to purchase the equipment and technology necessary to expand the programs that the grant was targeting, and that existed prior to the grant. The ability to purchase equipment and technology currently used in the industry that aligns with industry standards, empowered LTEC staff to accomplish the objective of creating a blended learning environment. LTEC leadership emphasized the importance of purchasing updated and industry-relevant equipment that provided students with hands-on experience, increasing their marketability and employability. Without the USDOL-issued TAACCCT grant, LTEC would have been unable to enhance and expand the programs offered at the facility.

LTEC Flexibility

The flexible nature of LTEC programs enabled LTEC staff and faculty to tailor the programs to the students' needs. LTEC leadership reported that course schedules were flexible, allowing students to maintain their full-time work schedules and integrate class time. Courses were organized in longer blocks of time, allowing students to get through the material more quickly. Employers reported that the flexibility of not only class scheduling, but the program content itself, encouraged partnerships and the establishment of employee training programs. Employers were able to customize content for their employees to ensure they were learning the content that the employers needed. While there are inherent challenges to this type of customization (i.e., no set structure, unpredictability), employers chose to partner with LTEC rather than larger institutions due to the flexibility of course scheduling and content.

Stakeholder Investments and Partnerships

Early in the grant, LTEC staff examined ways to encourage stakeholder investments and participation in LTEC development. Initially, LTEC leadership anticipated engaging employers through the establishment of the Employer Leadership Group that would provide input and feedback on curriculum and identify skill gaps typically found in their employees. However, this group convened only three times during the project and did not progress or assist with curriculum development outside of the recommendations and feedback that they provided at the meetings. Rather, LTEC staff determined that establishing one-on-one relationships with employers in other capacities (i.e., equipment donations and employee training programs) would be

"I enrolled because I read that there are a lot of carriers that will only hire from Vincennes and I wanted those opportunities."

Program Participant



more beneficial moving forward. These partnerships and investments contributed to the sustainability and profitability of LTEC programs.

One of the most influential partnerships that LTEC obtained was that through First Book. This partnership enabled LTEC to launch a fully functional warehouse in the facility. Students were able to move real product through the supply chain and directly apply the traditional classroom content to a hands-on environment. LTEC leadership prioritized this partnership to ensure students could have a meaningful educational experience at their facility through a blended learning environment, incorporating traditional, online, and hands-on learning models. The partnership with First Book also allowed LTEC to generate revenue that contributed, and will likely continue to contribute, to sustainability of the facility and its programs.

Partnerships were also established with local high schools and high school programs during Year 3 of the grant to offer training programs to high school students. These students were enrolled as a cohort and upon program completion, received a certification. Similar agreements were set up with other organizations in the area to offer accessible and affordable training to cohorts of students (i.e., EmployIndy). Transfer and articulation agreements were set up with multiple four-year institutions in the region to ensure certification, course, and degree transferability for students that continued their education. The partnerships established with and investments provided by local employers, high schools, education institutions, and other organizations afforded LTEC staff the opportunity to enhance and expand programs in a way that was tailored to the needs of the stakeholder, a noted factor that encouraged partnerships.⁶⁵

Ongoing Recognition of Student Needs

Throughout the grant, LTEC staff and faculty have continually worked to ensure they are meeting their student's educational needs and have considered numerous options for streamlining career pathways, increasing the flexibility and accessibility to students. For instance, LTEC staff reworked courses in the Supply Chain Logistics Management program to align with the target population's abilities and skill levels. LTEC staff also put this program online to ensure students could easily access course content at any time.

"I enrolled because I wanted to choose wisely on a career path that would benefit me and my family."

Program Participant

The additional examples below showcase the willingness of LTEC staff, faculty, and leadership to attempt multiple approaches to educational programs that would better meet the needs of adult learners:

LTEC leadership considered developing an **Associate of Science Career and Technical (ASCT) degree option** for the Supply Chain Logistics Management degree, a shift from the traditional associate degree, in order to increase accessibility to non-traditional students. The degree would offer adjusted math requirements (i.e., previous math requirements focused on theory, while the new math requirements would focus on technical application) and incorporate employability skills into course content. While this degree option has been halted due to the significant student interest in training versus academic programs, LTEC leadership anticipate offering a degree option that is similar to the ASCT degree post-grant to encourage academic program enrollment.

⁶⁵ See [Appendix D](#) for a complete list of stakeholder contributions and the [Program Partners](#) section for information regarding employer satisfaction and motivations behind their partnership with LTEC.



The **Advanced Logistics Internships and Graduation Network (ALIGN) program** was considered to provide students with the opportunity to receive a paid internship while they are enrolled in an academic program. For reasons similar to that of the ASCT degree (i.e., greater interest in training programs vs. academic programs), LTEC staff are temporarily putting this program on hold.

In addition, faculty made a number of changes to their courses to accommodate student's abilities and skill levels (i.e., slowing down content flow in courses so students can learn the material at a slower pace) as well as modifying content to reflect the needs of the industry (i.e., incorporating soft skills into courses). To further ensure that LTEC could meet the needs of students, prior learning agreements were formalized with the main campus. This allowed LTEC to articulate prior work experience to credit, including prior military experience. The considerations above as well as the changes and adjustments made to programs have allowed LTEC staff to remain flexible in how programs are delivered, to continually meet the needs of the students that are enrolled in LTEC programs.

Blended Learning Environment and Technology Solutions

Unlike traditional college classrooms, LTEC provided students with access to a blended learning environment, incorporating online, classroom, and hands-on training. This structure enabled students to transform logistics content and problems into meaningful learning experiences through the on-site warehouse. The blended learning content was reportedly easier for students to retain and increased the marketability of the students through hands-on learning, a significant factor noted by employers in their decisions to hire.⁶⁶ The training and academic programs at LTEC were designed to provide a career pathway that leads students to high-wage careers.

In addition to the blended learning environment, LTEC also developed a competitive facility for logistics training and education through new technology solutions such as Radio Frequency Scanning, Pick-to-Light, and Voice-Pick. The launch of these technologies afforded LTEC the opportunity to bridge relevant hands-on experience with traditional content learning, while incorporating technologies that were used by employers in the industry.

Training Program Ties to Industry Needs

Developing training programs that are built on the identified needs of industry employers was a significant goal of the grant. With this in mind, LTEC leadership worked to establish a number of employer relationships early in the grant to ensure they were receiving feedback on the needs of employers in the logistics industry. LTEC leadership anticipated this would be through the establishment of the Employer Leadership Group. While this group only met three times, LTEC continued to work with employers one-on-one to determine their needs. The information gathered from these meetings facilitated the expansion and enhancement of the existing Tractor-Trailer Driver Training program at LTEC. The use of grant funds allowed the program to purchase new equipment relevant to current industry facility needs. The partnerships established with LTEC enabled the facility to provide industry-recognized credentials and programs through direct requests from employers.

Throughout the grant, LTEC leadership have also worked with local and regional employers to establish employee training programs, a direct need identified by employers. These programs allowed employers to send their employees directly to LTEC for additional training and certifying. Employers indicated that they needed to upskill their current employees, a need that LTEC addressed and will continue to address through

⁶⁶ See the *Student Progress* and *Program Partners* sections for more information.



new partnerships. LTEC has continually been successful in offering training programs that tie directly to needs identified by the logistics industry.

Barriers and Challenges

As with any grant program, several factors hinder or slow grant progress. For the LTEC Initiative, these included a range of elements from student enrollment and recruitment, to data collection and staff turnover. These hindering factors included:

- Academic Student Enrollment and Retention
- Student Recruitment and Marketing
- Post-Program Data Collection
- Internal Staff Capacity
- Lack of Workforce System Referrals
- Finding Qualified Instructors and Faculty
- Lack of Established Employer Group
- Main Campus Proximity
- Process of Identifying Student-Attainable Programs and Pathways

Academic Student Enrollment and Retention

Throughout the grant, LTEC staff was concerned with student retention and recruitment. Staff reported that students entering LTEC programs typically could not commit to academic programs due to barriers (e.g., employment, family, remedial needs, etc.). These students also left LTEC programs upon certificate completion and/or employment resulting in low academic program enrollment and retention. Moving into the final year of the grant, LTEC staff began to consider ways to improve student recruitment and retention as means of sustainability. For example, LTEC staff considered implementing an Associate of Science Career and Technical (ASCT) degree option in Supply Chain Logistics Management to address the challenges in completing math courses for non-traditional students considering academic program enrollment (i.e., previous math focused on theory while adjusted math will focus on technical application). While this degree option would likely be implemented post-grant, LTEC staff have continually revisited why students are not successful in academic programs, what content is relevant for students to obtain employment, and identify students' needs.

Student Recruitment and Marketing

LTEC student recruitment was an ongoing challenge throughout the grant, which was exacerbated by delays in marketing material development. For example, LTEC staff designed truck wraps for the Tractor-Trailer Driver Training program with three different messages, one message for veterans specifically, that were delivered nearly a year after initial design. Once these truck wraps were released, LTEC leadership reported a number of students inquiring about LTEC programs and referencing the truck wraps as the reason why they inquired.

“Several different methods for recruitment and marketing were tried but many of these methods are costly and difficult to sustain.”

LTEC Leadership

LTEC attempted to utilize typical marketing strategies through the use of radio ads, social media, webpages, and brochures but did not generate a significant pool of students interested in LTEC programs. LTEC attempted to explore unique ways to engage non-traditional students and veterans through local events



and job fairs but found it was difficult to reach these students without the assistance from others (e.g., workforce system and employers).

Many of the students enrolled in LTEC programs reportedly came from local employers for customized, short-term training programs and other funding organizations such as the Excel Centers. While these partnerships brought in a number of students, many of these customized training programs in particular did not occur until the end of the grant period. These challenges, among others, created obstacles for LTEC in solidifying a strong regional presence.

Post-Program Data Collection

Like many other institutions, LTEC experienced challenges in collecting responses for student data beyond grant services. Previously, LTEC staff followed a system of contacting students through emails with a survey, letters to the student, and follow-up calls to elicit post-graduation information from students including employment and wage information. However, LTEC encountered obstacles in contacting students for this information.

LTEC attempted to incentivize students to follow-up through an Amazon gift card. Although the incentive helped encourage some students to complete the post-graduation/completion survey, LTEC staff could not capture information on all student completers and could not sustain the incentive as it fell outside of grant funds. As the grant moved forward and LTEC experienced consistent staff turnover, there was no capacity to provide post-enrollment data collection with fidelity. To account for this, a third-party was contracted to assist with post-enrollment data collection throughout Year 3 of the grant.

Internal Staff Capacity

The LTEC programs, most notably the TTDT program, quickly expanded throughout the life of the grant in terms of interest and regional/employer need. However, LTEC faculty and staff did not have the capacity to accommodate all interested students and employer needs with the current staffing and facility accommodations.

“The instructors are so knowledgeable and helpful but they need more of them!”

Program Participant

Internal capacity has created challenges for LTEC in regards to program expansion and streamlined programmatic functions, as the staff needed to operationalize the components that did not exist. LTEC staff continue to examine whether hiring additional staff and faculty is necessary to ensure ongoing program sustainability, allow for increased student enrollment, and accommodate diverse employer partnerships.

Lack of Workforce System Referrals

From the beginning of the grant, LTEC staff reported challenges in establishing connections with the workforce system. Communication between the workforce system and LTEC was slow to develop, despite staff efforts to connect with local workforce development boards about the opportunities offered at LTEC (e.g., through “WorkOne tours” and other events). LTEC recognizes that the workforce system is critical in accessing and identifying TAA-eligible participants but the non-responsiveness of the WorkOne offices created challenges in student enrollment and TAA participation. Throughout the grant, a few relationships were made with WorkOne offices in the Marion County region and regions outside of the service area but other regional offices were not responsive to LTEC. These referrals also varied by program with the TTDT program receiving the most WorkOne referrals.



In addition, many of the relationships that were established with WorkOne offices and employers were lost due to turnover. This created a number of challenges as LTEC staff had to continually locate new contacts and establish new relationships with WorkOne offices. These prolonged processes slowed potential student referrals from WorkOne offices. LTEC staff will continue to reach out to the workforce system beyond the grant to establish these relationships.

Finding Qualified Instructors and Faculty

LTEC leadership continually emphasized the challenges in locating qualified and knowledgeable instructors and faculty to develop curriculum, course structures and schedules, and teach LTEC courses. Many candidates did not meet industry experience requirements, specifically in logistics, while other candidates were available only during specific times (i.e., evenings). LTEC staff indicated that many of the qualified candidates were already employed in the industry so they were not interested in the salary reduction. For those that were expressing interest, the candidates were looking to teach at LTEC for supplemental income as they were still employed elsewhere, limiting the availability of those candidates. These challenges in locating qualified instructors and faculty delayed program-related progress as the existing LTEC staff and leadership needed to add these responsibilities (i.e., develop curriculum, set up course structures and schedules, and teach LTEC courses) to their workload.

“It was a delicate balance between hiring someone with industry experience and someone who knows how to take their knowledge and teach in a way that helps students learn.”

LTEC Leadership

Additionally, all new staff had to be approved by the main campus with justification for the hire request and how the position would be sustained. These lengthy internal processes slowed the pace of hiring decisions, but LTEC staff recognized the importance of considering sustainability and strategic hiring practices.

Lack of Established Employer Coalition

LTEC progress was likely hindered by the lack of an established coalition of employers interested in LTEC programs and partnerships. Initially, LTEC anticipated establishing an active Employer Leadership Group (ELG) that would gather together to provide input on curriculum, identify skill and training needs, and discuss resource and partner opportunities. Because of scheduling constraints, this group did not progress and LTEC began reaching out to employers individually. While this approach yielded strong partnerships and opportunities to provide customized employee training programs, the lack of a strong coalition like the ELG removed the efficiency component. In other words, LTEC typically reached out to individual employers to establish a partnership rather than have those employers all in one place. While challenges were associated with the ELG and successes associated with the one-on-one approach, LTEC leadership were reportedly disappointed that the ELG did not progress, despite their best efforts to engage at a group-level with them.⁶⁷

Main Campus Proximity

Due to the distance between the main campus and LTEC, disconnect was created at the beginning of the grant, limiting LTEC’s ability to leverage the main campus’ relationships and influence. This distance, over 100 miles across the state of Indiana, hindered communication and limited the development of close

⁶⁷ LTEC leadership attempted to incentivize ELG participation by offering one free seat in the GLA program. Despite interest in this offer, only one employer took advantage of this opportunity.



connections and relationships. While the disconnect between the main campus and LTEC will likely always exist due to the distance, LTEC staff and the main campus have worked together to streamline processes and communication by identifying the appropriate contacts at the main campus, expediting programmatic progress (i.e., hiring personnel, utilizing resources, and receiving curriculum approval).

Process of Identifying Student-Attainable Programs and Pathways

While LTEC staff have been successful in developing training programs that tie directly to employer needs, staff struggled in identifying programs and pathways that would generate enough student interest to be sustainable. This was due, in part, to challenges associated with targeting a focus area within the vast logistics industry. Navigating all of the different training options and identifying those that may be the most successful was a trial-and-error approach for LTEC staff.

Although employers helped shape LTEC's focus, a learning curve was still present for LTEC. For example, at the beginning of the grant, LTEC staff focused mainly on the development and implementation of academic (for-credit) programs as staff recognized approval for these programs would be lengthy but would help establish career pathways⁶⁸ for students. However, the lack of student interest encouraged staff to shift focus to more short-term, non-credit training programs. LTEC staff was responsive to the needs of students and employers for more short-term, non-credit training programs but the process of identifying these programs as "in-demand" was lengthy. LTEC staff and leadership will continue to focus on the successful short-term, non-credit training programs, rather than academic programs with career pathways, from a sustainability perspective moving forward but will ensure that academic program offerings are available for interested students as well.

Environmental Factors

In addition to accelerators and barriers, there were also several external factors within the environment surrounding LTEC, which positively and negatively impacted program implementation. These included:

- Central Indiana Logistics Environment
- TAA Regional Presence
- Logistics Industry Job Qualifications

Central Indiana Logistics Environment

Central Indiana provided a particularly strategic location for LTEC. In the Indianapolis Metropolitan Statistical Area, the concentration of employment in transportation and warehousing is 77 percent higher than the national average in 2016; compared to 54 percent in 2013.⁶⁹ Employment in the Central Indiana's logistics industry has grown 21.5 percent since 2012 (the start of the grant), offering over 61,000 jobs in the region.⁷⁰ LTEC is located near the Indianapolis International Airport, and its interstate access eliminates barriers for students and employers who would not likely make the 2.5-hour drive from Central Indiana to Vincennes, Indiana (where the main campus is located). As the industry continues to grow beyond the grant, LTEC's central location in Indiana will likely continue to benefit the facility.

⁶⁸ Establishing career pathways was an objective within the Evidence-Based Design core element. Various sections throughout the report discuss why establishing career pathways was no longer feasible for LTEC.

⁶⁹ EMSI Analyst, 2016.2. Retrieved by www.economicmodeling.com

⁷⁰ Data related to Indiana and the Indianapolis Metropolitan Statistical Area come from EMSI Analyst, 2016.2 Retrieved by economicmodeling.com



TAA Regional Presence

LTEC leadership continually reported challenges in engaging the workforce system for referrals of participants that are eligible for Trade Adjustment Assistance (TAA), a noted target population for the TAACCCT grants. However, as reported by LTEC leadership and confirmed by Department of Workforce Development data, the number of individuals that have been awarded petitions in Indiana has, in fact, decreased since 2012⁷¹. In 2012, 28 TAA petitions were certified compared to 13 in 2015.⁷²

However, the number of individuals that have been certified as TAA-eligible has increased since 2012 from 2,178 to 2,796 in 2015.⁷³ In other words, there are currently more individuals that are TAA-eligible than petitions that are being awarded. While the TAA presence in Indiana was never significant, the lack of TAA participants in Indiana has reportedly impacted LTEC's ability to target this population for enrollment in LTEC programs. The lack of TAA presence may not have impacted grant progress but it created significant barriers to recruiting this population, a recognized target for the TAACCCT grant. To counteract this challenge, LTEC targeted other non-traditional and adult learners for LTEC programs.

"We were diligent about checking the Indiana DWD website for TAA certification notices but Indiana has experienced an overall decline in these certifications."

LTEC Leadership

Logistics Industry Job Qualifications

The logistics industry, unlike other industries with successful programs offered at the main campus (e.g., Industrial Maintenance), does not require as much previous work experience and/or formal education to enter into low-middle skill jobs. For example, jobs such as Industrial Truck and Trailer Operators; First-Line Supervisors of Transportation and Material Moving; Transportation, Storage, and Distribution Managers; among others only require a high school diploma or equivalent and less than five years or no previous work experience to obtain employment.⁷⁴ While there are other managerial positions that require additional, formal training and more work experience, many of the jobs in the logistics industry have minimum previous work and education requirements.

*"Part of LTEC's challenge was explaining the difference between a logistics **job** and **career** to potential students because there are so many open jobs."*

LTEC Leadership

Because of this, LTEC leadership reported challenges associated with encouraging students to enroll in academic, degree programs and/or continue their education through a pathway from short-term, non-academic training programs to bachelor-level degrees. This is due, in part, to the minimum education requirements in the industry and the ability of LTEC to meet the work experience requirements of many logistics-related jobs through the warehouse and blended learning environment. Students that completed short-term training programs typically received employment post-program completion, a goal of the TAACCCT grants, however, LTEC leadership had expected greater enrollment in academic programs at the initial start of the grant. With this in mind, LTEC leadership shifted priorities based on these trends to a focus on training programs and will continue to do so post-grant.

⁷¹ The original grant application was submitted in 2012, thus, a target for this comparison.

⁷² Indiana Department of Workforce Development. (2016). *Indiana Trade Adjustment Assistance*. Retrieved by <http://www.in.gov/dwd/2423.htm>

⁷³ Indiana Department of Workforce Development. (2016). *Indiana Trade Adjustment Assistance*. Retrieved by <http://www.in.gov/dwd/2423.htm>

⁷⁴ EMSI Analyst, 2016.2. Retrieved by www.economicmodeling.com



STUDENT PROGRESS

The content within this section of findings focuses on research questions grouped around the common elements of student progress. These findings outline student feedback and student assessment data.

Research Questions

- How satisfied are participants with the program? Why?

Student Perspectives

Interviewed students reported overall satisfaction with the program offerings and structure of LTEC. Students indicated satisfaction with the following:

Program flexibility – Students indicated that program flexibility in the form of customized training to fit student abilities and skills (e.g., slowing pace of coursework to reflect student skills and abilities) as well as course scheduling made it possible for students to enroll and complete the program. In some instances, course schedules were developed based on the students' availability, facilitating a more tailored approach to scheduling. Students also reported that the block scheduling utilized by LTEC was much easier to schedule around than the typical course structure of 60 to 90-minute class meetings. Interviewed students recognized that the block scheduling expedited time to completion.

“The program is flexible enough that I can work and take the class. It’s a lot more flexible than other programs I’ve been in.”

Participant

Blended learning model – Interviewed students throughout the grant period continually reported an appreciation for the mixed teaching methods (i.e., blended learning model). The ability to learn content in the classroom and put that material to use in the warehouse in a number of different capacities (i.e., moving items with a fork-lift, sorting product with different technologies, and delivering/transporting product with a tractor-trailer) was a selling point for the students.

“The classroom and hands-on training is parallel to current jobs. We are learning the principles and seeing the physical parts of the training.”

Participant

Small class sizes – Interviewed students indicated that the small class sizes allowed the students to get comfortable with each other. Students received more one-on-one time with the instructor and could work with other students to ensure that the content was understood. Students indicated the ability to work with other students, assist each other with content, and ask questions more openly in class enhanced their learning experience.

Employer exposure – Interviewed students, notably in the TTDT program, reported continual exposure to local employers and companies. These employers, many with relationships to the instructors, have hired past program completers and students recognized the opportunities to network with the employers that visit the facility and/or speak to the students in LTEC courses.

“We have had seven or eight employers visit so now I know the different places I can go to get a job.”

Participant



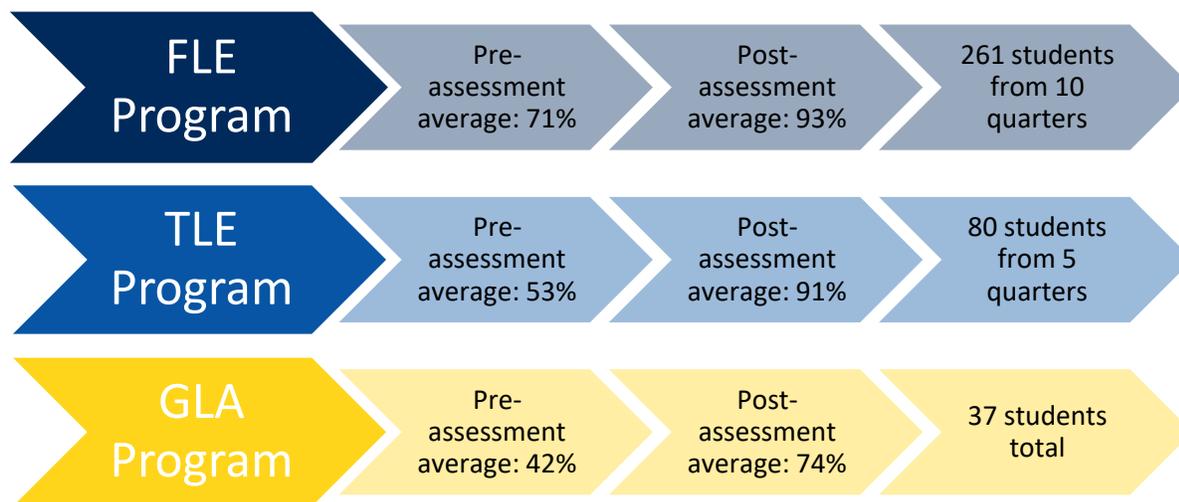
Pre-/Post-Assessment Findings

For three grant-funded programs offered at LTEC – Fork-Lift Essentials (FLE), Team Lead Essentials (TLE), and Global Logistics Associate (GLA) – a pre- and post-assessment was administered by LTEC staff to gauge the level of knowledge gains from the beginning to the end of the programs. Data from these programs’ pre-and post-assessments was provided for analysis. The data allowed LTEC staff and leadership to determine the knowledge gained throughout the programs, which was averaged across each assessment. The Evaluation Team also assessed differences between the pre-and post-assessments over time (i.e., over each quarter), for varying training days, and comparisons by and between groups.

For this analysis, reported cumulatively for this report, data by program, quarter, and type (i.e., student’s company, cohort, or status) was provided by LTEC staff. Descriptive statistics were drawn from the data to help describe, show, and summarize the data in a meaningful way (i.e., to allow for patterns to emerge from the data).⁷⁵ Measures of mean were gathered to show the differences between pre- and post-assessment data within different quarters and programs. Descriptions were provided about the data that were available to enable LTEC staff to understand the knowledge gains for students in the TLE, FLE, and GLA programs. A more detailed report of this data is located in [Appendix F](#).

The analysis found that students in all programs improved their assessment scores (i.e., showed knowledge gains) from the pre- to post-test. The assessments and corresponding participant numbers⁷⁶ are detailed by program below in Figure 6:

Figure 6: Pre-/Post-Assessment Averages and Participant Numbers



⁷⁵ Boeree, G. (2005). Descriptive statistics. Retrieved by <http://webspaceship.edu/cgboer/descstats.html>

⁷⁶ It is important to note that the participant numbers listed may not reflect total participant numbers for each program. Some students were excluded from the analysis due to incomplete data.



PROGRAM PARTNERS

The content within this section is focused on partner engagement and perspectives. Throughout the course of the grant, the Evaluation Team interviewed multiple employers and discussed partner engagement with LTEC staff and leadership⁷⁷.

Research Questions

- What contributions did partners make to the program? How?

Employer Perspectives and Contributions

Interviewed employers reported that the flexibility LTEC provided in how they accommodated employers and integrated their needs into program curriculum was a significant program strength. Interviewed employers indicated that the willingness of LTEC staff to incorporate customized equipment and training needs into LTEC programs was a key driver of accessibility and flexibility. While many of the interviewed employers had previously worked with LTEC and/or the LTEC Director, many still emphasized an appreciation for the flexibility, especially compared to other educational institutions that the employers have partnered with in the past. One employer expressed that while larger educational institutions have more resources, they are also less flexible in meeting the needs of employers because of the protocols and processes in place, making it difficult to establish a meaningful partnership. LTEC's ability to customize training to the employers' needs prompted the employer to establish a partnership with LTEC. All employers interviewed reported satisfaction in their work with LTEC throughout the course of the grant.

"VU's warehouse is better outfitted than some small employers I have seen."

Participating Employer

Employer engagement in the development and implementation of the LTEC Initiative primarily took two forms:

Employee training program participation – Throughout the grant, employers partnered with LTEC to offer employee training programs at the facility, in the Tractor-Trailer Driver Training (TTDT), Global Logistics Associate (GLA), Fork-Lift Essentials (FLE) and Team Lead Essentials (TLE) programs. These partnerships ensured that a cohort of employees would complete the program, many paying for the employee's tuition. LTEC staff will continue to work on partnerships with employers that send cohorts of students through their programs as this is a unique and important contribution to program sustainability.

"When you walk in, it looks so much like a fulfillment/distribution center operation, so very hands-on."

Participating Employer

Donated resources – A number of employers donated equipment to the LTEC training facility. TTDT faculty indicated that employers were consistently reaching out to LTEC to donate equipment and other resources to assist in the expansion of the TTDT program, in particular. For example, one employer donated one tractor and two 28-foot trailers, and a second employer donated one 53-foot trailer, facilitating the TTDT program's expansion. These donated resources afforded LTEC the opportunity to expand and enhance their facility, develop additional courses, and enroll more students. The donated equipment also afforded students the opportunity to be exposed to a number of diverse equipment types, each requiring different skillsets (e.g., fork-lift, Voice-Pick technology, and packaging).

⁷⁷ For a complete list of stakeholder contributions, see [Appendix D](#).



Partner Contributions

First Book

One of the most notable partnerships established through the grant was with First Book, a national book bank that provides access to books and educational resources to children in need.⁷⁸ LTEC partnered with First Book early on in the grant, in 2012, to provide a real-world, hands-on experience for students to validate the skills learned throughout the training program.

“Since 2012, LTEC has processed over 3.5 million children’s books.”

LTEC Leadership

LTEC simulated the supply chain with First Book products, with each program responsible for a specific piece. For instance, TTDT program students were dispatched to pick-up donated books at the publisher’s warehouses where they learned to drop and hook trailers, interact with warehouse associates, and navigate roads and required paperwork. These donated books were delivered back to LTEC where students learning material-handling skills would move and store the product using state-of-the-art equipment. These students interacted with the Warehouse Management System (WMS) and technology control systems to track and control the product. Finally, students would pick, pack, and ship completed orders using equipment commonly found warehouses.

High Schools and High School Programs

In addition to employee training programs, LTEC utilized partnerships with local high schools and high school programs to offer customized training to high school students. These partnerships enabled LTEC to increase program enrollment and create a pipeline of students that may be interested in continuing their education with LTEC upon graduation. These partnerships included the following:

- **Plainfield High School** where students pursued the GLA program as well as FLE and OSHA certificates⁷⁹ during the fall semester of their senior year. Students were then placed in an internship for the spring semester.
- **The Excel Center** targeted adult learners working toward a high school diploma. These students enrolled in the TTDT, FLE, and GLA programs.
- **TeenWorks**, a summer internship program, to afford high school students the opportunity to work in the warehouse and pursue an FLE certification.
- **Hire Tech** for students participating in an advanced manufacturing and logistics-based high school program providing them the opportunity to articulate credit toward Supply Chain Logistics Management introductory courses at LTEC.
- **Area 31** allowing junior and senior students to attend a two-semester logistics course, earning GLA, fork-lift, and OSHA certifications, which occurred post-grant. These students then completed an internship in the spring or CDL Class A and fork-lift certifications during the spring semester of their senior year.⁸⁰

⁷⁸ For more information, see: <https://www.firstbook.org/first-book-story/innovation-in-publishing/marketplace>

⁷⁹ The OSHA certification was offered to students online.

⁸⁰ The Area 31 partnership within the TTDT program existed prior to the grant but the partnership within the Global Logistics Associate program surfaced post-grant.



Other Organizations and Partnerships

In addition to the employer, high school and high school programs, and First Book (a noted significant partnership to the success of LTEC) partnerships, LTEC engaged other organizations as well. The nature of these relationships included:

Reentry programs – A partnership with Volunteers of America enabled LTEC to provide TTDT to ex-offenders. Through a different grant, Volunteers of America was able to pay the students' tuition.

Additional funding sources – Through the award of other grants (i.e., Department of Corrections and Department of Transportation), LTEC was able to train students within the TTDT program free of charge. While the Department of Corrections, Department of Transportation, and Schneider partnerships occurred after the grant, they are notable in regards to sustainability.

Veteran-specific organizations – Partnerships with VU's Veterans Upward Bound Program, Hire Hoosier Vet, Director of Veteran Affairs at the state level, and DVOPs from WorkOne offices enabled LTEC to recruit military veterans.



BEYOND THE GRANT

The following grouping of research questions address considerations for the LTEC Initiative once grant funding ends. These findings center around sustainable change created as a result of the grant and recommendations for consideration should another educational institution chose to implement a program similar to those found at LTEC.

Research Questions

- How can program processes, tools, and/or systems be modified to improve performance?
- How satisfied are program leadership and staff with the program? Why?
- What is the legacy of the program? What elements of the program will be sustained beyond the grant?

Program Sustainability

Reflecting over the grant period, LTEC leadership, staff, and faculty indicated satisfaction with the grant. All LTEC staff, faculty, and leadership have recognized the importance of the grant in expanding and enhancing the existing facility and programs, a noted strength to reducing start-up time. This indicates that a project such as the LTEC Initiative could benefit from utilizing existing programmatic and foundational structures.

LTEC leadership and staff will continue implementing and improving the training program offerings at LTEC to ensure they are continually serving the needs of the students moving forward. LTEC leadership indicated that they will be branching out to other programs related to the logistics industry and all grant-related programs will continue beyond the grant.⁸¹

LTEC leadership and staff reported satisfaction with several areas including positive impacts experienced by participants⁸², positive impacts with employers and other partners⁸³, and the sustained changes from the program. The following are legacies of the LTEC Initiative:

- State of the Art Warehouse
- Stronger Employer Relationships
- Credential Attainment
- Blended Learning Environment
- Demand-Driven Approach
- Logistics Industry Understanding
- Refined and Focused Programs

State of the Art Warehouse

The state of the art warehouse, developed with grant funds and partner donations, allowed LTEC staff and faculty to offer hands-on, meaningful learning experiences to students. With the latest technology and equipment in the industry, LTEC leadership indicated that an educational facility of such size and capacity does not exist in the region. The competitive advantage of the state of the art warehouse enables LTEC to sustain programs moving beyond the grant and has been deemed the most successful component of the grant.

“There is a lot we are able to do now with the implementation of new technology.”

Warehouse Technician

⁸¹ All training programs will be sustained through LTEC, while academic programs will be sustained and offered online through the main campus’s Distance Education department.

⁸² Seen throughout *Accelerators* and *Impact* sections.

⁸³ Seen throughout *Accelerators* and *Employer Partners* sections.



Stronger Employer Relationships

The grant project, especially through the expansion and enhancement of LTEC programs, highlighted the need to engage employers and develop strong relationships with industry leaders in the region. Fundamentally, the identification of employee skills needed in the industry as well as industry-recognized credentials could not be accomplished without heavy business engagement. LTEC leadership and staff reported a greater focus on reaching out to employers for program development and partnership needs. Even if contacted businesses were not interested in participating in the grant long-term or at all, LTEC leadership reported that maintaining these employer connections was critical and will continue to look for additional opportunities to connect with employers beyond the grant.

Credential Attainment

While credential attainment can be an option outside of the grant, this grant spurred the increased focus on credential attainment that aligned with training and industry needs, allowing participants to have “proven” transferrable skills that they could carry with them throughout their careers.

Blended Learning Environment

The grant enabled LTEC staff to implement a blended learning environment and contribute to the limited evidence base supporting these types of learning environments for adults and other non-traditional students. Students reported ongoing satisfaction with the combination of traditional, online, and hands-on learning and material that LTEC offered. This environment expedited time to credential attainment and allowed LTEC to accommodate students’ responsibilities outside of their education (i.e., jobs and families).

“You get the opportunity to take control of your education. If you want more hands-on time, you can get it”

Participant

Demand-Driven Approach

LTEC leadership and staff experienced a strengthened focus on the needs identified by participants and employers in programmatic development and implementation. More specifically, this demand-driven approach enabled LTEC leadership to identify the training programs that would be the most successful (i.e., Tractor-Trailer Driver Training), even if these programs were not part of the original grant project plan. Additionally, LTEC strengthened existing, and built new, employer relationships through the grant to facilitate this demand-driven approach.

Logistics Industry Understanding

As a direct result of TAACCCT funds, LTEC leadership and staff reported a better understanding of the logistics industry, what employment opportunities are available, and why the logistics industry is important to Central Indiana. LTEC leadership and staff plan to continue to provide participants with support and guidance around logistics careers beyond the life of the grant, and will be able to incorporate current knowledge into their advising of the importance of logistics, the different avenues for training, and employment opportunities in the region.



Refined and Focused Programs

While the LTEC programs existed at the facility prior to the grant, grant funds enabled LTEC to enhance and expand the programs in a number of different ways. For instance, LTEC curriculum and credentials were refined to reflect industry and student needs (i.e., employers identified relevant credentials and curriculum was adjusted to reflect adult learner work experience and lack of educational experience). Grant funds afforded LTEC the opportunity to purchase modern and relevant equipment and technology to enhance the student's learning experience (i.e., through warehouse, hands-on experience, opportunities for online learning, and equipment that is used currently by employers). LTEC staff and leadership were able to refine and focus programs directly to employer and student needs through the use of TAACCCT grant funds.

"I'm thankful for the opportunities here. I wouldn't get this from a larger campus."

Participant



FUTURE PROGRAM IMPLEMENTATION

LTEC leadership, staff, and faculty identified the following recommendations for an educational institution considering implementing programs similar to those at LTEC. These recommendations fall into three general categories – considerations for program development, personnel, and external stakeholder engagement.

Considerations for Program Development

- Establish Academic and Non-Academic Programs with Flexibility
- Develop Basic Marketing Plan Prior to Program Implementation
- Implement Onboarding Policies and Practices Prior to Hiring Staff
- Focus on Sustainability Early in the Grant
- Create Implementation Plan Prior to Program Roll-Out
- Blended Learning as Key Approach to Training Programs

Considerations for Personnel

- Establish Communication Standards and Expectations Early
- Hire Staff Promptly to Specialize Roles
- Establish Database Specialist Position

Considerations for External Stakeholder Engagement

- Identify and Engage Target Employers and Community Partners

Considerations for Program Development

For Starting or Adapting the LTEC Initiative

Establish Academic and Non-Academic Programs with Flexibility

Both academic and non-academic programs are important when creating a pipeline of stackable credentials. This is especially true when an institution caters to a diverse range of student skills and interests. Non-academic programs directly address the needs of non-traditional students (i.e., provide training and certification as quickly as possible to deliver the student back into the workforce). On the other hand, academic programs provide justification for sustainability (i.e., lengthened program enrollment results in increased funds through student tuition). In order to address the needs of both academic and non-academic programs, it is beneficial to visualize and map out credential pathways to identify gaps in programming (e.g., addressing middle-skill gaps in programs) to ensure that credentials are stackable and accessible for students. However, these programs should be revisited consistently throughout grant implementation to enable staff to revise programs based on students' and employers' needs. The needs of employers and students can change as the grant moves forward so remaining flexible is critical in grant implementation. Staff should be aware of demand throughout the project to ensure sustainability and success of programs.

Develop Basic Marketing Plan Prior to Program Implementation

Marketing and recruitment efforts are necessary in enrolling sufficient students to sustain program implementation and future improvements. A basic outline of a marketing plan prior to program implementation would allow staff to develop tangible goals and action items for achieving those goals. The marketing plan could include general avenues for marketing (e.g., brochures, radio, newspaper, etc.) and encourage staff to find the most efficient ways to reach the target population. Educating themselves on the target population could promote better marketing practices as the programs launch and expand. Along



with general goals and marketing avenues, the plan should also include target outcomes, timeline, and budget to ensure that there is a plan moving forward.

Implement Onboarding Policies and Practices Prior to Hiring Staff

Efficient and effective staff is dependent upon successful implementation of onboarding policies and practices. An appropriate onboarding process ensures that new hires are aware of the roles, expectations, company culture, and norms moving forward as well as provides opportunities for input for future growth. Onboarding directly impacts employee retention and satisfaction, leading to employees being productive faster.

Focus on Sustainability Early in the Grant

A focus on sustainability early in the grant enables staff to ensure sustainable practices moving forward. In other words, staff could be more likely to consider sustainability when making decisions regarding program development and implementation when a plan is put in place early in program design. An early focus on sustainability also enables grant staff to develop program goals (i.e., enrollment and revenue), which could hold grant staff accountable throughout the implementation phase and give the team something to work toward. Solidifying these practices early can help ensure future sustainability of grant programs.

Create Implementation Plan Prior to Program Roll-Out

An implementation plan includes setting goals and timelines, establishing concrete items to work from, and identifying staff and leadership ownership over specific components of the plan. A concrete plan can help promote progress and consistency in program implementation. A component of this plan should include establishing marketing efforts early in the program (as detailed above) and looking for early successes and employer “champions” who can advertise the program to their peer-employers.

Blended Learning as Key Approach to Training Programs

Serving non-traditional students surfaces a need for new learning models. Because this population does not typically learn in the traditional sense (i.e., lecture-style), blended learning models could better serve the needs of these students. A blended learning environment brings together traditional, online, and hands-on learning to provide students with an all-encompassing model for learning. Students are able to access content easily through the online components, integrate with traditional classroom content, and apply it directly through the hands-on component. This type of learning is also a draw for employers as students can learn applicable job training, saving companies on training time.

Considerations for Personnel

For Starting or Adapting the LTEC Initiative

Establish Communication Standards and Expectations Early

Successful implementation of a new program is dependent on clear and well-articulated lines of communication. As a new program will often require hiring new staff and faculty, it is important for program leadership to proactively engage with new hires to establish 1) communication standards, 2) new hire roles and expectations, and 3) how the new hire fits into the program structure. Establishing communication standards early encourages staff to exchange ideas and collaborate to produce quality programs and services. Clarifying new hire roles and expectations ensures staff are aware of their responsibilities, increasing accountability and empowerment of new hires. Communicating how a new hire fits into the



program structure allows staff to see the program at a higher-level so the staff understand the relationships between each other.

Hire Staff Promptly to Specialize Roles

In addition to setting clear roles and expectations, LTEC staff emphasized the importance of hiring all necessary staff early. Hiring staff at the beginning of program start-up allows a program to streamline and expedite business processes and operations. Each staff member could begin with a clear understanding of his/her role and how he/she relates to the overall program, and dedicate program start-up time to specializing in the specific roles and responsibilities of the position.

Establish Data Specialist Position

Accurate and consistent data reporting is key to evaluating the impact and success of a new program. As new program implementation will likely include new data tracking requirements and new data definitions, it is important that there is a point-person for data questions and data quality review. Elements of a grant-funded data position could include, but are not limited to:

- *Data Definitions* – Creating a clear understanding of what the workforce areas were looking to track and what the definitions were for the data.
- *Data Tracking* – Fluency with the current database to know what is possible within the database. Then communicate with database programmers about what needs to be added for collection (as needed).
- *Staff Training* – Training all staff on how to record all the program data. Training elements can include 1) a data manual with data definitions and “how to” guide for entering information into the database, 2) in-person training for staff, and 3) ongoing staff training either in-person, via webinars, or via email.
- *Regular Data Monitoring* – Reviewing the data reports regularly, at least monthly, to identify data trends and identify reporting gaps.
- *Data Reporting* – Reporting out numbers to USDOL, or other funder, for the required reports.
- *Troubleshooting* – Responding to staff data challenges, database issues, and other problems as they arise.

Considerations for External Stakeholder Engagement

For Starting or Adapting the LTEC Initiative

Identify and Engage Target Employers and Community Partners

Identifying priority industry sectors and the key regional employers within these sectors is critical to program enrollment, curriculum development, and post-program student employment. It is important for a community college to understand its key employer groupings. This allows the college to actively target and engage regional employers in identifying program gaps and curriculum enhancements as well as increase program enrollment. Employers understand the job market, skillsets needed for new employees, and new and emerging trends within the industry. Engaging employers to provide this feedback to the college will strengthen college programming and increase the competitiveness of program graduates. In addition, engaging employers through internships, informational sessions, job fairs, and facility tours increases student and faculty understanding of industry needs and can build ties between students and industry that are beneficial for student job placement.



VU LTEC Final Evaluation Report

Additionally, recognizing potential partners in the community (i.e., city councils, high schools, and other organizations) can be beneficial in generating community buy-in for educational programs. Community investment in new programs can aid in student enrollment, and program development and sustainability (i.e., through financial assistance). Establishing these partnerships early in the grant affords the community partners the opportunity to participate in program design, development, and implementation, which can increase investment in the programs (i.e., increased investment through strong participation).



Impact Evaluation



IMPACT EVALUATION

DESIGN SUMMARY

The purpose of the Impact Evaluation is to assess whether the implementation of specific TAACCCT-funded programs at Vincennes University's (VU) Logistics Training and Education Center (LTEC) had an effect on participants' short-term employment outcomes. Employment outcomes are defined as employment status and total quarterly wages in the first quarter after program completion. The programs assessed in the Impact Evaluation included LTEC's Fork-Lift Essentials (FLE) program and the Tractor-Trailer Driver Training (TTDT) program.

The Evaluation Team made the decision to assess the impact of the FLE and TTDT programs independently, in separate studies, for two reasons: 1) the programs differed in terms of duration and substance, and 2) the analytic methods required to evaluate the impact of each program were different. Study 1 (FLE program) employed a treatment-only pre/post design, whereas Study 2 (TTDT program) contrasted the treatment group's employment outcomes with those of an equivalent comparison group that participated in a similar program.^{84,85} A general outline of the research design and an overview of the analytic approach employed for each study is presented in the design summary below. A more detailed account of the data, methods, and samples used in the two studies appears in Appendix B.

For Study 1, since there was no arguably equivalent group for comparing students completing the TAACCCT-funded FLE program within the VU system, longitudinal modeling was employed to create a virtual comparison group from the projected outcomes of the treatment group itself. With this approach, program impact is operationalized as the post-program deviation in the participants' quarterly earnings/employment status from a baseline trend in that same group's pre-program earnings. This is known as a short-interrupted time series design (SITS).⁸⁶ While some important sources of bias remained (notably history and maturation) and the validity of the comparison estimate was susceptible to modeling limitations, the Evaluation Team believes this approach is the most rigorous possible, given the many constraints.

For Study 2, program impact is estimated by way of a matched comparison group design coupled with analytic modeling procedures that should help to minimize observed variation between the treatment and comparison groups. In the benchmark approach for Study 2, the Evaluation Team used a two-stage approach to "match" the comparison and treatment groups on unobserved, and potentially unobservable, characteristics as well as observed characteristics. These procedures are employed to improve the likelihood of producing valid impact estimates.

⁸⁴ Both studies were observational in nature and relied upon four sources of data: 1) administrative data collected by VU, 2) individual-level economic data from the Indiana Department of Workforce Development (DWD), 3) contextual (aggregate) economic data from the Indiana public data utility (STATS Indiana), and 4) the Federal Bureau of Labor Statistics. Detailed information about data agreements and data merging are provided in Appendix B.

⁸⁵ An RCT was deemed impracticable prior to the creation of the Evaluation Plan.

⁸⁶ While in principal a pre-/post-study, the SITS design was able to obviate some important sources of potential bias by estimating a growth rate for the treatment group and, therefore, a credible counterfactual of what treatment group outcomes would be without treatment.



A summary of the findings from the benchmark analyses is presented below (see the *Findings Overview* section). Further details on the benchmark impact studies and results of sensitivity analyses, which are secondary investigations that assess the robustness of the impact estimates, are reported in [Appendix C](#).

RESEARCH QUESTIONS

VU reported that TAACCCT-funded enhancements to the FLE program included an increased administrative and training staff, greater integration of program specific training activities into course work, and various enhancements to existing curriculum. The TTDT program benefitted from increased administrative and training staff and additional training equipment. VU proposed that these TAACCCT-funded enhancements should improve labor market outcomes for program completers through enhanced access to employment opportunities within the logistics industry and by equipping FLE and TTDT graduates with the skills to pursue mid- and high-level employment tracks. The general hypothesis for the Impact Evaluation, therefore, was that exposure to the FLE and TTDT interventions should improve employment outcomes for participating students. These expectations were formalized in four Impact Evaluation research questions.

Study 1 | FLE Program

- **Research Question 1:** Did the FLE certificate TAACCCT-funded program at LTEC improve the *probability of employment* for students who completed the program more than would be expected given their pre-program employment?
- **Research Question 2:** Did the FLE certificate TAACCCT-funded program at LTEC improve the *quarterly wages* of students who completed the program more than would be expected given their pre-program wages?

Study 2 | TTDT Program

- **Research Question 1:** Did students who completed the TAACCCT-funded TTDT program (treatment) at LTEC demonstrate a higher *probability of employment* relative to an equivalent comparison group of students who completed a similar, but non-TAACCCT-funded TTDT program (control)?
- **Research Question 2:** Did students who completed the TAACCCT-funded TTDT program (treatment) at LTEC demonstrate *greater increases in quarterly wages* relative to an equivalent comparison group of students who completed a similar, but non-TAACCCT-funded TTDT program (control)?



FINDINGS OVERVIEW

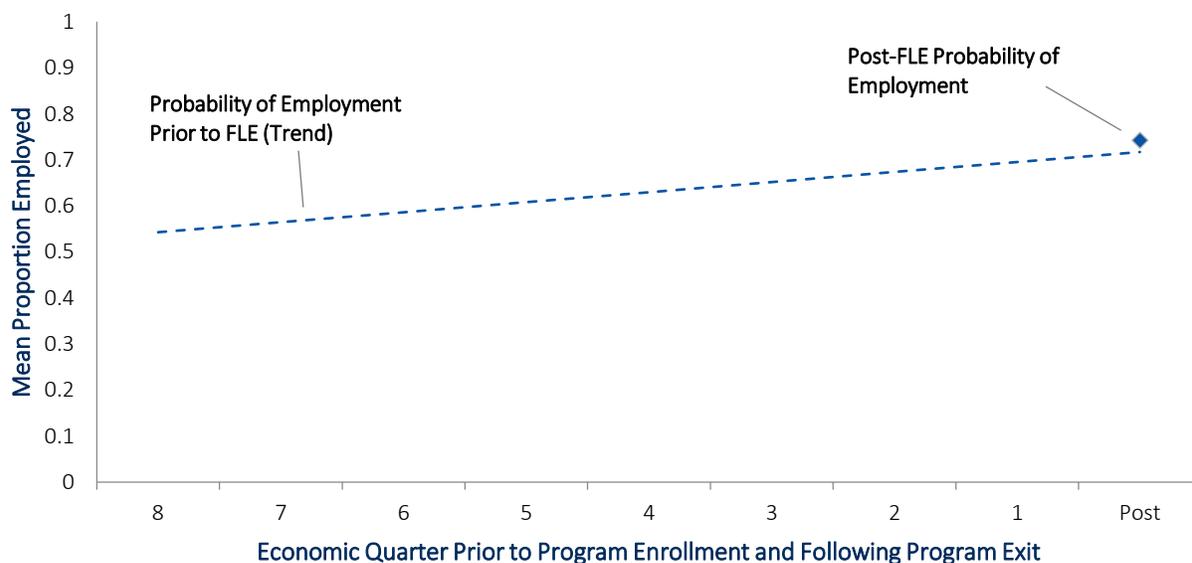
Study 1 | FLE Program

Research Question 1: FLE Program Effect on Employment Status

Findings from the benchmark analysis for Research Question 1 demonstrate that completion of the FLE program did not improve the probability of employment – at least in the short term.^{87,88} Model estimates presented in Table C8 in *Appendix C* show that in the first quarter after completion of the training program, FLE participants demonstrated a difference in probability of employment from what was projected by the baseline trend, but that difference was not statistically significant.

Figure 1 illustrates the regression results – namely that the post-FLE employment effect was difficult to distinguish from the pre-intervention trend. The probability of employment after the intervention looks quite similar to what the model projected would happen for an individual who did not receive the FLE training. Converting the estimated impact into a standardized effect size confirmed that the observed change was small (hedges' $g = .06$) and suggests that the findings would likely be replicable.

Figure 1: Estimated Pre-Intervention Employment Trend and Adjusted Post-Intervention Proportion Employed



While these results seem free of complications, a series of sensitivity studies was conducted to test the extent to which the findings were robust to the many analytic decisions. Impact estimates from these

⁸⁷ Although the Evaluation Team only reported findings for first quarter post-program economic impact, they also conducted identical analyses which estimated second quarter post-program economic impact. The Evaluation Team only reported on the first quarter post-program impact because the second quarter post-program data were incomplete and as such not representative of the broader population of interest.

⁸⁸ Impact for Study 1 was evident when the test statistic associated with the post-program deviation in the participant's earnings/employment status from a baseline trend in that same group's pre-program earnings was statistically significant at the .05 level.



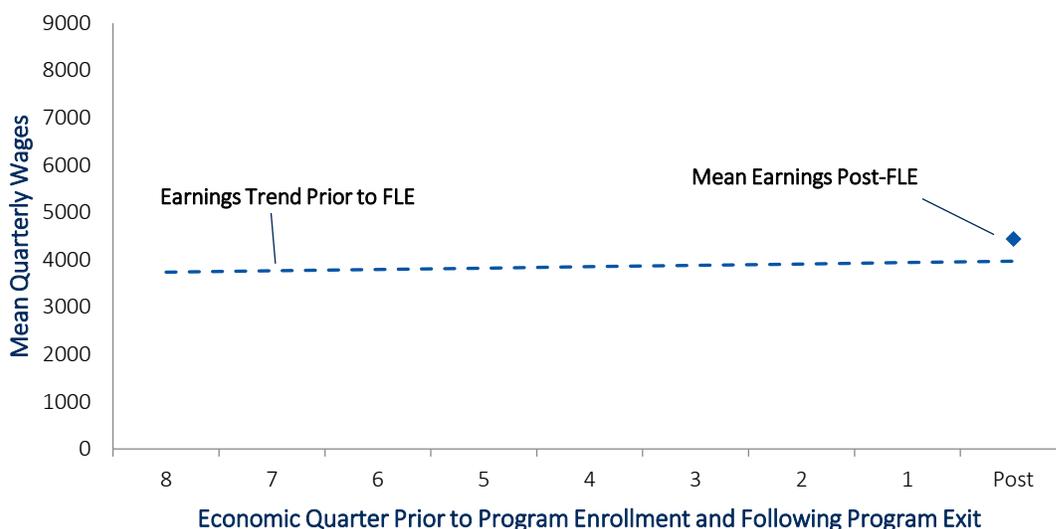
sensitivity tests are reproduced in Table C10 in *Appendix C*. The tests themselves are explained in more detail in *Appendix C*, but consisted of running a pre-/post-model rather than the SITS model, and running the benchmark SITS model with covariates and time-variant economic contextual variables iteratively included. In all but the first case (pre-/post-model), results corroborated the benchmark analytical model. The Evaluation Team is confident that the benchmark results are the most credible and valid but provides further details and interpretation of results in *Appendix C* of this document.

Research Question 2: FLE Program Effect on Earnings

Empirical results for Research Question 2 indicate that completing the FLE program improved earnings in the first quarter immediately following program completion.⁸⁹ Model estimates presented in Table C8 in *Appendix C* show that in the first quarter after completion of the training program, FLE participants demonstrated a statistically significant increase in quarterly earnings (\$473.47) from what is projected by the baseline trend.

Figure 2 presents a graphic representation of the mean pre-program wage trend as well as the deviation from the trend reflected within the first quarter after program completion. There is a noticeable post-FLE effect in quarterly earnings, as the regression adjusted mean earnings post-FLE training are perceptibly above the line. Recipients of FLE were earning more money in the first quarter post-intervention, even when a secular increase in quarterly wages was accounted for over the prior two years. While the quarterly wage data cannot inform whether this increase in wages reflects higher pay or more hours worked, it does suggest that participants took home almost \$500.00 more each quarter than would have been expected had they not received the training. Converting the estimated impact into a standardized effect size (hedges' $g=.10$) lends further support to the conclusion that FLE training contributed to a small but substantive increase in quarterly take home pay.

Figure 2: Estimated Pre-Intervention Earnings Trend and Adjusted Post-Intervention Earnings



Again, the Evaluation Team conducted a series of secondary analyses to test the extent to which the findings produced by the benchmark analysis were robust to the decisions employed there. Impact

⁸⁹ See Footnote 76.



estimates from these sensitivity tests are reproduced in Table C10 in *Appendix C*. The tests are the same as those performed on the benchmark employment model with the addition of two tests that excluded outliers in the analysis. All but one of these models confirmed the benchmark results. In this analysis, however, the sample size was so reduced that the most reasonable interpretation is that the difference in findings is being driven by changes in the samples rather than added explanatory power of the covariates. Further details and interpretation of this test are provided in the Conclusions section of this document.

Study 2 | TTDT Program

Research Question 1: TTDT Program Effect on Employment Status

Results produced by the benchmark analysis for the first research question of Study 2 indicate that completion of the TTDT program had no impact on the probability of employment.⁹⁰ Sensitivity studies, however, suggest that limited statistical power may be inhibiting the capacity to detect an effect. In any case, estimates of the benchmark analysis produced in Table B.9 in Appendix B show that in the first quarter after completion of the training program, TAACCCT-funded TTDT participants demonstrate no significant difference in likelihood of employment as compared to the comparison group who received non-TAACCCT-funded TTDT. Figure 3 illustrates the comparative estimated linear trends in proportional employment status for both groups through eight quarters prior to TTDT along with the actual adjusted employment probabilities in the first quarter after receiving TTDT training.

Figure 3: Estimated Employment Trend and Adjusted Post-Intervention Proportion Employed, by Group

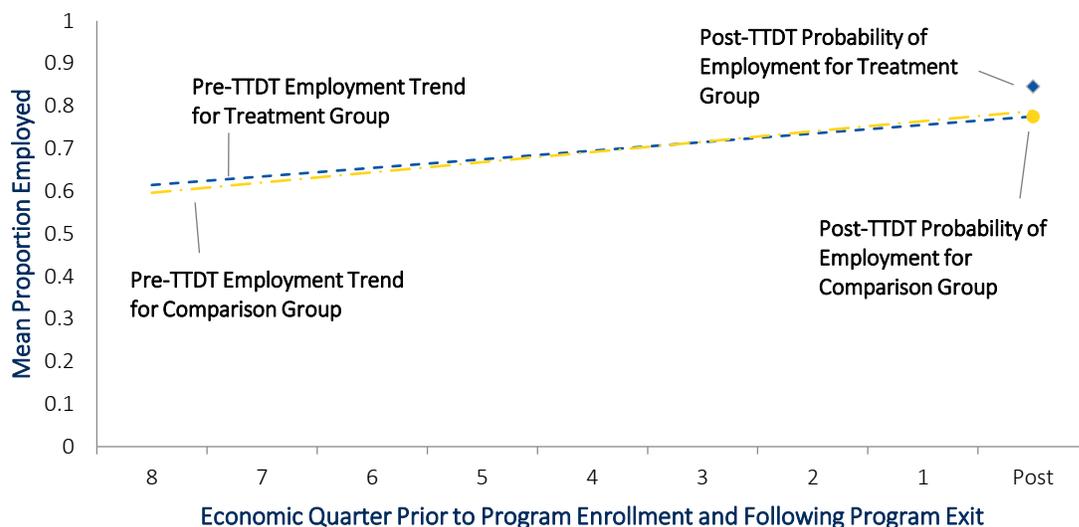


Figure 3 shows the estimated trends for both treatment and comparison groups and the relative post-TTDT employment probabilities for both groups. The trends of both groups are strikingly similar.⁹¹ This is largely

⁹⁰ Impact for Study 2 was evident when the test statistic associated with the difference between the treatment and comparison group in post-intervention change (accounting for their different trajectories) in earnings/employment status was statistically significant at the .05 level.

⁹¹ This similarity was also evident in the baseline equivalence statistics in Table C7 in *Appendix C*.



a function of the weighting procedures.⁹² The lines demonstrate that at least in terms of prior employment status, the weighted treatment and comparison samples were almost identical. The benchmark results indicate that although the difference in post-program employment is noticeable, the impact is statistically insignificant.⁹³ A more detailed discussion of these results and the sensitivity studies appears in [Appendix C](#).

Research Question 2: TTDT Program Effect on Earnings

Results produced by the benchmark analysis for Research Question 2 indicate that completion of the TAACCCT-funded TTDT program had no impact on first-quarter post-program earnings.⁹⁴ Estimates presented in Table C9 in [Appendix C](#) demonstrate a statistically insignificant difference in the first-quarter post-program earnings of students completing the TAACCCT-funded TTDT program and students completing the non-TAACCCT-funded TTDT programs. Figure 4 illustrates the estimated linear trends in quarterly wages for both groups through eight quarters prior to TTDT along with the actual adjusted wages in the first quarter after receiving TTDT training. Though the effect reflected in Figure 4 appears substantial, sensitivity studies suggest that the apparent effect was mainly attributable to the uniformly high variability which existed in the outcome measure across comparison groups. Converting the estimated impact into a standardized effect provided partial confirmation of this interpretation. The standardized effect size, which was a function of the estimated effect and the standard deviation of that measure, was comparatively small (hedges' $g = .04$).

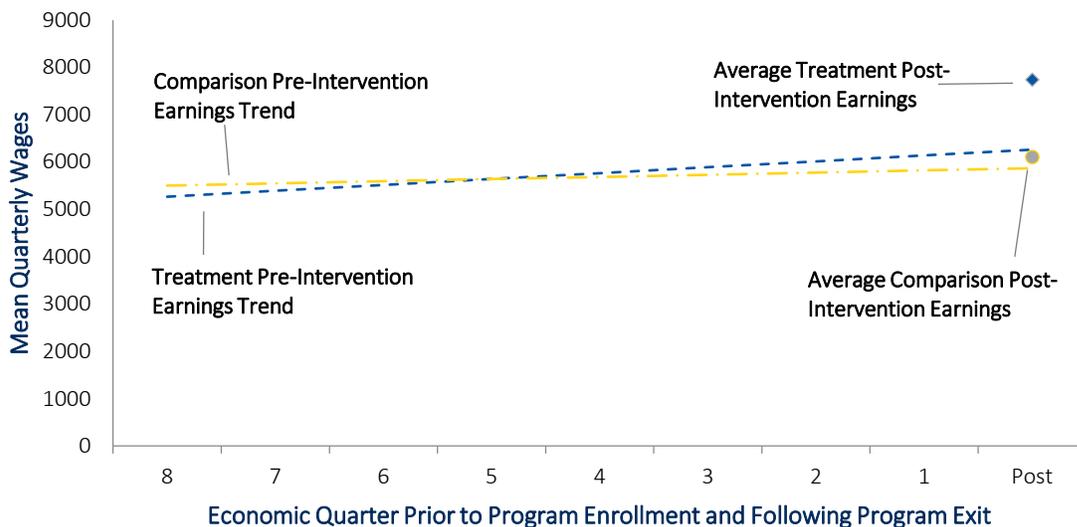
⁹² See Figure C4 in [Appendix C](#) for a graphic illustration of the regression lines estimated without applying inverse probability weights.

⁹³ Secondary analyses suggest that the reason for this uncertainty may have been produced by the variability in outcomes for the two constituent groups that made up the pooled contrast, and that a small sample is likely inhibiting the ability to detect an effect.

⁹⁴ See Footnote 78.



Figure 4: Weighted Estimated Pre-Intervention Earnings Trend and Adjusted Post-Intervention Earnings, by Group



All sensitivity studies further corroborate these findings and indicate that results were not sensitive to analytical decisions. In each of the sensitivity studies, the mean difference in treatment and control participants’ first-quarter post-program earnings remains statistically insignificant.

Limitations

Given the constraints placed upon the study, the Evaluation Team believes it has produced the most rigorous impact analysis possible. Nevertheless, it is important to highlight how these constraints may limit the ability to isolate the effects of programming from potential sources of bias.

Unobserved Variation – Although a well-executed randomized controlled trial (RCT) is the only reliable way to consistently estimate an unbiased program impact, an RCT was deemed impracticable by VU leadership. The Evaluation Team therefore relied upon quasi- or non-experimental (QED) methods to estimate program impacts. QEDs rely on statistical and after-the-fact controls on observed features to reduce the possibility that the effect that is attributed to the treatment is not conflated with other influences. However, among the potential limitations associated with QED designs, its chief general weakness is that it cannot control for unobserved variation (as RCTs do through randomization), so the analyst cannot be absolutely certain that the impact credited to the program is not also being motivated by differences in unobserved factors in the treatment and comparison groups (e.g., motivation or persistence).

Maturation and Historical Effects – Study 1 is also potentially compromised by the treatment-only pre/post design. In the absence of a comparison group that is equivalent to the treatment group, the Evaluation Team cannot ignore the possibility that impact estimates are a combination of the actual program impact and alternative causal factors such as maturation and historical effects. Historical factors that happen outside the control of the study (e.g., economic events and issues) or maturation factors, which are natural growth or development that would have occurred without the program could be influencing the outcomes directly or indirectly. However, because the



program itself was of short duration (and only one quarter separated the pre- from post-program observations), the potential for these factors to bias the impact estimates is possible but unlikely.

Historical and Selection Effects – Study 2 employed an apparently equivalent comparison group as a means to control for some of the extraneous factors that might bias impact estimates in a treatment-only design. Nevertheless, it is possible that the comparison group itself has insinuated alternative causal confounds into the study. The retrospective group’s labor market experiences may have been different enough (and in ways that the Evaluation Team cannot observe or measure) from the treatment group’s that the programmatic effects estimated by the empirical models are, in fact, a blend of the actual impacts and these economic factors. Similarly, if there are selection processes that differ across regions in the contemporaneous contrast, the impact estimates may also be biased.

Propensity Score Weighting – It is possible that the propensity score weighting procedures have created a match that looks good on observed variables but in fact creates imbalance on unobserved factors. This is unlikely, given the predictive value of the pre-intervention outcome data. Nevertheless, this bias remains a possibility.

Small Sample Sizes – Further limitations have been imposed by the relatively small size of the analytical samples. Small sample sizes invariably diminish statistical power, which increases the likelihood that a study is unable to detect significant effects of programming, even if those effects in fact exist. This is exacerbated – as the Evaluation Team believes is the case in Study 2 – when variation or “standard error” in the outcome estimate is large relative to the estimated impacts.

Project Timeline – Finally, due to the competing considerations of reporting requirements and sample size concerns, the Evaluation Team was compelled to measure the effects of programming over a very short period of time. If they exist, employment effects of programs such as these undoubtedly increase over time (up to a point). For this study, however, the Evaluation Team was constrained to a relatively narrow window in which to observe the potential benefits of programming.



Conclusions



CONCLUSIONS

LASTING EFFECTS OF THE GRANT

It is beyond the scope of this evaluation to make value judgments about whether the degree of tangible and intangible success obtained as a result of the LTEC Initiative was sufficient to warrant the amount of public investment made, or to otherwise draw conclusions about the benefit of LTEC. Qualitative evidence suggests, however, that effects of the LTEC Initiative are likely to continue through the end of the grant and beyond.⁹⁵ Although the LTEC Initiative took more time to implement than originally anticipated, even with the existing programs and facility in place, the time that has been invested has positioned the facility, partners, and program participants for continued success:

Capacity Building – The LTEC Initiative has facilitated capacity building within the facility by allowing staff and faculty to test programming innovations (i.e., hybrid delivery models). While some programmatic elements of these innovations will last – training programs and warehouse functions – even more so the effects will be on the capacity of the facility to offer enhanced and expanded logistics-related programs.

Partner Engagement – Because program success was heavily dependent on partnerships and investments made by employers, community organizations, and educational partners, the grant aided in increased connections between LTEC and these entities. Partner engagement findings are qualitatively described within the *Implementation Evaluation: Program Partners* section.

Hybrid Training Model – Significant investments in the warehouse, including technology solutions and equipment, and in curriculum and program development will continue to benefit LTEC’s faculty, staff, and students. Interviewed program participants found the hybrid model incorporating online and traditional classroom material as well as the hands-on experience gained in the warehouse as unique and valuable components to their program. Similarly, regional employers and LTEC faculty noted that the hybrid program model offered by LTEC provided relevant and much-needed training for the logistics industry.

LOOKING BEYOND THE GRANT

At the end of the grant, LTEC leadership have determined next steps for the facility. Due to the funding from USDOL, and investments and donations from partners, LTEC was able to expand and enhance programs to offer innovative delivery models and meaningful learning experiences through the development and implementation of a fully functioning warehouse. Because of these features, LTEC leadership anticipate sustaining all programs and continuing to expand partnerships with industry and the facility as a whole moving forward. Moving beyond the grant, LTEC leadership anticipate the following activities to take place.

⁹⁵ Training funds ended in March 2016 and all other grant funding ends in September 2016. As of August 2016, 36 participants are actively pursuing LTEC training in the GLA and TTDT programs, and the staff was continuing to enroll new participants into the program.



CONCLUSIONS

VU LTEC Final Evaluation Report



Additional Employer Partnerships

LTEC established a number of connections with local employers that will likely continue post-grant. Most notably, a recent partnership with Toyota Material Handling has resulted in the establishment of a customized, employee training program within the Global Logistics Associate (GLA) training program. LTEC leadership anticipate that this partnership will bring a number of employees from Toyota through the program – currently, Toyota anticipated sending several hundred employees to LTEC on a yearly basis – and has already enrolled students for the August session. Through this partnership, LTEC has also received donations from Toyota to aid LTEC in customization of the GLA program. This post-grant partnership, as well as others, will aid in sustainability of LTEC programs moving forward.



Additional Programs

In addition to all current LTEC programs being sustained beyond the grant, LTEC leadership have started to explore opportunities to add other programs to the facility. Upon discussions with the main campus, LTEC leadership have considered adding the Industrial Maintenance program to LTEC for a number of reasons, including: 1) the main campus focuses on the advanced manufacturing side of Industrial Maintenance but LTEC, with its focus in logistics, could open up this program to a wide array of logistics students; 2) industry recognizes the need for post-secondary degrees within this program and can potentially require completion of the program, which could likely improve academic program enrollment at the facility; and 3) this program would allow LTEC to continue expanding in regards to student enrollment and industry partnerships through a new focus area within the logistics industry.



Enhancing Programs

Through additional funding sources, investments, and donations, LTEC anticipates continuing to enhance programs by purchasing additional equipment to accommodate more students, hiring personnel to increase capacity, and finding new and innovative ways to encourage degree completion (e.g., through potential implementation of new degree options at the facility that adjust math requirements to more technical applicability-levels). These options are described in the *Accelerators and Strengths: Ongoing Recognition of Student Needs* section. While LTEC is still determining whether these degree options would actually encourage student degree completion, the ability to continue enhancements and modifications to programs post-grant suggests knowledge sharing and growth as a result of grant implementation.



Additional Funding and Investments

Throughout the course of the grant, LTEC has established partnerships with employers and other partners resulting in equipment donations and monetary investments. More recently, LTEC has identified a number of potential funding sources (i.e., grants) including a Department of Corrections grant to assist with program improvements beyond the TAACCCT grant. LTEC staff will continue to explore different grant opportunities to facilitate ongoing facility improvements. LTEC leadership have also submitted a proposal to community partners, such as the Town of Plainfield, for additional funding to expand current logistics programming offered at LTEC. Near the beginning of the grant, a relationship was established with the Town of Plainfield, who invested \$500,000 in the LTEC facility. This long-standing partnership could continue to support LTEC's goal of serving non-traditional students in the logistics industry beyond the grant.



FUTURE RESEARCH OPPORTUNITIES

A review of study findings and study limitations suggests several avenues for future research. The Evaluation Team has identified three areas where further research may yield greater insight into the effects of the TAACCCT-funded FLE and TTDT programs. These are: 1) whether a longer post-program observational window would reveal impacts of greater magnitude; 2) how and why FLE program completion appeared to impact wages but not the probability of employment; and 3) whether the results of models estimating employment impact for TTDT completers were driven by a small sample size.

Following the first suggestion would require extending the post-program observational period for the purposes of examining outcomes beyond the first quarter following FLE program completion. Employing an extended post-program observational period would answer questions about whether the effects of TAACCCT-funded programs were different over the short and longer terms. Hypothetically, it seems reasonable to expect that the influence of the programs were not fully manifest in the first quarter post completion. This is an empirical question that would be worth investigating.

Exploring the second suggestion would likely necessitate qualitative data collection. Ideally, by interviewing a sample of TAACCCT-funded and non-TAACCT-funded FLE program completers, as well as a set of representative employers, researchers could gather insight into the experiences and expectations related to the trainings. In particular, researchers could ask questions and seek to find common themes about why completers sought out FLE training and when. They could also investigate what employers understood and valued in the program and whether it was the sort of training they expected new hires to obtain, or whether it was envisioned more as training for existing employees.

Investigating the next question would simply require a larger analytic sample. With a larger sample, researchers could determine if in fact this study was under-powered to detect a meaningful effect. Although it lies outside the scope and resources of this evaluation, an a priori power analysis could determine an ideal sample size to investigate impacts at a pre-specified minimal detectable effect size, given certain assumptions. The resulting study could produce more conclusive estimates of TAACCCT-funded TTDT program impact.

Finally, examining the implication of the effectiveness of mixed-methods evaluations (i.e., pairing implementation – qualitative – and outcomes/impact – quantitative – evaluations) requires inquiry into the advantages of establishing a mixed-methods approach for large-scale, grant-funded projects. For this study in particular, the mixed-methods approach enhanced the relevance of the evaluation – as the formative Implementation Evaluation informed the Impact Evaluation study design, and the summative Implementation Evaluation provided context and insight into grant progress and fidelity to the original model. However, in order to implement a successful mixed-methods strategy, a significant amount of time is required to collect data from both the implementation and outcomes/impact analyses.⁹⁶ Future researchers could examine the effectiveness of this approach in greater depth, yielding more conclusive evidence on whether this approach is the best suited for large-scale, grant-funded projects.

⁹⁶ Creswell, J. (2009). *Research design: Qualitative, quantitative, and mixed-methods approaches*. SAGE: Thousand Oaks, CA. Retrieved by: <http://www.ceil-conicet.gov.ar/wp-content/uploads/2015/10/Creswell-Cap-10.pdf>



Appendices



APPENDIX A. USDOL-IDENTIFIED CORE ELEMENTS

Information for this section was drawn from the USDOL TAACCT Solicitation for Grant Applications.

Table A1: TAACCT Core Elements

Evidence-Based Design	Implement projects that develop new strategies, or the replication of existing evidence-based strategies, that are likely to improve education and employment outcomes for program participants.
Stacked and Latticed Credentials	Working closely with industry associations and employers to review programs and identify clusters of courses that could be considered for valued credentials. The development of certifications, certificates, and diplomas will be stacked to promote student progress and also build on previously-learned content allowing for side-by-side credentialing.
Online and Technology-Enabled Learning	<p>Learning strategies that effectively serve TAA-eligible workers and other adult learners. Online and hybrid learning allows these populations to balance the competing demands of work and family to acquire new skills in an expedited and accessible way.</p> <p>These strategies should effectively teach content to students, enable students to teach themselves and each other, and/or allow students to engage in hands-on learning. Competency-based assessment models and accelerated learning are supported through this learning strategy.</p>
Transferability and Articulation	Creating pathways for TAA-eligible workers and other adults to further their education, through increased cooperation among institutions both within and across state lines.
Strategic Alignment	<p>Three types of stakeholders must be engaged: 1) employers and industry; 2) the public workforce system; and 3) education institutions and other organizations.</p> <p>Employers and industry representatives assist the institution in defining program strategies and goals, providing resources to support education/training, and committing to hire qualified program participants.</p> <p>Engagement of the public workforce system can include identifying, assessing, and referring appropriate candidates for education and training; connecting workers with employers; providing support services where appropriate; and tracking participants as they reenter the workforce.</p> <p>Educational institution and other organization engagement can include sharing information, lessons learned, and program content; sharing technological innovations; developing transferability and articulation agreements; and working together to standardize credentials.</p>



APPENDIX B. IMPLEMENTATION EVALUATION METHODS

An important component of the evaluation was that LTEC staff received ongoing and accessible feedback to build upon any early evidence as it emerged throughout the evaluation. Throughout the execution of the evaluation, and especially throughout the Implementation Evaluation, the Evaluation Team employed principles of a utilization-focused framework.⁹⁷ The substantiated assumptions⁹⁸ of utilization-focused evaluations are: 1) intended users are more likely to utilize evaluation findings if they understand and value the evaluation’s process; 2) intended users are more likely to understand and value the evaluation’s process if they are engaged in evaluation decisions; 3) engaged intended users both enhance the credibility of evaluation findings and possess greater capacity for utilizing findings to improve the program; and 4) capacity for utilizing findings relies heavily on a collaborative, functional relationship between intended users and evaluators.

Additionally, the formative component of the Implementation Evaluation offered real-time feedback as the program rolled out, as opposed to offering information only retrospectively, through frequent calls and annual reports following evaluation site visits. This provided the opportunity to identify early evidence of strengths and areas for growth throughout the development of the program.

RESEARCH QUESTIONS

Table B1 summarizes the research questions examined through the Implementation Evaluation, including ties to data sources and collection tools/protocols, and analysis methods. Further details on data sources and collection plans, analysis methods, and potential limitations of the Implementation Evaluation are detailed in subsequent sections.

Table B1: Implementation Evaluation Research Questions

Research Question	Data Sources and Collection	Analysis Methods
What LTEC program implementation has taken place to date?	<ul style="list-style-type: none"> Implementation Evaluation update calls On-site/phone interviews Program artifact reviews Pre- and post-data 	<ul style="list-style-type: none"> Review artifacts including quarterly USDOL reporting to verify output production Discuss outputs with LTEC leadership and staff/faculty
How were training strategies developed and implemented?	<ul style="list-style-type: none"> On-site/phone interviews 	<ul style="list-style-type: none"> Document themes, interpret, and report on qualitative data provided by employers/partners, staff/faculty, and LTEC leadership

⁹⁷ Patton, M.Q. (2012) *Essentials of Utilization-Focused Evaluation*. Thousand Oaks, CA: Sage.

⁹⁸ Brandon, P., Smith, N., Trenholm, C., and Devaney, B. (2010). “The Critical Importance of Stakeholder Relations in a National, Experimental Abstinence Education Evaluation.” *American Journal of Evaluation*, 31, 4: 517-531.

Patton, M. Q. (2012). *Essentials of utilization-focused evaluation*. Thousand Oaks, CA: Sage.

Taut, S. (2008). What have we learned about stakeholder involvement in program evaluation? *Studies in Educational Evaluation*, 34.



What have been successes and obstacles to program performance? Why?	<ul style="list-style-type: none"> Implementation Evaluation update calls On-site/phone interviews 	<ul style="list-style-type: none"> Document themes and report on qualitative data provided by LTEC leadership, staff, and faculty
What contributions did partners make to the program? How?	<ul style="list-style-type: none"> On-site/phone interviews 	<ul style="list-style-type: none"> Document themes and report on qualitative data provided by employers/partners and LTEC leadership and faculty
How satisfied are program leadership, staff, and participants with the program? Why? ⁹⁹	<ul style="list-style-type: none"> On-site/phone interviews 	<ul style="list-style-type: none"> Document themes and report on qualitative data provided by employers/partners, staff/faculty, participants, and LTEC leadership
How can program processes, tools, and/or systems be modified to improve performance?	<ul style="list-style-type: none"> On-site/phone interviews 	<ul style="list-style-type: none"> Document themes, interpret, and report on qualitative data provided by leadership, staff, faculty, and participants
What is the legacy of the program? What elements of the program will be sustained beyond the grant?	<ul style="list-style-type: none"> On-site/phone interviews 	<ul style="list-style-type: none"> Document and synthesize general themes and details from interviews and interpret and summarize qualitative data in report format

DATA SOURCES AND COLLECTION

Data for the Implementation Evaluation was collected from the following data sources:

- Implementation Evaluation update calls with LTEC leadership – monthly
- On-site interviews and focus groups with LTEC leadership, staff and faculty, regional employers, and participants – biannually
- LTEC Initiative documents and artifacts, including quarterly program reports, program-related promotional materials, and other documents
- Pre-/post- participant assessment data

Implementation Update Calls

Implementation Evaluation update calls between the Evaluation Team and LTEC leadership took place on a monthly basis. Members of LTEC leadership included the Director and Project Manager.

The Implementation Evaluation update calls allowed LTEC leadership to provide the Evaluation Team with timely information regarding the LTEC Initiative processes, progress, obstacles, and successes. These findings were elaborated upon during site visit interviews, but calls provided LTEC leadership with an opportunity to recall events and challenges more frequently than the biannual site visits. Thomas P. Miller & Associates’ (TPMA’s) Evaluation Project Manager maintained detailed notes from each call. These notes were stored on TPMA servers and provided a timeline of relevant occurrences used as a reference point

⁹⁹ Note that this question, within the *Implementation Evaluation* section, it separated into two questions.



for staff and employer interviews. Face-to-face meetings substituted for the Implementation Evaluation update calls when the Evaluation Team conducted evaluation site visits.

On-Site Interviews

Site visit plans included a series of semi-annual site visits for one-on-one and small group interviews, in September 2013, April and September 2014, March/May¹⁰⁰ and September 2015, and March 2016. When USDOL granted the six-month extension, the Evaluation Team expanded the site visit schedule to include leadership, faculty, instructors, staff, and students in March 2016.¹⁰¹ Also, additional Implementation Evaluation update calls were added to supplement the final site visit and ensure that ample qualitative data was being collected. A number of phone interviews were used as well to ensure that all staff, faculty, and participants were able to provide feedback, updates, and recommendations for improvement.

The Evaluation Team developed interview facilitation guides to be used with each of the site visits. These guides were originally deployed during the September 2013 site visit in Year 1 and were used in subsequent site visits in April 2014 of Year 2, September 2014 of Year 2, March and May 2015 of Year 3, and September 2015 of Year 3. For the final site visit in March 2016, the guide was revised to focus on themes and issues that had emerged throughout the years of implementation as well as program sustainability and lessons learned.

The Evaluation Team visited the LTEC facility and conducted interviews with stakeholder groups outlined in *Table B2*.

Table B2: Implementation Evaluation Stakeholders

Stakeholder	Description	Totals
LTEC leadership	The Evaluation Team conducted semi-structured 60-90 minute interviews with LTEC leadership on program activities and integration, collaboration/partnerships, resources, lessons learned, and sustainability.	>10 interviews
LTEC staff	Semi-structured 30 minute small-group and individual interviews were held with LTEC staff, covering program activities and integration, collaboration/partnerships, resources, lessons learned, and sustainability.	>15 individual interviews
LTEC faculty and instructors	As available, 30 minute semi-structured small-group and individual interviews were conducted with LTEC faculty and instructors. Discussions centered on program activities, collaboration/partnerships, resources, and lessons learned.	>10 individual interviews
Regional employers and partners	Semi-structured 30-60 minute interviews were held with regional employers. These interviews typically took place via phone or at the LTEC facility. Employer discussions focused on program engagement, impacts to the business, and overall satisfaction.	>10 individual interviews
LTEC participants	The Evaluation Team held semi-structured 30-60 minute focus groups with grant participants. Typically, these focus groups occurred during originally scheduled class time.	>10 focus groups

¹⁰⁰ The May 2015 site visit was specifically to observe classroom instruction and conduct participant focus groups.

¹⁰¹ Previously the March 2016 site visit was to only include LTEC leadership.



	Discussions focused on the individual’s goals, program experience and satisfaction to date, and overall program feedback.	
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Interviews were semi-structured with open-ended questions for probing and conversational inquiry. In line with the principles of applied thematic research, this interview approach allowed research participants to speak about experiences in their own words, free of the constraints imposed by fixed-response questions. Inductive probing allowed the Evaluation Team to clarify statements, meaning, and the feelings associated with the experiences, to promote accuracy in detailed observational notes. This interview framework also provided the means to “[learn] from the participants’ talk and dynamically [seek] to guide the inquiry in response to what is being learned.”¹⁰²

To increase validity of the interviews, the Project Lead was present for every site visit and the same two evaluators were present for most visits and participated in the Implementation Evaluation update calls, program artifact reviews, and report writing. This consistency helped build and preserve institutional knowledge across site visits. In addition, these methods are consistent with recommendations made by qualitative researchers,¹⁰³ and allow a member of the Evaluation Team to focus on facilitation and a second member to take detailed notes.

Program Artifact Reviews

The Evaluation Team reviewed a variety of program artifacts including:

- Quarterly fiscal, program narrative reports, and Annual Performance Reports sent by LTEC leadership to USDOL;
- Promotional materials highlighting LTEC programs (i.e., flyers and brochures); and
- Training, process flow, policies and procedures, and sustainability plans prepared internally by LTEC leadership, faculty, and staff.

These documents provided additional context and information to evaluate program implementation at each stage – program challenges, successes, unintended consequences (both positive and negative), and the reasons for accelerated or delayed program progress. Context from these documents informed questions for the monthly Implementation Evaluation update calls and for site visits, and informed context within the evaluation reports.

Pre-/Post-Participant Assessment Data

For three grant-funded programs offered at LTEC – Fork-Lift Essentials (FLE), Team Lead Essentials (TLE), and Global Logistics Associate (GLA) – a pre- and post-assessment was administered by LTEC staff to gauge the level of knowledge gains from the beginning to the end of the programs. Data from these programs’ pre-and post-assessments was provided for analysis. The data allows LTEC staff and leadership to determine the knowledge gained throughout the programs, which was averaged across each assessment. The Evaluation Team also assessed differences between the pre-and post-assessments over time (i.e., over

¹⁰² Guest, G., MacQueen, K.M., and Namey, E.E. (2011). *Applied Thematic Analysis*. Thousand Oaks, CA: Sage.

¹⁰³ Kidd, P. S. & Parshall, M. B. (2000). Getting the focus and the group: Enhancing analytical rigor in focus group research. *Qualitative Health Research*, 10, 3: 293-308.



each quarter), for varying training days, and comparisons by and between groups. See [Appendix F](#) for more details.

ANALYSIS METHODS

Thematic Analysis

A general inductive thematic approach,¹⁰⁴ with influences of applied phenomenology,¹⁰⁵ was used to analyze the qualitative data generated from the interviews. This approach was selected because of its usefulness in drawing clear links between research questions or objectives and data collection results, and because it provides a theoretical foundation for subjective meaning to be interpreted and extrapolated from discourse. The analytical framework used for the analysis included a time-dependent gradient (before the program, changes occurring in each year of program implementation, and post-program scaling) and a program-dependent gradient (analyzing the program components).

Units of analysis included the programs; LTEC leadership, staff, and faculty; and participants.

Emerging themes were then developed according to the analytical framework and through a review of 1) the notes taken during monthly calls; 2) LTEC documents and artifacts; 3) detailed notes taken during site visits; and 4) the Evaluation Team's extensive experience with technical training programs and the body of evaluation knowledge built through their work. Guidance about what was important came from the grant narrative, research questions, and calls that had occurred throughout the grant period. Following the initial theme development, additional Evaluation Team members reviewed the results, adding contextual details and examples. These themes were divided into five categories:

- *Interim Progress* – Documentable steps that had been taken to advance or achieve grant outcomes, deliverables, milestones, and/or goals;
- *Accelerators/Strengths of Progress* – Factors that had enhanced grant progress and improved the ability of grant staff to carry out grant initiatives, focused on internal factors (program design, modification, implementation, and application);
- *Barriers/Challenges to Progress* – Persistent difficulties grant staff had faced in accomplishing grant initiatives;
- *Recommendations* – Opportunities the Evaluation Team identified for improving progress toward grant outcomes (in Interim Reports), and recommendations for other educational institutions looking to start similar programs; and
- *Sustainability* – Components of the program that will continue once funding ends.

The results were again compared to the analytical framework and the anticipated reporting elements. The final step in the analysis was to send the summarized results to LTEC leadership for clarification and additional contextual details.

To strengthen the accuracy and credibility of implementation study findings, the Evaluation Team relied on triangulation and collaborative inquiry. By comparing findings based on different data sources and using approaches that incorporated both evidences and negative evidence, the Evaluation Team created a robust

¹⁰⁴ Thomas D. R. (2006). A general inductive thematic approach for analyzing qualitative evaluation data. *American Journal of Evaluation*, 27: 237-245.

¹⁰⁵ Guest, G., MacQueen, K.M., & Namey, E.E. (2011). *Applied thematic analysis*. Thousand Oaks, CA: Sage.



and dynamic depiction of implementation.¹⁰⁶ By presenting findings to LTEC stakeholders for elaboration, corroboration, and modification,¹⁰⁷ the Evaluation Team confirmed and updated analyses. Additionally, by sharing findings with intended users as they emerged, the Evaluation Team built a collaborative relationship with stakeholders that encouraged higher quality first-person data and increased the likelihood the evaluation could produce timely, user-relevant findings.¹⁰⁸

Reporting

Data were interpreted, analyzed, and included in three Interim Reports, in December 2013, 2014, and 2015, and the final report, drafted in Summer 2016 and finalized by September 2016. The reports contained the results of the analysis, recommendations for improvements, rationale for recommended modifications, and any threats or challenges that may have arisen as a result of recommended modifications. An in-depth review of these reports was conducted by LTEC leadership for member checking, factual verification, and elaboration on findings and recommendations. Subsequently, the reports were submitted to the USDOL.

Pre-/Post-Assessment Analysis

For this analysis, reported cumulatively for this report only, data by program, quarter, and type (i.e., student's company, cohort, or status) was provided by LTEC staff. Descriptive statistics were drawn from the data to help describe, show, and summarize the data in a meaningful way (i.e., to allow for patterns to emerge from the data).¹⁰⁹ Measures of mean were gathered to show the differences between pre- and post-assessment data within different quarters and programs. Descriptions were provided about the data that were available to enable LTEC staff to understand the knowledge gains for students in the TTDT, FLE, and GLA programs. See [Appendix F](#) for a more detailed report of this data.

LIMITATIONS

Limitations for the Implementation Evaluation included four main elements:

Partial and Biased Findings – Qualitative and perceptual research methods offer good insights, but are, by nature, partial and biased. To attempt to address this limitation, the Evaluation Team took advantage of an opportunity embedded in mixed-methods evaluation, the triangulation of data.¹¹⁰ Triangulating results from multiple sources, such as comparing findings among stakeholder interviews and with documents reviewed, creates more credible evaluation results, and is considered critical to the validity and reliability of findings. Findings that have been corroborated through triangulation tend to be sufficiently robust and credible.¹¹¹

Selection Bias – To address the threat of non-response and non-consent, and to improve the likelihood that sufficient data could be collected to draw valid conclusions, the Evaluation Team

¹⁰⁶ Brewer, J. and Hunter, A. (2006). *Foundations of multimethod research: Synthesizing styles*. Thousand Oaks, CA: Sage.

¹⁰⁷ Harry, B., Sturges, K.M., & Klingner, J.K. (2005). Mapping the process: An exemplar of process and challenge in grounded theory analysis. *Educational Researcher*, 34, 2: 3-13.

¹⁰⁸ Sturges, K.M. (2013). Building consensus in (not so) hostile territory: Applying anthropology to strategic planning. *Practicing Anthropology*, 35, 1: 35-39.

¹⁰⁹ Boeree, G. (2005). Descriptive statistics. Retrieved by <http://webpace.ship.edu/cgboer/descstats.html>

¹¹⁰ Brewer, J. and Hunter, A. (2006). *Foundations of multidimensional research: Synthesizing styles*. Thousand Oaks, CA: Sage.

¹¹¹ Harry, B., Sturges, K.M., & Klinger, J.K. (2005). Mapping the process: An exemplar of process and challenge in grounded theory analysis. *Educational Researcher*, 34, 2: 3-13.



relied on purposive and convenience sampling coordinated by program staff. This approach introduced selection bias into the findings. Participants and employers more interested in providing feedback or more involved in the program may have chosen to participate in interviews at a higher rate than less-interested or less-engaged participants and employers, and program staff responsible for coordinating interviews may have selected only those cases where they anticipated favorable responses to interview questions. Neutral and critical feedback from participants and employers at LTEC, however, supported the notion that these research participants were chosen primarily for their willingness to participate in the study rather than the likelihood that they would cast the program in a favorable light.

Researcher Extrapolation – Analyses conducted with an interpretive and analytical framework, influenced by phenomenology, suffer from the threat that researcher extrapolation and interpretation may go too far beyond what is present in, and supported by, data.¹¹² Indeed, the recommendations provided in this report are based on a combination of what was learned and supported by data and the experiences and findings of the evaluator’s previous experience designing, implementing, and evaluating various training programs.

Human Error – The Evaluation Team relied on LTEC staff and faculty to collect and track much of the data required for the Implementation Evaluation (tracking pre- and post-data). Human error and competing priorities could lead to imperfect and delayed data entry and tracking, which impacts the validity of the analysis. To mitigate this as much as possible, LTEC eventually hired a specific staff person to input student data into Excel. In addition, LTEC leadership reviewed all data prior to sending to the Evaluation Team for accuracy. Receipt and review of data by the Evaluation Team and by LTEC leadership assisted in identifying and addressing data quality challenges, however, there may still be data imperfections with the tracking.

Missing Data – Student data outlining the program of study, pre- and post-employment status, assessment data, and how the student was referred to LTEC was not consistently captured. Because of this, pre- and post-assessment data may not be completely accurate. If, for any reason, an assessment was not completed, or other data was not accurately captured, this could affect the reliability and validity of the inferences and findings from the pre- and post-assessment data, and thus, introduces another bias into the findings.¹¹³

INFORMING IMPACT EVALUATION

The Implementation Evaluation findings provided context for the Impact Evaluation by documenting the timing and nature of adjustments to program design. The Impact Evaluation utilized this documentation to understand whether changes to the program might impact various participants.

Impact Evaluation Revisions

As originally designed, the evaluation plan for the LTEC Initiative included a comparison group evaluation. The anticipated evaluation plan stated that by comparing LTEC participants to similarly situated Workforce Investment Act (WIA)-eligible workers from the Indianapolis area, the evaluation would demonstrate

¹¹² Guest, G., MacQueen, K.M., & Namey, E.E. (2011) *Applied thematic analysis*. Thousand Oaks, CA: Sage.

¹¹³ McKnight, E. & McKnight, K. (2007). *Missing data: A gentle introduction*. New York, NY: The Guilford Press.



whether individuals who went through the LTEC model, as a cohort, saw better employment, wage, and retention outcomes than a comparable group who did not.

Separating Comparison Groups

However, as LTEC was being implemented, the Evaluation Team, through the Implementation Evaluation, identified a critical threat to the original design: participants in academic and non-academic programs appeared to be different. The differences were highlighted as the one to two day Fork-Lift Essentials (FLE) training increased in popularity while the other more medium-term trainings had yet to be fully developed. This led to a gap in both the timeframes of the various LTEC programs as well as the type of students interested in the programs. This led the Evaluation Team to evolve the original analysis plan to include two different comparison groups that would address the academic and non-academic student participants.

1. LTEC short-term training students, specifically those in the FLE training, would be compared with a matched cohort of workforce system customers who expressed an interest in logistics positions and scored within a comparable range on the WorkKeys assessment.
2. LTEC academic students in the Supply Chain Logistics Management program would be matched with students in VU's Supply Chain program, offered on the main campus.

Refining Comparison Design Approach

As the Initiative continued to be implemented, additional adjustments were made to the Impact Evaluation design. The comparison group analysis anticipated utilizing workforce system data for FLE LTEC training program participants and workforce customers. Unfortunately, the Evaluation Team was only able to retrieve data at an aggregated level, not an individual level, from Indiana's Department of Workforce Development. The limited data availability created complications for comparing LTEC participants to workforce customers, to determine the differences between training. As a result, the Evaluation Team shifted to a treatment-only pre/post design for FLE participants.

Additionally, the original comparison group intended to compare mixed learning (LTEC) to traditional learning (main campus) environments through comparison of LTEC's long-term/academic program, Supply Chain Logistics Management, and VU's Supply Chain program. However, academic program enrollment at LTEC remained very low and the program was discontinued in Year 2 at the main campus. Subsequently this comparison design was no longer feasible.

Instead, when LTEC brought on the Tractor-Trailer Driver Training (TTDT) program in Year 3, the Evaluation Team built a quasi-experimental design to compare TTDT LTEC program participants with two similar training programs. One of these programs was the same TTDT program offered at LTEC prior to the implementation of TAACCCT improvements. The other was a TTDT program at another campus (VU Fort Branch); this program operated contemporaneously with the treatment program but had not been modified with TAACCCT improvements. Since students in both of these programs were expected to be similarly incentivized and career-directed (they had selected into a training program as the treatment group), and because they would be entering a similar target industry upon graduation, the Evaluation Team believed that the students in these programs comprised an arguably equivalent comparison pool of students for the treatment group.¹¹⁴

¹¹⁴ See [Appendix C](#) for full description of Impact Evaluation approach.



APPENDIX C. IMPACT EVALUATION METHODS

INTRODUCTION

This Impact Evaluation assessed the efficacy of two Trade Adjustment Assistance Community College and Career Training (TAACCCT)-funded programs offered at Vincennes University's¹¹⁵ (VU's) Logistics Training and Education Center (LTEC). Specifically, the Evaluation Team estimated the effect of LTEC's programs on participant employment outcomes. Broadly, LTEC programs were designed to prepare participants for employment in the logistics industry. TAACCCT funding provided LTEC with the ability to increase administrative and training staff, create new programming, enhance existing programs, integrate training activities earlier into existing processes, and to track the progress of participants. The main campus believed the TAACCCT-funded enhancements to its LTEC programs would improve the skills of and economic outcomes for participants above and beyond those achieved by participants who completed LTEC programming prior to TAACCCT funding.

The purpose of the Impact Evaluation is to assess the extent to which TAACCCT funding impacted the observed employment effects for participants of two LTEC programs. Toward this aim, the Evaluation Team conducted two studies: the first (Study 1) examined employment outcomes associated with completion of LTEC's Fork-Lift Essentials (FLE) program; the second (Study 2) examined employment outcomes associated with completion of LTEC's Tractor-Trailer Driver Training (TTDT) program. In particular, Study 1 tested whether the FLE program (*operating with TAACCCT-funded enhancements*) improved the quarterly wages and employment status for program completers relative to the outcomes one would expect for the same individuals, had they not completed the FLE program. Study 2 used multiple comparison groups to test whether the "treatment" TTDT program (*operating with TAACCCT-funded enhancements*) improved quarterly wages and employment status for program graduates above and beyond those for similar graduates who completed the "comparison" (non-funded or pre-TAACCCT-funded TTDT) program. Both Study 1 and Study 2 were observational studies and relied upon administrative data collected by VU and upon economic data from the Indiana Department of Workforce Development (DWD). The Evaluation Team describes procedures for merging the VU and DWD data in the *Data Collection and Management* section of this Appendix.

The decision to employ a two-study design was made in consultation with VU staff. VU staff and the Evaluation Team agreed that the FLE and TTDT programs were so different that simply pooling students together in a single sample would complicate the analysis and generate an impact estimate that would be substantively meaningless.¹¹⁶

¹¹⁵ Vincennes University (VU) is referred to as the main campus throughout the report.

¹¹⁶ The FLE and TTDT programs had different durations and curricula. The FLE was either a one- or two-day program while the TTDT was an intensive six-week training program. The two programs were designed to equip students with different skill sets and prepare students for different target employment markets.



Study 1 | FLE Program

Research Questions

In Study 1, the Evaluation Team examined whether the FLE program (*operating with TAACCCT-funded enhancements*) improved the economic outcomes of program completers above and beyond what might be expected based upon their pre-program (baseline) economic outcomes. Specifically, the research questions investigated in this study were:

- **Research Question 1:** Did the FLE certificate TAACCCT-funded program at LTEC improve the *probability of employment* for students who completed the program more than would be expected given their pre-program employment?
- **Research Question 2:** Did the FLE certificate TAACCCT-funded program at LTEC improve the *quarterly wages* of students who completed the program more than would be expected given their pre-program wages?

Sample Selection

To be included in the study, students must have enrolled and completed the FLE program between April 1, 2013 and September 30, 2015, and have completed pre-program and outcome economic data. The Evaluation Team operationalized economic outcomes as quarterly wages and employment status in the first quarter after the completion of the FLE program. The Evaluation Team and VU representatives could not identify a comparison group that was equivalent to the treatment group. As a consequence, the most rigorous design available to assess the impact of the program was a QED using a single-group pre/post study. In this analytical approach, the information provided by the treatment group's pre-intervention outcomes (wages or employment) served as the means to estimate the counterfactual experience of not being exposed to the program.

The "impact" was estimated as the difference between this and the observed post-intervention outcomes. Although this design was in principle vulnerable to a broad range of potential threats to validity, the Evaluation Team had managed, with the cooperation of Indiana Department of Workforce Development (DWD) and VU representatives, to collect two years of baseline (pre-intervention) economic outcome data for study participants. As a consequence, the Evaluation Team was able to present a more convincing case that the observed change in outcomes from pre- to post-program would be a credible estimate of program impact.¹¹⁷ Since prior observations of outcome data are highly predictive of subsequent values, any significant deviation from a baseline average or trend would be reasonably compelling evidence of program impact.¹¹⁸

Analytic Model

With the absence of an external comparison group, but the presence of eight quarters of pre-program data, the principal analytical question was how to best use (in a statistical model) the pre-program data to most convincingly estimate the counterfactual (i.e., what employment outcomes would be in the absence of the intervention). The two choices available were to model pre-program outcomes as means (of wages and proportion employed) across all eight quarters prior to program exposure or as a linear trend.

¹¹⁷ Indiana DWD provided the Evaluation Team with eight quarters of pre-program employment and wage data.

¹¹⁸ The short duration of the intervention and the proximity of pre- and post-observations of outcomes (one quarter) further reduced the likelihood of bias resulting from historical events or maturation.



The **first option** disregarded any potential information about improvement or decline over time (a trend) for the parsimony of an average value across two years.

The **second option** allowed the statistical model to incorporate additional information of whether outcomes were improving or declining in the two years prior and therefore provided a more precise and possibly more accurate estimate of expected outcomes.

To select which approach best fit the data, the Evaluation Team examined descriptive statistics of the pre-intervention outcome (i.e., quarterly wage and employment) data across the eight quarters prior to program exposure. Results of these diagnostics, which include a graphical representation of the average outcomes over time (Figure C1), presented a convincing case for modeling both outcomes as a trend.¹¹⁹ As such, the Evaluation Team decided to incorporate prior earnings as a trend in the benchmark statistical model that estimates program impact.^{120, 121}

Study 2 | TTDT Program

Research Questions

In Study 2, the Evaluation Team examined whether attending the TTDT program (*operating with TAACCCT-funded enhancements*) improved the economic outcomes of program completers more than an arguably equivalent group of students who attended the TTDT program (*operating without TAACCCT-funded enhancements*). The research questions for this study were:

- **Research Question 1:** Did students who completed the TAACCCT-funded TTDT program (treatment) at LTEC demonstrate a higher *probability of employment* relative to an equivalent comparison group of students who completed a similar, but non-TAACCCT-funded TTDT program (control)?
- **Research Question 2:** Did students who completed the TAACCCT-funded TTDT program (treatment) at LTEC demonstrate *greater increases in quarterly wages* relative to an equivalent comparison group of students who completed a similar, but non-TAACCCT-funded TTDT program (control)?

Again, the Evaluation Team operationalized economic outcomes as quarterly wages and employment status in the first quarter after the completion of the TTDT program. To be included in the study, treatment students must have enrolled and completed their TTDT program between January 1, 2014 and September 30, 2015 and have completed pre-program and outcome economic data.¹²²

¹¹⁹ To test whether the benchmark approach was sensitive to these analytic decisions, the Evaluation Team conducted a sensitivity study that modeled pre-intervention earnings as a mean for both outcomes. The results of all sensitivity studies for Study 1 are presented in Table C10.

¹²⁰ The literature refers to this method as a Short Interrupted Time Series (SITS) design. See Bloom, H. S. (1999). Estimating program impacts on student achievement using “short” interrupted time series. Washington, DC: MDRC.

¹²¹ The Evaluation Team used a multilevel regression model in their estimation of FLE program completion impact on wages and a multilevel linear probability model for the estimation of FLE program completion impact on employment status.

¹²² Students who attended the TAACCCT-funded program and were eligible to be selected into the study were referred to as “treatment” students.



Sample Selection

For this study, representatives from VU and the Evaluation Team were able to identify multiple candidate training programs that were identical to the treatment program, except that the training programs had not yet received the TAACCCT-funded enhancements.¹²³ These candidate programs included:

- The same TTDT program offered at LTEC prior to the grant award.
- A TTDT program at another campus (VU Fort Branch); this program operated contemporaneously with the treatment program but had not been modified with TAACCCT improvements.

Since students in both of these programs were expected to be similarly incentivized and career-directed (i.e., they had selected into an identical training program as the treatment group), and because they would be entering a similar target industry upon graduation, the Evaluation Team believed that the students in these programs comprised an arguably equivalent comparison pool of students for the treatment group.

The counterfactual state that the Evaluation Team estimated and contrasted with the treatment in this study was receipt of the same program without TAACCCT-funded improvements. Students in these pre-screened comparison groups must also have met the same eligibility requirements as the treatment group. Students in the contemporaneous group must have enrolled and completed their TTDT program between January 1, 2015 and September 30, 2015. Students in the retrospective group must have completed their TTDT program between January 1, 2014 and September 30, 2014. Both must have completed pre-program and outcome economic data.

With multiple candidate groups, the Evaluation Team had to first decide which contrast would represent the most credible comparison group for the benchmark analysis. Abiding by sound scientific principles, the Evaluation Team made this decision prior to the analysis of (post-intervention) outcome data.¹²⁴ Each comparison group had potential advantages and limitations. The retrospective group should, expectedly, have been comprised of individuals who were more similar to the treatment group as they came from the same region, but they may have been subject to different economic conditions at entry and/or exit. Members of the contemporaneous group should have been exposed to similar economic conditions but may have possessed different, and unobservable, motivations than the treatment group because they came from a different region that may have been culturally different in ways that could explain the outcomes.

Ultimately, the Evaluation Team made the decision to not favor the advantages or limitations of one over the other but to pool the two groups into a single comparison contrast. The decision was based on the following rationale: 1) the combined group would provide more statistical power; 2) the Evaluation Team reasoned that the potential advantages and limitations of each group may have offset each other in a combined comparison group; and as a consequence, 3) this combined group may have allowed for a comparison contrast that would be more broadly generalizable, and therefore of greater policy interest.¹²⁵ The baseline equivalence statistics produced in the “unweighted” columns in Table C7 indicate that the

¹²³ See the Pre-Screening sub-section within *the Identification of Comparison Participants: Selection Procedures and Rationale* section in [Appendix C](#).

¹²⁴ If a researcher selects a comparison group, or makes any other analytic decisions, after examining the outcome data, the individual may be incentivized to choose (or be suspected of choosing) the one that best fits the individual’s hypotheses.

¹²⁵ For more details, see the [Study Design](#) section for Study 2.



treatment and comparison groups were reasonably similar but would not at this point be considered balanced on observable characteristics.

Analytic Model

To augment the pre-screening procedures the Evaluation Team employed propensity score weighting to maximize the equivalence of the treatment and comparison groups on observed characteristics and pre-program outcomes. While there was a very limited set of background characteristic variables complete enough to use in the propensity score equation, there were eight quarters of pre-intervention employment and quarterly wage data available, which were naturally highly predictive of the outcomes. The Evaluation Team converted propensity scores to inverse probability weights (IPW) and used these weights to better balance the treatment and comparison groups. This approach assigned more “weight” to the members of the treatment and comparison groups who were more similar to each other and assigned less “weight” to the members who were dissimilar. Baseline equivalence statistics produced in the “weighted” columns in Table C7 indicate that at least on a limited set of covariates, economic context variables, and prior wage and employment values, the treatment and comparison groups were very well balanced.

The Evaluation Team’s final analytic decision was how to best use, in a statistical model, the pre-program outcome data for both groups to most convincingly estimate the effect of the program on quarterly wages and likelihood of employment. As with Study 1, the choice was essentially one of selecting a model that incorporated a pre-intervention trend into the estimate, or one that relied only on the pre-intervention average. To select which approach best fit the data, the Evaluation Team examined descriptive statistics of the pre-intervention outcome (quarterly wage and employment) data across the eight quarters prior to program exposure. A graphical plotting of the average values for both is presented in Figure C3. While the average wages and employment probabilities were not as convincing in their over-time development prior to enrolling in the TTDT program (as they were for Study 1) they were reasonably linear in progression.¹²⁶ Further, since there was some evidence of a difference in trend in pre-program wages for treatment and comparison groups, disregarding this information could bias results upward. Therefore, the Evaluation Team decided to model both outcomes as a trend.^{127, 128}

¹²⁶ Part of this non-linear progression was due to the pre-program dip that was most apparent in the plot of pre-program quarterly wages. It is reassuring, however, that both groups displayed this pre-program dip, which would seem to suggest that the Evaluation Team had, in part, minimized the selection issue with the pre-screening process.

¹²⁷ The literature refers to this method as a Comparative Short Interrupted Time Series (CSITS) design. See M Somers, P Zhu, R Jacob, and H Bloom (2013). *The Validity and Precision of the Comparative Interrupted Time Series Design and the Difference-in-Difference Design in Educational Evaluation*. To test whether the benchmark approach was sensitive to these analytic decisions, the Evaluation Team conducted a sensitivity study that modeled pre-intervention earnings as a mean for both outcomes. In both cases the impact results were substantively identical with the benchmark sample. The results of all sensitivity studies for Study 2 are presented in Table C11.

¹²⁸ The Evaluation Team used a multilevel regression model in their estimation of TTDT program completion impact on wages and a multilevel linear probability model for the estimation of TTDT program completion impact on employment status.



DATA METHODS

Data Collection

The Evaluation Team did not collect any original data for the Impact Evaluation Study. Though they were limited in scope, individual-level outcome, covariate data, and contextual/regional economic data did exist and were collected on a regular basis by VU, the state employment agency (Indiana Department of Workforce Development (DWD)), the state public data utility (STATS Indiana), and the Federal Bureau of Labor Statistics. Consequently, all data for propensity score matching and analytical modeling were obtained entirely from VU, the Indiana DWD, STATS Indiana, and the USDOL Bureau of Labor Statistics.

The impact study required receipt of pre- and post-exposure individual-level Unemployed Insurance (UI) wage data (i.e., quarterly wages) for individuals who completed treatment or comparison programming during the study windows. In order to gain access to these data, the Evaluation Team engaged in all necessary precautions to ensure confidentiality and complied with all requirements from the State of Indiana regarding data security practices. Data requests were submitted to VU and DWD after all enrollment had ended. Data sharing agreements were arranged and the Evaluation Team was given access to data, which became its final analytical sample in June 2016.

The Evaluation Team received wage data reflecting employment outcomes for each FLE and TTDT program completer and each of the eight quarters, which preceded exposure to either program (i.e., baseline data collection), and for the two quarters immediately following completion of either program. The Evaluation Team made the decision to only analyze the first quarter post-program wage data for the benchmark analysis due to the apparent completeness of the data for all participants.¹²⁹ While the specific pre-program quarterly observations varied for each individual, depending on when they received the training, the range of data received fell between the eight quarters prior to April 1, 2013 (start date of comparison period for Study 1) and one quarter after September 2015. Data collection procedures were identical for all treatment and comparison group members.

The UI wage data from DWD included individual-level employment and UI wage record data for students who provided VU administration with their Social Security Number (SSN). While the UI wage data reflecting quarterly wages and employment status were mostly complete for the eight quarters prior to each students' participation,¹³⁰ the Evaluation Team only had complete UI wage data for the economic quarter which immediately followed each student's date of program completion.

The student-level VU data included demographic and background data on individuals who completed either or both of the TTDT and FLE programs during the comparison and intervention time periods. However, these data were incomplete and contained inconsistent covariate data (e.g., age, race, etc.) across campuses and treatment statuses. Further discussion of data limitations are provided in the *Limitations* section of this Appendix.

¹²⁹ The Evaluation Team initially requested four quarters of post-program economic data; however due to various limitations - including time constraints for reporting, delays in program implementation, and a three- to six-month lag that is necessary to construct reliably complete data - only the immediate post-program quarter was complete enough for analysis.

¹³⁰ One student was dropped from the final analytic sample because the individual did not supply a social security number to VU staff and as such there was no way for DWD to provide the necessary outcome measures.



Data Procedures

As data were obtained from multiple sources, a unique identifier was used to create a composite dataset. The students' SSN was used by VU staff to link UI wage data to administrative data. Data sharing and merging procedures were as follows:

- The Evaluation Team requested all de-identified (unique identifier in place of SSN) student administrative data from VU, reviewed the data for completeness, and identified students for treatment and comparison groups. In the de-identified dataset, VU included a unique student ID (not the SSN) that they used to link back to the student's SSN.
- Next, the Evaluation Team submitted the analytic groups to VU, who, in turn, mapped students' SSNs back into the dataset using the unique ID and then submitted the data to DWD for UI wage data matching.
- Once the UI wage data had been merged with the student dataset, DWD removed the student SSN variable and submitted the data to the Evaluation Team for analysis.

The data were submitted in an individual-level, person-level format, wherein each student had one record and multiple variables contained the data from each economic quarter. The full data request timeline is shown in the table below (Table C1).

Table C1: Data Request Timeline

	Step 1	Step 2	Step 3	Step 4
Group includes students with enrollment dates from:	Evaluation Team requested data for all students from VU	VU submitted data for all students to Evaluation Team	VU requested data for analytic sample from DWD	DWD submitted de-identified data for analytic sample to Evaluation Team
April 1, 2013 – Sept. 30, 2015	3/31/2016	4/30/2016	5/12/2016	5/31/2016

Data Sources

All data transfers between VU and the Evaluation Team were conducted using Citrix ShareFile, a secure data sharing service hosted by the Policy & Research Group (PRG). Prior to the first data submission deadline, the Evaluation Team provided the appropriate staff from VU with guidance on how to upload data via PRG's website, so as to ensure successful and secure transfer of data. All data transfers between DWD and either VU or the Evaluation Team were conducted using DWD's secure File Transfer Protocol (FTP) site. VU staff and Evaluation Team members were provided with secure accounts for the DWD system.

Vincennes University Student Administrative Data

All covariate data were obtained from existing administrative data available through VU. The Evaluation Team requested data for both the treatment and comparison group students. These data were collected by VU staff prior to the participation of any programming (i.e., at baseline). Although incomplete because some students chose not to respond/did not want to release personal background information, the Evaluation Team received all agreed-upon VU data elements for students who enrolled in either or both the TTDT and FLE programs during the study period. The Evaluation Team used these data to identify the analytic sample for all treatment and comparison groups.



Indiana Department of Workforce Development Data

The Indiana DWD provided the Evaluation Team with individual-level UI wage data for each treatment and comparison participant in the analytic sample, including eight quarters of pre-program and four quarters of post-program quarterly UI wage data.¹³¹ Individual, student-level pre-program wages were operationally defined as the wages earned by a student during each of the eight economic quarters preceding the economic quarter during which the student began LTEC training. Likewise, pre-program employment status reflected the condition of employment or unemployment for each student during each of the economic quarters that preceded the economic quarter during which a student began training. Although the Evaluation Team requested four quarters of post-program UI wage data, much of the post-program economic data was incomplete due to the lag time associated with compiling, cleaning, and disseminating complete UI wage data. It took three to six months from the time DWD received reports from employers before reliably complete data became available from DWD. As such, the Evaluation Team only had access to reliably complete individual-level post-program completion data for the first quarter immediately following the quarter during which each student completed training.¹³²

The Evaluation Team also had individual-level second-quarter post-program completion wage data for students who completed programming earlier (rather than later) in the study window. While the Evaluation Team used second-quarter post-program completion wage data for sensitivity analyses (see the *Outcome Measures* section), the Evaluation Team did not include these data in the primary analysis aimed at answering the Impact Evaluation's research questions. This decision was made because too few students had completed programming early enough in the study period to have been reliably measured and reported upon within the second quarter post-program completion UI wage data. As such, the Evaluation Team chose to look only at the economic quarter for which there were complete data.¹³³ Individual-level post-program wages were operationally defined as the wages earned by a student during the economic quarter immediately following each students' date of program completion.

USDOL Bureau of Labor Statistics

In addition to student administrative data collected by VU staff, and UI wage data collected by DWD, the Evaluation Team also collected publicly available data from the U.S. Department of Labor (USDOL) Bureau of Labor Statistics (BLS).¹³⁴ These data incorporated results from the monthly *Current Population Survey* (CPS), conducted by the U.S. Census Bureau and information from the state UI program. The Evaluation Team compiled data made available by BLS on the following contextual economic indicators: unemployment rate, total labor force, total employed, total unemployed, number of employing

¹³¹ Economic quarters begin on January 1, April 1, July 1, and October 1 of each year. Economic quarters close on March 31, June 30, September 30, and December 31 of each year.

¹³² The Evaluation Team claimed data were complete for a given quarter when that quarter reliably and accurately reflected the employment status and average wage earned for each student included in the analytic sample, regardless of when they began or completed programming.

¹³³ Choosing to use both post-program completion quarters would have biased the estimates of program impact because doing so would privilege (only examine) the outcomes of students who completed programming earlier in the study window relative to those who completed programming later. Doing so would also significantly reduce the sample size in a systematic way and in turn both the internal and external validity of the Impact Evaluation study would be threatened.

¹³⁴ Monthly labor force estimates are prepared by state agencies and submitted to BLS.



establishments,¹³⁵ and average weekly wage at the county-level for each economic quarter between 2013 and 2015. The Evaluation Team identified economic conditions for the county in which the student received programming (Hendricks County, IN for students who received training at LTEC in Plainfield, IN; and Gibson County, IN for students who received training at the Fort Branch campus of VU), during the quarter directly preceding the quarter in which the student began training, as well as the quarter directly following the quarter in which the student completed training.

Data Received

The data that the Evaluation Team requested and ultimately received for this Impact Evaluation had varying degrees of completeness in terms of individual-level covariates, which helped explain the outcomes of interest and describe the analytic samples. For Study 2 in particular, individual-level data were not consistently collected across the treatment and comparison groups. The following describes the administrative variables that were collected for each individual group of students. These data were collected from students using an intake form at the entry point into the program.

Study 1 VU Administrative Intake Variables

- ID variable
- Date of birth
- Gender [dichotomous; male, female]
- Student race [categorical; Black/African-American, White, Other/Multiple Races]
- Ethnicity [categorical; Hispanic/Latino(a), not Hispanic/Latino(a)]
- Incumbent worker status [dichotomous; Yes/No]
- TAA eligibility status [dichotomous; Yes/No]
- U.S. military veteran status. [categorical; Yes, No, Eligible Spouse]
- Start and end date of program [6 week period falling within study window]
- Program indicator variable [categorical; FLE, TTDT]
- Site indicator variable [categorical; LTEC, VU Fort Branch/Vincennes]

Study 2 VU Administrative Intake Variables

- ID variable
- Date of birth
- Gender [dichotomous; male, female]
- Start and end date of program [categorical; 6 week period falling within study window]
- Program indicator variable [categorical; FLE, TTDT]
- Site indicator variable [categorical; LTEC, VU Fort Branch/Vincennes]

Below, the Evaluation Team presents tables (Table C2 and Table C3) describing the individual-level variables requested, the number of missing cases in the analytic sample, and the percent complete for each variable. For Study 2, the information is presented by treatment or comparison group.

¹³⁵ An establishment is commonly understood as a single economic unit, such as a farm, a mine, a factory, or a store, that produces goods or services. Establishments are typically at one physical location and engaged in one, or predominantly one, type of economic activity for which a single industrial classification may be applied. A firm, or a company, is a business and may consist of one or more establishments, where each establishment may participate in different predominant economic activity.



Table C2: Individual Level Covariate Completeness, Study 1

	Number Missing	Percent complete
Number in Sample	(n = 194)	
Race	18	90.7%
Gender	0	100.0%
Age at study entry	21	89.2%
TAA eligible	12	93.8%
Incumbent worker	4	97.9%
Veteran Status	30	84.5%

Table C3: Individual Level Covariate Completeness, Study 2

	Treatment		Comparison	
	Number Missing	Percent complete	Number Missing	Percent complete
Number in Sample	(n = 64)		(n = 54)	
Race	1	98.4%	15	72.2%
Gender	0	100.0%	0	100.0%
Age at study entry	0	100.0%	0	100.0%
TAA eligible	0	100.0%	54	0.0%
Incumbent worker	1	98.4%	54	0.0%
Veteran Status	3	95.3%	25	53.7%

Variables

Benchmark analytical models do not include covariates or contextual control variables. The following section provides an overview of the individual-level covariates, time-variant economic and contextual variables, and outcome measures that the Evaluation Team used in sensitivity studies for Study 1 and Study 2. Both studies differ in their application of individual-level covariates. The time-variant economic and contextual variables as well as the outcome measures are identical for Study 1 and Study 2.

Covariates

As demonstrated in Tables C2 and C3, the completeness of covariate data varied across programs and across time periods. In the end, since the Evaluation Team could only use data that were complete or relatively complete for each study (see *Missing Data* section), the list of covariates was limited to: age at study entry, gender, race, TAA eligibility status, and U.S. military veteran status in Study 1; and age at study entry and gender in Study 2.

Time-Variant Economic and Contextual Indicators

Time-variant economic and contextual variables captured second order processes existing outside of the control for the study design, and may have influenced outcomes for students who were beginning and ending different programs at different times and in different locations. For instance, time-variant and contextual variables attempted to capture differences in labor market conditions at different points in time during the study period. Including these variables should have helped to diminish any potential bias



stemming from variable economic conditions across time and geographic location. Time-variant and contextual variables for Study 1 and Study 2 included:

- Days elapsed between enrollment and beginning of economic quarter of enrollment [continuous; 0-91 days]
- Days elapsed between enrollment and beginning of study period, [continuous; 0-912 days]
- Days elapsed from graduation to end of economic quarter [continuous; 0-91 days]
- County unemployment rate for quarter preceding “enrollment” [continuous]
- County unemployment rate for first quarter post-graduation (same quarter as post-intervention observation of outcome data) [continuous]
- County labor force for quarter preceding “enrollment” [continuous]
- County labor force for first quarter post-graduation (same quarter as post-intervention observation of outcome data) [continuous]
- Regional average weekly wages for zip code for quarter preceding “enrollment” [continuous]
- Regional average weekly wages for zip code for first quarter post-graduation [continuous]
- Regional number of establishments for zip code for quarter preceding “enrollment” [continuous]
- Regional number of establishments for zip code for first quarter post-graduation [continuous]

Outcome Variables

Employment outcomes were assessed with two measures: 1) employment status (i.e., whether or not one was employed during a given quarter); and 2) wages (i.e., the total wages earned in a quarter). These data were collected by DWD on a quarterly basis. Outcome measures reflected the eight contiguous quarters that immediately preceded a participant’s enrollment in the program and the first quarter immediately following a participant’s completion of the program.¹³⁶ The UI wage data were provided by DWD. The completion and enrollment dates were included in the VU administrative dataset. In Table C4 below, the Evaluation Team outlines how these outcome measures were constructed.

¹³⁶ Although the Evaluation Team requested four quarters of post-program UI wage data, reliably complete data only existed for the first economic quarter which followed each student’s date of program completion in the final analytic sample. For the purposes of sensitivity studies, the Evaluation Team utilized a diminished sample which reflected both the first and second quarters of post-program completion for students who completed programming early enough in the study window to possess complete second quarter post-program UI wage data.



Table C4: Outcome Measures for Study 1 and Study 2

Outcome	Measures	
	Pre-Intervention	Post Intervention
Employment Status Data Source: Indiana DWD UI wage record data	Pre-intervention employment status was measured as eight dichotomous variables for each of the eight contiguous quarters immediately prior to enrollment that indicate whether the participant was employed or not in each of those quarters. Enrollment was defined as the first day of training. Each of the eight employment variables had a value of 1 if participant was employed during that quarter or 0 otherwise. Employment was indicated if the individual has any amount of wages in the quarter(s) that were measured.	Post-intervention employment status was measured as a dichotomous variable that indicated whether the participant was employed or not during the first quarter immediately post completion of the program. Completion was either defined as when a student received their FLE credential or, in the case of TTDT participants, as completing the final day of training. The employment indicator variable had a value of 1 if participant was employed in the quarter immediately following the intervention/comparison period, and 0 otherwise. Employment was indicated if the individual had any amount of wages in the quarter(s) that were measured.
Earnings Data Source: Indiana DWD UI wage record data	Measured as a continuous variable which took the average value of the quarterly wages reported for the eight contiguous quarters immediately preceding enrollment. ¹³⁷	Measured as a continuous variable which took the average value of the quarterly wages reported for the quarter immediately following the intervention/comparison period.

Missing Data

This section describes the analytical decisions and procedures for missing data followed for each study.

Study 1 | FLE Program

No outcome data were imputed for the benchmark study. If outcome data were missing, the case was not eligible for inclusion in the study. Since the benchmark model included no covariates, the procedures outlined here describe the approach to handling missing data for sensitivity studies. For Study 1, the Evaluation Team received data from VU including eleven variables with varying degrees of completeness. The Evaluation Team made the decision to include one sensitivity analysis that had as broad an array of covariates as possible, while also retaining the most representative sample. Consequently, for all variables that were at least 90 percent complete, the Evaluation Team imputed values for the missing cases and used

¹³⁷ DWD wage data quantified the wages reported for that individual for that quarter. For individuals who had zero wages reported for them, DWD reported nothing. As noted elsewhere, zero wages could be the result of that individual being unemployed or his/her employer not being included in the DWD survey. In any case, the Evaluation Team converted this empty value to zero for analysis.



dummy variable adjustment procedures.¹³⁸

While this method was most justifiable within the scope of an RCT (though not unanimously recommended), the Evaluation Team believed it represented the most valid approach here because it retained the broadest sample of program participants and therefore should have produced the analytic sample with the broadest representativeness. While data imputation had its detractors, recent findings suggest that dummy variable adjustment procedures represent the preferred approach to dealing with missing covariate data.¹³⁹ In any case, to test this approach the Evaluation Team conducted another sensitivity study that used case-wise deletion of all missing covariates.

Study 2 | TTDT Program

For Study 2, the data picture was a little more complex due to the degree to which data were missing was also confounded with “assignment” into the treatment and comparison groups.¹⁴⁰ Both groups, in fact, shared very little in common in terms of the covariates for which data were relatively complete. Since modeling and weighting procedures (outlined below) sought to maximize the equivalence of both groups, in terms of a limited set of covariates and prior earnings trajectories, the Evaluation Team elected to use no covariates or contextual control variables in the benchmark model.

For sensitivity studies, the Evaluation Team included only covariates that were non-missing for both groups (employing case-wise deletion in one instance).¹⁴¹ No outcome data were imputed for the benchmark analysis. Participants were eligible for inclusion in the study if they had complete pre- and post-intervention outcome data.

¹³⁸ The Evaluation Team also ran sensitivity analyses wherein case-wise deletion was used instead of dummy variable imputation so as to determine whether or not the analytical decision to impute was supported.

¹³⁹ See Jones, M. (1996). Indicator and Stratification Methods for Missing Explanatory Variables in Multiple Linear Regression. *Journal of the American Statistical Association*, 91, 222-230.

¹⁴⁰ “Assignment” in this case should be understood as function of program location and the time interval over which students elected to begin and finish either the TAACCCT-funded TTDT program or one of the non-TAACCCT-funded TTDT programs.

¹⁴¹ One student who completed the TTDT program was dropped from the analytical sample because the individual was the only TTDT completer who did not provide a date of birth.



ANALYSIS METHODS

Selecting Benchmark Analytical Approach

Since there existed no arguably equivalent group to the one completing the TAACCCT-funded FLE program within the VU system, the Evaluation Team used longitudinal modeling to create an estimated (i.e., potential) comparison group from the projected outcomes of the treatment group itself. Employing this model, the Evaluation Team operationalized program impact as the post-program deviation in the participants' quarterly earnings/employment status from a baseline trend in that same group's pre-program earnings. This approach is known as a short-interrupted time series design (SITS) and it represented the benchmark analytical model.¹⁴² While in principal a pre-/post-study, the SITS design was able to obviate important sources of potential bias by estimating a growth rate for the treatment group, and therefore a credible counterfactual of what treatment group outcomes would be without treatment. While some important sources of bias remained (notably history and maturation), and the validity of the comparison estimate was susceptible to modeling limitations, the Evaluation Team believed this approach was the most rigorous possible, given the many constraints.

For Study 2, the Evaluation Team estimated program impacts by way of a matched comparison group design coupled with analytic modeling procedures, both of which helped control for observed variation between the treatment and comparison groups. In the benchmark approach for Study 2, the Evaluation Team utilized a two-stage approach to “match” the comparison and treatment groups.

Study 1 | FLE Program

Study Design

Rather than using a single pre-test observation to account for pre-program employment status/wages, the Evaluation Team used multiple observations of the pre-program outcome variable in order to more accurately predict a counterfactual outcome (i.e., what the participants' employment status/wages would have been had they not participated in the program). In a conventional pre-/post-design, a single measurement of the outcome variable would have been observed at some point prior to the intervention and this would be used either as a predictor of post-program outcomes (in a regression model) or to calculate a difference or change in earnings/employment status from pre- to post-program. This approach was limited for numerous reasons, but in the case of predicting economic outcomes, using a single measurement of the outcome variable was likely to produce less robust estimates and, in turn, less credible findings.

A typical quasi-experimental alternative for approximating a natural experiment was to construct a comparison group that was arguably equivalent to the treatment group based on observed characteristics. In this case, students who attended the same school but who were not exposed to the FLE program seemed like an obvious choice for potential comparison group members; selection concerns, however, made this comparison untenable in a non-experimental impact study. Since any comparison set of students would have deliberately elected not to enroll in the program (and selected into a different program), any subsequent impact analysis would be biased because it would fail to account for this difference.

¹⁴² The Evaluation Team tested this analytical decision with a sensitivity study that modeled the pre-program wage and employment performance of participants as a mean. This decision effectively disregarded any trend that existed and formulated a comparison on pre-intervention levels of both outcomes alone. The Evaluation Team discusses the findings of this sensitivity study elsewhere in this report.

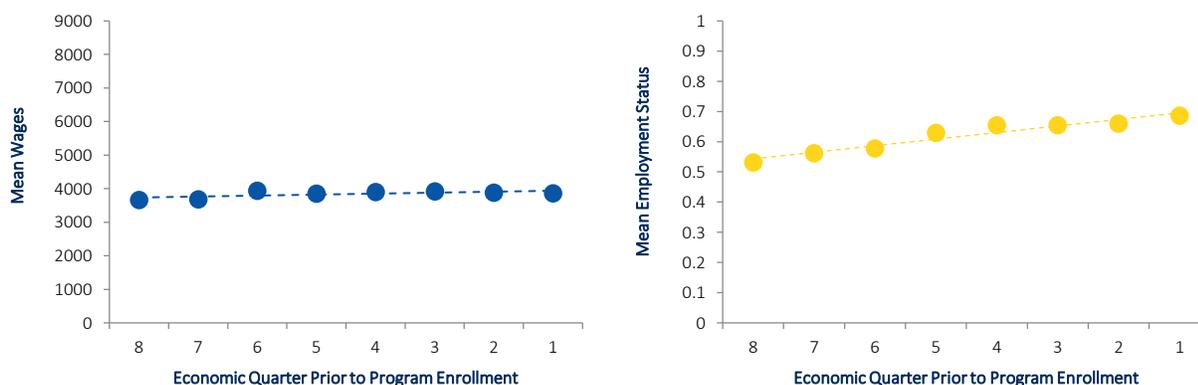


Comparing the economic outcomes of the TAACCCT-funded FLE program completers to non-TAACCT-funded FLE program completers was also not practicable. The FLE program was established after TAACCCT-funding had begun at LTEC and VU staff reported that no other VU campuses offered the FLE program. Without a convincing external equivalent comparison group, the Evaluation Team concluded that the most rigorous alternative available was to use a quasi-experimental longitudinal design with as many pre-intervention observations of the outcome measure as possible. Using a SITS design allowed the Evaluation Team to capitalize on the longitudinal nature of the available data.

By using multiple observations over time to estimate the natural wage growth rate and trends in employment status, the Evaluation Team produced a more precise counterfactual condition. In this case, the estimated trend line became the counterfactual as it represented the expected change for the treatment group without treatment exposure. The chief shortcoming of this approach was that by utilizing the trend as counterfactual, the validity of the model rested on the goodness of fit of the pre-program trend. With the cooperation of the Indiana DWD, the Evaluation Team was able to obtain eight quarters of pre-intervention employment outcome data for each participant in the analytic sample (see the *Outcome Measures* section for details).

The Evaluation Team examined the pre-intervention data for the presence or absence of a pre-program trend in wages and employment for FLE participants. Preliminary diagnostics revealed a linear trend, which indicated the use of a SITS model, was appropriate for examining FLE program impacts on both outcomes (see Figure C1).

Figure C1: Average Pre-Intervention Quarterly Outcomes, Study 1¹⁴³



The trend lines in Figure C1 demonstrate a clear linear trajectory. The wage figure has a modest slope but is convincing in its linearity. The employment status slope is more pronounced but its linear fit is not perfect. Secondary diagnostics of these lines revealed that the slope for the first table (wages) is insignificant but

¹⁴³ The trend lines presented in these figures represent the Evaluation Team’s modeled pre-intervention trend used in the SITS analytic model but are not identical to the ones used in the analysis. The regression trend lines presented here were based on OLS models calculated in Excel, not Stata, and are intended for illustrative purposes to demonstrate that there was a clear linear trend in employment outcomes for the sample prior to receiving the intervention.



strongly significant for the second table (employment status).¹⁴⁴ The Evaluation Team reasoned that modeling wages as either a SITS or a pre/post would have negligible impact on the substantive results. Sensitivity studies, described elsewhere in this report, confirmed this.

The obvious (and statistically significant) slope for employment on the other hand indicated that a trend model like SITS was more methodologically appropriate for these data. If the Evaluation Team were to disregard the apparent trend, and use a pre-intervention mean baseline, then they would in essence have biased the study in favor of finding an impact (where no impact likely exists) because the already evident growth in likelihood of employment for that group would be confounded with the actual treatment effect. A sensitivity study confirmed this, in fact. A pre-/post-regression model attributed a positive employment impact to the program, whereas the benchmark approach finds none. The Evaluation Team is confident, however, that the benchmark approach was the analytically correct one.

Identification of Treatment Group

All participants in Study 1 had to be enrolled in the FLE program at VU. Participants also had to have sufficient administrative and outcome data to be included into the analytic sample of Study 1.¹⁴⁵ At a minimum, participants must have had start and end dates associated with their case number and complete (i.e., non-missing) Unemployment Insurance (UI) wage data (see *Data Collection Management* section) for all pre- and post-intervention quarters necessary for the analysis (see *Analytical Approach* section below). Data collection and merging procedures for producing this dataset are detailed in the *Data Collection and Management* section of this Appendix.

Students were selected into the treatment group for Study 1 if they had complete outcome UI wage data and the merged administrative data from VU indicated that the student completed the TAACCCT-funded FLE program at LTEC between April 1, 2013 and September 30, 2015. Students who completed either the one- or two-day program were eligible for selection into the treatment group. Completing the program was operationally defined as the presence of start and end dates for the FLE program in VU administrative data.

¹⁴⁴ The Evaluation Team used the benchmark multilevel regression to estimate the slope for pre-intervention wages and the benchmark multilevel linear probability model to estimate the slope for the pre-intervention employment probability.

¹⁴⁵ In addition, students were eligible to participate in the study if they had agreed to provide their Social Security Number to VU. SSNs were essential for matching student background data to employment data from DWD. As such, students who opted not to provide SSN data were excluded from the study.



Selection of Analytic Approach

In Study 1, the outcome contrast that the Evaluation Team was interested in gauging was simply the difference in employment outcomes from pre- to post-intervention. The Evaluation Team operationalized this as the change in earnings or employment status post-program from the eight-quarter trend exhibited by this same group of participants prior to their FLE exposure.

For Study 1, the Evaluation Team used a SITS design in which post-intervention outcomes for the treatment group were compared against the estimated outcomes for the same participants, which were based upon eight quarters of pre-intervention economic data. In this approach, the impact estimate was the difference in employment trends before and after program participation. Program impact is thus, estimated as the post-program shift from the estimated pre-program trend in wages (Research Question 1) or trend in likelihood in employment (Research Question 2).

Analytic Model Specifications

The program impact for the first economic quarter following program completion was estimated as the deviation from the trend established by eight quarters of pre-intervention outcome data for each student. The SITS regression model is specified as:

$$Y_t = \beta_0 + \beta_1 TREND + \beta_2 POST + e_t$$

where Y_t is the outcome of interest; $TREND$ is a continuous time period variable, centered so the last pre-treatment (quarterly) observation = 0, the first observation = -7 and the last (post program = 1); $POST$ is a dummy (indicator) variable representing the post intervention observation period (pre-intervention = 0, post = 1). β_0 represents the intercept, or in this case the adjusted mean value of the outcome variable in the quarter immediately preceding program exposure. β_1 is the slope, or trajectory of the pre-program trend of the outcome. β_2 represents the change or deviation from the trend line of the outcome that occurs in the period immediately following the introduction of the intervention. This was the coefficient of interest in the SITS model.¹⁴⁶

¹⁴⁶ For the sake of simplicity and legibility the Evaluation Team did not include multi-level subscripts. This model was, however, a multi-level model. The Evaluation Team used the mixed command in Stata to estimate this empirical model with student time-varying observations nested in students. The multi-level linear probability model was used to produce estimates for dichotomous outcomes.



Study 2 | TTDT Program

Study Design

Study 2 was also a QED, but in this case, the Evaluation Team identified two external, and arguably equivalent, comparison groups to represent the counterfactual condition (receipt of intervention before TAACCCT-funded improvements). To this end, the Evaluation Team used matching procedures to maximize the equivalence of treatment and control groups on observed variables. Study 2 also employed a number of additional analytic techniques that were found in empirical research to reduce bias and produce results that were consistent with experimental designs. From the two external comparison groups, the Evaluation Team identified three potential comparison contrasts to estimate the treatment effect; these groups are described below. Ultimately, the Evaluation Team decided to combine the two groups into a pooled comparison group. Selecting these contrasts represented an attempt to “pre-screen” the comparison groups so that they were as equivalent as possible to the treatment group, especially in terms of unobserved/unmeasured characteristics (motivation) that likely explained differences in employment outcomes. In practice, pre-screening constituted the first step in achieving optimal balance between treatment and control groups. As such, the Evaluation Team considered pre-screening “Stage 1” in the process for achieving baseline equivalence.

In the next stage, the Evaluation Team sought to maximize the balance of treatment and control groups on observed variables with weighting procedures that took into account background characteristics (i.e., age at entry to program and gender) and other time-varying contextual factors that may have motivated or otherwise explained outcomes (e.g., economic conditions and time of entry into the study). The two-stage approach to “match” the comparison and treatment groups is described in greater detail in the *Selection Procedures and Rationale* section below.

The Evaluation Team estimated program impacts with a CSITS empirical model as its benchmark analytical approach. This approach provided a means to control for missing or unobservable characteristics or attributes that had the potential to bias results. The Evaluation Team considered employing a difference-in-differences (DID) modelling approach if diagnostics of the pre-intervention wage and employment data did not evince a convincing linear trend. While the Evaluation Team focused their reporting on the CSITS model, a battery of sensitivity analyses were conducted using a DID model for the purposes of determining whether their choice of analytical model influenced the impact estimates.¹⁴⁷

¹⁴⁷ The DID model used in the Evaluation Team’s sensitivity analyses operationally defined pre-intervention wages and employment status as the average of the eight-quarters reported prior to program exposure. The impact estimate was the treatment group’s deviation from the trajectory of pre- to post-program difference in means reported by the comparison group. The Evaluation Team ultimately decided to employ the CSITS model, as the pre-intervention wage and employment data indicated a convincing linear trend leading up to the point of intervention. The CSITS model is a variation of the DID model but relaxed the assumption that both groups will improve at the same rates over time. The Evaluation Team outlines our analytic procedures in more detail below. Results from DID models were substantively consistent with results derived from the CSITS model.



Identification of Treatment Group

All participants in Study 2 must first have met some minimum eligibility requirements to enroll in the TTDT program at LTEC or VU Fort Branch. Enrollment eligibility for the TTDT program involved meeting the following criteria:

- Be at least 18 years old;
- Pass a DOT physical exam including drug screen;
- Have a valid Indiana driver's license;
- Be able to read, write, and speak English;
- Have a high school diploma, GED, or be in the process of obtaining a GED; and
- Pass a minimum of three knowledge exams administered by the Bureau of Motor Vehicles.

In addition to the above minimum requirements for enrollment into the program, participants also had to have sufficient administrative and outcome data to be included into the analytic sample of Study 2.¹⁴⁸ At a minimum, participants must have had start and end dates associated with their case number and have had complete (i.e., non-missing) UI wage data (see *Data Collection and Management* section) for all pre- and post-intervention quarters necessary for the analysis (see *Analytical Approach* section below). Data collection and merging procedures for producing these datasets are detailed in the *Data Collection and Management* section of this Appendix.

Students were selected into the treatment group for Study 2 if they had complete outcome UI wage data and the merged administrative data from VU indicated that the student had completed the TAACCCT-funded TTDT program at LTEC between January 1, 2015 and September 30, 2015. Completing the program was operationally defined as the presence of start and end dates for the TTDT program in VU administrative data.

Identification of Comparison Group

Students were selected into the comparison group for Study 2 if they had: 1) complete outcome UI wage data, and 2) the merged administrative data from VU indicated that they had completed the TAACCCT-funded TTDT program at LTEC between January 1, 2014 and September 30, 2014, or the TAACCCT-funded TTDT program at the VU Fort Branch campus between January 1, 2015 and September 30, 2015.¹⁴⁹ Completing the program was operationally defined as the presence of start and end dates for the TTDT program in VU administrative data.

Identification of Comparison Participants: Selection Procedures and Rationale

The Evaluation Team aimed to make causal claims about the impact of the intervention, but because the study was not an RCT, the self-selection inherent in treatment assignment could not be ignored. Without balancing the sample (i.e., the treatment and comparison groups) in some way that approximated randomization, impact estimates would have been biased and inconsistent.¹⁵⁰ The Evaluation Team did this, in part, through multi-stage matching procedures that are becoming common in the impact evaluation

¹⁴⁸ In addition students were eligible to participate in the study if they had agreed to provide their Social Security Number (SSN) to VU. SSNs were essential for matching student background data to employment data from DWD. As such, students who opted not to provide SSN data were excluded from the study.

¹⁴⁹ As with the treatment group, completing the program was operationally defined as the presence of start and end dates for the TTDT program in VU administrative data.

¹⁵⁰ Guo, S. and Fraser, M.W. (2010).



literature.¹⁵¹ The effectiveness of this balancing procedure rested in part on the ability to arguably remove selection bias.¹⁵² It also rested on identifying a pool of participants for whom the potential for selection bias was minimized. Since many of the factors that motivated selection are unobservable, theory and past empirical research are often employed as guides. The efficacy of the matching procedures on observed variables was partially verified by establishing baseline equivalence of the treatment and comparison groups for each outcome-contrast.

The Evaluation Team's solution to this was a two-stage procedure that pre-screened treatment students with a pooled group of similar students who pursued the same credential paths within a time period of identical length, positioned similarly in the academic year, but at a time one year prior to the start of the intervention and at the same time but at a separate geographic location. The Evaluation Team then employed propensity score procedures to weight the analytic sample to maximize the observed balance of both groups on observed characteristics. These two stages are described below.

Step 1: Pre-Screening

The Evaluation Team considered three potential Comparison Contrast groups for Study 2. The first (**Comparison Contrast 1**) was comprised of students who completed the six-week, 240-hour TTDT program at LTEC during the same nine months immediately preceding the implementation period of the TAACCCT-funded enhancements to its TTDT program. Students were selected into the Comparison Contrast 1 group for Study 2 if they had complete UI wage outcome data and the merged administrative data from VU indicated that the student had completed the TAACCCT-funded TTDT program at LTEC between January 1, 2014 and September 30, 2014.¹⁵³ The selection criteria described above reflect the Stage 1 procedures for sample selection. Stage 2 procedures (details provided in the *Selection Procedures and Rationale* section) would not reduce this initial sample, but may have imposed weights to both treatment and comparison groups to better balance the groups on observed variables.

The second potential comparison group (**Comparison Contrast 2**) that the Evaluation Team considered was comprised of students who completed the six-week, 240-hour non-TAACCCT-funded TTDT program at a different campus in the VU system (VU Fort Branch) during the exact time period as the treatment group. Students were selected into the Comparison Contrast 2 group for Study 2 if they had complete UI wage outcome data and the merged administrative data from VU indicated that the student completed the non-TAACCCT-funded TTDT program at the VU Fort Branch campus between January 1, 2015 and September 30, 2015.¹⁵⁴ Like Comparison Contrast 1, the selection criteria described in this paragraph reflect the Stage 1 procedures for the Compare Contrast 2 sample selection. Stage 2 procedures would not reduce this initial sample, but may have imposed weights to both treatment and comparison groups to better balance the

¹⁵¹ Stuart EA. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science*. 25:1–21. Shadish, W.R., Cook, T.D., and Campbell, D.T. (2002). *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. New York: Houghton Mifflin Company. Cook, T. D., W. R. Shadish, and Wong, V. (2008). "Three Conditions Under Which Experiments and Observational Studies Produce Comparable Causal Estimates: New Findings from Within-Study Comparisons." *Journal of Policy Analysis and Management* 27 (4): 724-750.

¹⁵² Historical bias, which was also a concern, was mitigated by 1) including a contrast that is contemporaneous; and 2) modeling procedures – both analytic and matching – that included a sex variable and a date of birth variable.

¹⁵³ As with the treatment group, completing the program was operationally defined as the presence of start and end dates for the TTDT program in VU administrative data.

¹⁵⁴ As with the treatment group, completing the program was operationally defined as the presence of start and end dates for the TTDT program in VU administrative data.



groups on observed variables.

Ultimately, the Evaluation Team decided to pursue a third comparison group (**Comparison Contrast 3**) for Study 2, which was a pooled sample of Comparison Contrast 1 and 2 (See Figure C2). Individuals were selected for inclusion in Comparison Contrast 3 if they were selected for inclusion into either Comparison Contrast 1 or Comparison Contrast 2. Again, these selection criteria outlined the pre-screening criteria (i.e. Stage 1). Stage 2 procedures did not reduce the initial sample, but may have imposed weights to both treatment and comparison groups to better balance the groups on observed variables.

Figure C2: Comparison Contrast 3 Study Windows

2014												2015											
Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1		
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Comparison 1 Study Window									Treatment Study Window														
									Comparison 2 Study Window														

The primary argument for using a retrospective comparison group from the same campus was that it helped the Evaluation Team to control for selection biases that could have resulted from comparing treatment students to dissimilar students (e.g., students who enrolled in a different program) at the same school or similar students (e.g., students who enrolled in the same program) at a different location. Selection confounds refer to differences in treatment/comparison group participant characteristics that may have motivated or incentivized them to perform differently. Since these incentives and motivations were quite often very explanatory of employment outcomes, any impact estimate that failed to control for these differences in motivations and incentives may have misattributed these (positive or negative) impacts to the program itself. Selection effects (e.g., differing motivations) were difficult to contend with because the differences were almost always unobservable and unmeasurable so they could not have been controlled for in statistical procedures. The use of a retrospective comparison group should have helped reduce these selection effects and effectively control for any confounding differences in programming that may have occurred across campuses.

The use of a historical comparison group, however, raised the possibility that any inference of impact that the Evaluation Team attributed to the treatment might in some part be due to differing economic conditions during the two periods – generally referred to as an historical bias or confound. The Evaluation Team believed, however, that by including statistical controls for this variation in the matching and analytic models (regional unemployment rates, start dates, etc.), the extent to which estimates were biased by extraneous causes could be reduced.¹⁵⁵

Students in the second comparison group for Study 2 received training at the same time (and left and entered the workforce at the same time) as the treatment group; however the TTDT program they received was different. The key contrast of interest in this case was that some were exposed to a TTDT program with

¹⁵⁵ The Evaluation Team also conducted diagnostics to assess whether there was sufficient overlap in economic conditions to justify statistical controls.



TAACCCT-funded enhancements (treatment group) while others were exposed to a TTDT program without enhancements (comparison group). With a contemporaneous comparison group, the Evaluation Team mitigated the potential for historical effects but opened the door to the possibility of programming confounds and unobservable selection effects. While selecting a program that included individuals who were similar in terms of obvious selection processes (they were selecting into the same program) should have helped to diminish the selection problem substantially, the students themselves attended programming at a smaller campus which was situated more than 140 miles away from LTEC. Given the significant distance separating the two colleges, there were likely important local market conditions that influenced economic outcomes for students attending either site.¹⁵⁶ Further, and perhaps more important, the treatment/comparison contrast was confounded by the school at which the groups received that training. This means that the Evaluation Team would have been unable to differentiate treatment from school effects for this comparison contrast (this is sometimes called an n=1 confound).

In the end, the Evaluation Team reasoned that the various confounds could be offset and potentially leverage the positive attributes of each sample and minimize the negative ones by combining both contrasts into a pooled sample (Comparison Contrast 3.) The contemporaneous group should have been exposed to similar economic conditions but may have possessed different (and unobservable) motivations. The retrospective group should have been motivationally similar but may have been exposed to different economic conditions. The Evaluation Team's decision was based on the following rationale: 1) the combined group would have provided more statistical power; 2) they reasoned that the potential advantages and limitations of each group may have offset each other in a combined comparison group; and as a consequence 3) this combined group may have allowed for a comparison contrast that would be more broadly generalizable, and therefore of greater policy interest.

As partial evidence that these comparison groups were arguably equivalent to the treatment group, and that the pooled sample was preferable to either of the constituent programs alone, the Evaluation Team presents unweighted baseline equivalence statistics in Table C7.

¹⁵⁶ An important factor to consider is proximity to major metropolitan areas and the relative value of VU programming within those areas. While both LTEC and VU Fort Branch share nearly the similar proximity to a metropolitan area – each being less than 20 miles away from the closest metropolitan area, – LTEC is closer to Indianapolis (the state capital and largest city in Indiana with a metro population circa 2,000,000) while VU Fort Branch is closer to Evansville, IN (the state's third largest city with a metro population of circa 360,000). These differences may have contributed to unobserved (and unmeasured) differences between comparison groups, and in turn biased estimates for either group. Empirical research on QEDs demonstrates consistently that regionally distal comparisons are less likely to produce unbiased estimates relative to QEDs with "local comparison groups." Cook, T. D., W. R. Shadish, and Wong, V. (2008). "Three Conditions Under Which Experiments and Observational Studies Produce Comparable Causal Estimates: New Findings from Within-Study Comparisons." *Journal of Policy Analysis and Management* 27 (4): 724-750. Glazer, S., Levy, D., Myers, D. (2003). Nonexperimental versus experimental estimates of earnings impacts. *The Annals of the American Academy of Political and Social Science*. 589(1), 63-93.



Table C5: Unweighted Standardized Difference of Treatment Sample and Comparison

	Contrast 1	Contrast 2	Contrast 3
Gender			
Female	0.06	0.06	0.06
Age			
Age at study entry	0.10	0.21	0.15
Mean Pre-Program Wages			
Mean Wages	-0.30	-0.31	-0.30
1 st quarter prior wages	-0.25	-0.31	-0.28
2 nd quarter prior wages	-0.50	-0.32	-0.42
3 rd quarter prior wages	-0.28	-0.34	-0.31
4 th quarter prior wages	-0.42	-0.25	-0.35
5 th quarter prior wages	-0.24	-0.23	-0.24
6 th quarter prior wages	-0.31	-0.24	-0.28
7 th quarter prior wages	-0.11	-0.33	-0.20
8 th quarter prior wages	-0.17	-0.28	-0.22
Mean Pre-Program Employment Status			
Mean Employment Status	-0.40	-0.30	-0.36
1 st quarter prior employment	-0.49	-0.40	-0.45
2 nd quarter prior employment	-0.23	-0.38	-0.30
3 rd quarter prior employment	-0.34	-0.23	-0.29
4 th quarter prior employment	-0.33	-0.25	-0.30
5 th quarter prior employment	-0.12	-0.18	-0.15
6 th quarter prior employment	-0.25	-0.11	-0.19
7 th quarter prior employment	-0.32	-0.20	-0.27
8 th quarter prior employment	-0.45	-0.30	-0.39
Study Entry and Exit Indicators			
Number of days from beginning of study window to program entry	-0.06	0.11	0.01
Number of days from exit to the end of economic quarter of exit	0.36	-0.25	0.08

For each background characteristic, pre-intervention measure, or contextual variable that was not influenced by the program, Table C5 lists the standardized mean difference between that group and the treatment group. The standardized mean difference was the preferred measure of equivalence for establishing balance because it was not sensitive to sample size and it standardized the difference of the groups based on a pooled standardized difference of both groups. The three comparison contrast samples were, as hypothesized, reasonably similarly equivalent to each other and the treatment group, even though they would not be considered satisfactorily “balanced” by conventional rules of thumb.¹⁵⁷ The table also shows that the standardized mean difference for each variable in Comparison Contrast 3 moderated the difference of the two constituent groups.

¹⁵⁷ Weighting procedures outlined below substantially improved this balance.



Step 2: Propensity Score Estimation

In the second stage, the Evaluation Team estimated propensity scores that are employed as weights in the analytic model to maximize treatment and comparison group equivalence on observed variables. Propensity scores predicted the probability of being selected into the treatment group, based on an array of variables that were theoretically or empirically predictive of the outcome of interest. The balancing procedure essentially involved the identification of variables to use in the creation of a propensity score, the estimation of the propensity score, and then the creation of a propensity score weight that was included in the analytic models.¹⁵⁸ Variables used in the propensity score models were obtained from VU administrative data. Balance diagnostics of the weighted samples were then produced in terms of the standardized mean difference of available and relevant characteristic/covariate/pre-treatment variables to establish equivalence of the two groups. The procedures are outlined below.

For both outcomes of interest, the Evaluation Team first calculated propensity scores that estimated the likelihood of being in the treatment group. The procedure was to predict group membership as a logistic function of a set of variables that were theoretically considered explanatory of the outcome variable.¹⁵⁹ For each of the propensity score models, the following were included: the most recent pre-intervention measure of the outcome (quarterly wages and employment status); a mean value for these outcomes for all eight quarters prior to training; age at the start of training; a female indicator; a contextual variable that counted the number of days from the start of the study window to the day that they enrolled; and another contextual variable that counted the number of days from program completion to the end of the quarter in which training took place.¹⁶⁰

¹⁵⁸ Recent guidance from propensity score literature encourages researchers to give priority to covariates that are related to the outcome rather than treatment assignment. Stuart writes that matching should be done on the most prognostic variable. Stuart EA. (2010). Matching methods for causal inference: A review and a look forward. *Statistical Science*. 25:1–21. See also: Song, M., & Herman, R. (2010). Critical Issues and Common Pitfalls in Designing and Conducting Impact Studies in Education. *Educational Evaluation and Policy Analysis*, 32, 351–371. Guo and Fraser, 2010. Shadish, W.R., Cook, T.D., and Campbell, D.T. (2002). *Experimental and Quasi-Experimental Designs for Generalized Causal Inference*. New York: Houghton Mifflin Company. Imbens, G., 2004, Nonparametric Estimation of Average Treatment Effects under Exogeneity: A Review, *Review of Economics and Statistics*. 86, 4-30.

¹⁵⁹ Guidance from propensity score matching literature encourages researchers to include all variables that are theoretically expected to be related to the treatment assignment and the outcome in the matching procedure (e.g., Guo and Fraser, 2010; Stuart, 2010). Some encourage the researcher to be more inclusive in selecting matching variables (Rubin and Thomas, 1996; Hill et al., 2004; Stuart and Rubin, 2007; Stuart, 2010). However, there is disagreement on this matter, and the more recent literature suggests that when faced with restrictions, researchers should give priority to covariates that are related to the outcome rather than treatment assignment (Guo and Fraser, 2010; Stuart, 2010). At a minimum, where available, Song and Herman (2010) advise that “matching should be done on a pre-intervention measure of the outcome or a close proxy measure for the pretest” (p. 355). The only variables that research suggests one should not include are those that may have been affected by the treatment of interest, as this can lead to bias in the estimated treatment effect. See: Imbens, G., 2004, Nonparametric Estimation of Average Treatment Effects under Exogeneity: A Review, *Review of Economics and Statistics*. 86, 4-30.

¹⁶⁰ While this last variable was technically a post-intervention measure, the Evaluation Team included it because the program was essentially a fixed-length program and therefore this exit date was mainly a function of date of program entry (and therefore not influenced by the treatment). It was considered relevant to the balancing equation however because the date at which one exited the program (and presumably entered the workforce) would likely explain the outcomes – especially because the outcomes that were being measured were very short-term. In any case, benchmark results were substantively identical with and without this variable in the propensity score equation.



Propensity scores were included as inverse probability weights (IPW) in the analytic model. The benchmark analysis included the entire sample of eligible participants, regardless of the magnitude of their propensity score. However, because some research indicated that extremely high or low propensity scores could adversely affect the internal validity of the impact estimate, the Evaluation Team conducted sensitivity studies for both outcomes that included only those cases with a propensity score that fell within a specified range. Results were substantively identical in both cases to the benchmark analyses.

Baseline equivalence is reported for the set of covariates and contextual variables that were available and identified as explanatory. Balance was diagnosed on the basis of standardized mean differences of covariates.¹⁶¹ The Evaluation Team produced balance statistics for the full analytic samples for both the employment and quarterly wage outcomes for each contrast selected. The list of covariates used to assess baseline equivalence included: eight quarters of the pre-intervention dichotomous employment status variable, one mean (two-years) pre-intervention employment variable, eight quarters of the pre-intervention wages, one mean (two-year) pre-intervention wages variable, gender, age at study entry, days elapsed between enrollment and beginning of study period, and days elapsed from graduation to end of economic quarter of exit.

The procedure varied depending on whether the covariate was continuous or categorical/dichotomous. First, the Evaluation Team generated model-based estimates of the difference between the treatment and control groups for the identified baseline equivalence variables. Then, if the variable was continuous, the Evaluation Team computed the pooled standard deviation of these variables. Finally, for each variable the Evaluation Team produced a standardized difference of means.

The Evaluation Team generated a model-based estimate of the difference between treatment and comparison groups on the pre-intervention equivalence measures. Separate models were run for each of the variables and different models were run for each outcome. The empirical model was a reduced-form variation of the model that the Evaluation Team used to estimate program impact (as specified in the *Analytic Model Specification* section, below). It was a reduced-form because individual-level covariates were omitted. It was a variation because the dependent variable was the baseline equivalence variable, not the outcome measure. The parameter the Evaluation Team was interested in was the coefficient for the treatment variable. This represented the adjusted (but not standardized) mean difference in the baseline equivalency variable between treatment and control participants.¹⁶²

For baseline equivalence variables that were continuous, the Evaluation Team used the following formula to compute the pooled standard deviation of the pre-intervention measure as follows:

$$S_p = \sqrt{\frac{(n_t - 1)S_t^2 + (n_c - 1)S_c^2}{(n_t + n_c - 2)}}$$

where: n_t and n_c are the sample sizes, and S_t and S_c are the participant-level standard deviations for the pre-intervention measures for the analytic treatment and comparison groups, respectively. The Evaluation Team produced separate calculations of the pooled standardized deviation for each variable used to

¹⁶¹ Significance testing is inappropriate for this diagnostic task because it conflates balance with statistical power (Austin, 2007; Imai et al., 2008; Austin, 2009; Stuart, 2010).

¹⁶² There is a slightly different interpretation if the outcomes are dichotomous.



establish baseline equivalence. Next, the Evaluation Team produced the standardized difference. If the baseline equivalence variable was a continuous variable, the Evaluation Team proposed to use the following formula:¹⁶³

$$g = \frac{\beta_1}{S_p}$$

where: β_1 is the adjusted mean difference in the variable selected to establish baseline equivalence for the treatment and comparison groups (calculated in Step 1) and S_p is the pooled standard deviation (produced in Step 2). For baseline equivalence variables that were dichotomous, the Evaluation Team calculated the standardized difference as follows:

$$d = \frac{p_t - p_c}{\sqrt{\frac{p_t(1 - p_t) + p_c(1 - p_c)}{2}}}$$

where p_t and p_c represent the estimated probability of occurrence of the event within the treatment and comparison group respectively.

Step 3: Weighting

Study 2 applied statistical weights (IPW) in the benchmark analysis. This approach assigns more “weight” to the observed values reported for members of the treatment and comparison groups who were more similar and assigned less “weight” to the observed values reported for members of the treatment and comparison groups who were dissimilar.

Analysis Approach and Selection of Analytic Model

For Study 2, the Evaluation Team considered both a Difference in Differences (DID) design and a Comparative Short Interrupted Time Series (CSITS) design in which the Evaluation Team compared outcomes for the treatment group with up to three comparison groups.¹⁶⁴ Both used modeling of baseline differences in the outcome measure (and trends in the case of CSITS) to off-set self-selection concerns. While the literature on the capacity of these designs to produce internally valid estimates is developing, some recent within-study comparisons suggest that both DID and CSITS can produce estimates that are close to experimental benchmarks.¹⁶⁵ Typical specifications of the basic DID model assume parallel growth trends (i.e., maturation is a credible threat);¹⁶⁶ the CSITS model adjusts for this by allowing the Evaluation

¹⁶³ This is the formula for Hedges’ g.

¹⁶⁴ See Somers, M. A., Zhu, P., Jacob, R., & Bloom, H. (2013). The Validity and Precision of the Comparative Interrupted Time Series Design and the Difference-in-Difference Design in Educational Evaluation. *MDRC*.

¹⁶⁵ For example see Somers, M. A., Zhu, P., Jacob, R., & Bloom, H. (2013). The Validity and Precision of the Comparative Interrupted Time Series Design and the Difference-in-Difference Design in Educational Evaluation. *MDRC*.; and Clair, T. S., Cook, T. D., & Hallberg, K. (2014). Examining the internal validity and statistical precision of the comparative interrupted time series design by comparison with a randomized experiment. *American Journal of Evaluation*, 1098214014527337. St. Clair et al (2014) found that using a baseline mean (i.e., no varying slopes – similar to conventional DID) with more time points increased bias. Similarly, Somers et al. (2013) found that both a DID and CSITS design provide credible estimates of the impact (as compared to a RDD benchmark) even when it is not possible to find a “local” comparison group.

¹⁶⁶ See Mora, R., & Reggio, I. (2012). Treatment effect identification using alternative parallel assumptions.



Team to model the pre-treatment trends of both conditions (treatment and comparison) separately.¹⁶⁷ Findings from previous studies suggest that the DID approach is appropriate when there are differences in baseline outcome means but not systematic differences in outcomes over-time (i.e., trends).¹⁶⁸ When differences in trends exist, the CSITS model, with proper specification, will produce the least biased estimates.¹⁶⁹

As with Study 1, the choice was essentially one of selecting a model that incorporated a pre-intervention trend into the estimate, or one that relied only on the pre-intervention average. To select which approach best fit the data, the Evaluation Team examined descriptive statistics of the pre-intervention outcomes (quarterly wage and employment) data across the eight quarters prior to program exposure. A graphical plotting of the average values for both is presented below in Figure C3. While the average wages and employment probabilities were not as convincing in their over-time development prior to enrolling in the TTDT program (as they were for Study 1) they were reasonably linear in progression.¹⁷⁰ Further, since there was some evidence of a difference in trend in pre-program wages for treatment and comparison groups, disregarding this information could bias results upward.¹⁷¹ Therefore, the Evaluation Team decided to model both outcomes as a trend.^{172,173} Sensitivity studies in any case demonstrated that results were substantively identical for both outcomes regardless of model selection.

¹⁶⁷ See Somers, M. A., Zhu, P., Jacob, R., & Bloom, H. (2013). The Validity and Precision of the Comparative Interrupted Time Series Design and the Difference-in-Difference Design in Educational Evaluation. *MDRC*.

¹⁶⁸ For a review of such studies, see Somers, M. A., Zhu, P., Jacob, R., & Bloom, H. (2013). The Validity and Precision of the Comparative Interrupted Time Series Design and the Difference-in-Difference Design in Educational Evaluation. *MDRC*.

¹⁶⁹ See Somers, M. A., Zhu, P., Jacob, R., & Bloom, H. (2013). The Validity and Precision of the Comparative Interrupted Time Series Design and the Difference-in-Difference Design in Educational Evaluation. *MDRC*.

¹⁷⁰ Part of this non-linear progression was due to the pre-program dip that was most apparent in the plot of pre-program quarterly wages. It was reassuring, however, that both groups displayed this pre-program dip, which would seem to suggest that the selection issue had in part been minimized via the pre-screening process.

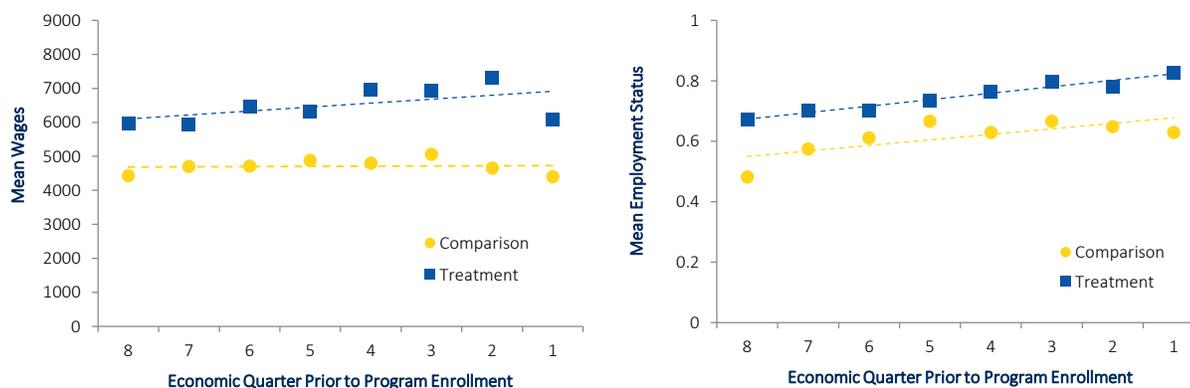
¹⁷¹ In their within-study comparison, Somers et al. found that the CSITS and DID models performed equally well in terms of providing internally valid estimates. However, the authors note that the slopes of the comparison and treatment groups were similar pre-treatment. Had the slopes been different, they argue, the (conventional) DID model “would have produced biased estimates of impacts” (p.76).

¹⁷² The literature refers to this method as a Comparative Short Interrupted Time Series (CSITS) design. See M Somers, P Zhu, R Jacob, and H Bloom (2013). The Validity and Precision of the Comparative Interrupted Time Series Design and the Difference-in-Difference Design in Educational Evaluation. To test whether the benchmark approach is sensitive to these analytic decisions, the Evaluation Team conducted a sensitivity study that models pre-intervention earnings as a mean for both outcomes. In both cases the impact results are substantively identical with the benchmark sample. The results of all sensitivity studies for Study 2 are presented in Table C11 in this Appendix.

¹⁷³ The Evaluation Team used a multilevel regression model in their estimation of program completion impact on wages and a multilevel linear probability model for the estimation of program completion impact on employment status.



Figure C3: Average Quarterly Wage and Employment Outcomes Pre-Intervention for Treatment and Comparison Sample, Study 2¹⁷⁴



Analytic Model Specifications

As diagnostic tests revealed a linear trend in outcomes during the eight pre-intervention economic quarters (See Figure C3), the Evaluation Team employed a CSITS model as their benchmark approach. The CSITS model is a variation of the DID model but relaxes the assumption that both groups will improve at the same rates over time. The CSITS model is specified as:¹⁷⁵

$$Y = a_0 + \beta_0 TX + \beta_1 TREND + \beta_2 TX * TREND + \beta_3 POST + \beta_4 TX * POST + e_i$$

where Y is the outcome of interest, a_0 is the intercept or the baseline mean of the comparison group at time = 0 (last baseline year); TX is the treatment group indicator, and its coefficient (β_0) is the parameter estimate of the additive difference of the baseline mean for the treatment group at the last baseline year, $TREND$ is a continuous time period variable, centered so the last pre-treatment (quarterly) observation = 0, the first observation = -7 and the last (post program) = 1; β_1 is the baseline slope for the comparison group; $\beta_1 + \beta_2$ equals the baseline slope for treatment group; $POST$ is the deviation from baseline trend for comparison group in the first post-intervention quarter; and β_4 is the deviation from the baseline trend for treatment group minus the comparison group's deviation in the first post-intervention quarter. β_4 is the estimate of interest because it quantifies the difference between the treatment and comparison group in post-intervention change, accounting for their different trajectories.

¹⁷⁴ The trend lines presented in these figures does not represent the modeled pre-intervention trend lines used in the SITS analytic model. The regression trend lines presented here are for illustrative purposes to demonstrate that there was a clear linear trend in employment outcomes for the sample prior to receiving the intervention.

¹⁷⁵ Again, for the sake of simplicity and legibility the Evaluation Team did not include multi-level subscripts. This model was, however a multi-level model. The Evaluation Team used the mixed command in Stata to estimate this empirical model with student time-varying observations nested in students. A multi-level linear probability model was employed for dichotomous outcomes.



ANALYTIC SAMPLES

Study 1 | FLE Program

Table C6: Descriptive Characteristics of Treatment Sample, Study 1

	Mean
Race	(n = 176)
Black/African American	33.5%
White	63.1%
Other	3.4%
Incumbent Worker	(n = 190)
Yes	51.1%
Veteran Status	(n = 164)
Veteran or eligible spouse	13.4%
TAA Eligible	(n = 182)
Yes	1.7%
Gender	(n = 194)
Female	17.5%
Male	82.5%
Age	(n = 173)
Age at study entry	33.67
Study Entry and Exit Indicators	(n = 194)
Number of days from beginning of study window to program entry	414.59
Number of days from beginning of economic quarter of entry to program entry	51.05
Number of days from exit to the end of economic quarter of exit	35.58
Number of days from exit to the end of study window	493.40
Regional Economic Indicators Prior to Program Entry	(n = 194)
Regional unemployment rate during quarter prior to program entry	4.99
Number in labor force during quarter prior to study entry	79976.33
Number of employment establishments during quarter prior to program entry	2885.88
Regional average weekly wages during quarter prior to study entry	\$629.21
Regional Economic Indicators After Program Exit	(n = 194)
Regional unemployment rate during quarter after program exit	4.48
Number in labor force during quarter after program exit	80899.53
Number of employment establishments during quarter after program exit	2914.61
Regional average weekly wages during quarter after program exit	\$633.21



The analytic sample for Study 1 consisted of a treatment group who was exposed to the FLE program at VU. The majority of students identified as being White (63.1 percent), while 33.5 percent reported being Black/African-American. A large majority reported being male (82.5 percent), and the mean age at study entry was between 33 and 34 years old. VU staff collected information at intake on a number of program indicators. Half of the analytic sample (51.1 percent) were incumbent workers, 13.4 percent reported being a veteran or an eligible spouse of a veteran, and a small number (1.7 percent) were eligible to receive TAA funding.

Individuals in the analytic sample for Study 1 entered training on average 415 days into the study period, which started on April 1, 2014, and exited the FLE program approximately 493 days before the close of the study window (September 30, 2015). Students began training approximately 51 days into the economic quarter in which they entered the study, and exited the program 36 days before the end of the quarter in which they graduated.

In the economic quarter directly preceding the quarter in which students enrolled, regional economic statistics indicated that there were 79,976 individuals in the labor force and 2,886 employment establishments in the county in which they attended training. The regional unemployment rate for the county in which they attended training was 5% and the average weekly wages for individuals in the county was \$629.21. In the economic quarter after the quarter in which they graduated, regional economic statistics indicate that there were 80,900 individuals in the labor force and 2,915 employment establishments in the county in which the students attended training. The regional unemployment rate for the county in which they attended training was 4.5% and the average weekly wages for individuals in the count was \$633.21.



APPENDICES

VU LTEC Final Evaluation Report

Study 2 | TTDT Program

Table C7: Unweighted and Weighted Baseline Equivalence of Treatment and Comparison Samples, Study 2

	Unweighted			Weighted		
	Comparison	Treatment	Standardized Difference	Comparison	Treatment	Standardized Difference
Gender	(n = 54)	(n = 64)		(n = 54)	(n = 64)	
Female	13.0%	10.9%	0.06	0.12	0.12	0.00
Age	(n = 54)	(n = 64)		(n = 54)	(n = 64)	
Age at study entry	36.50	34.55	0.15	35.15	34.92	0.02
Mean Pre-Program Wages	(n = 54)	(n = 64)		(n = 54)	(n = 64)	
Mean Wages	4706.68	6506.45	-0.30	5663.12	5702.70	-0.01
1 st quarter prior wages	4403.50	6100.44	-0.28	5505.01	5425.19	0.01
2 nd quarter prior wages	4659.25	7317.80	-0.42	5705.56	6439.88	-0.12
3 rd quarter prior wages	5061.89	6941.42	-0.31	6070.52	6124.92	-0.01
4 th quarter prior wages	4793.65	6965.82	-0.35	5715.51	6118.85	-0.06
5 th quarter prior wages	4880.90	6331.20	-0.24	5870.90	5575.84	0.05
6 th quarter prior wages	4713.81	6470.00	-0.28	5679.41	5637.79	0.01
7 th quarter prior wages	4703.43	5948.28	-0.20	5536.46	5182.62	0.06
8 th quarter prior wages	4437.03	5976.62	-0.22	5221.48	5116.50	0.01
Mean Pre-Program Employment Status	(n = 54)	(n = 64)		(n = 54)	(n = 64)	
Mean Employment Status	0.61	0.75	-0.36	0.68	0.69	-0.01
1 st quarter prior employment	0.63	0.83	-0.45	0.74	0.74	-0.01
2 nd quarter prior employment	0.65	0.78	-0.30	0.72	0.71	0.02
3 rd quarter prior employment	0.67	0.80	-0.29	0.73	0.74	-0.02
4 th quarter prior employment	0.63	0.77	-0.30	0.70	0.73	-0.06
5 th quarter prior employment	0.67	0.73	-0.15	0.72	0.68	0.09
6 th quarter prior employment	0.61	0.70	-0.19	0.67	0.65	0.05
7 th quarter prior employment	0.57	0.70	-0.27	0.62	0.63	-0.01
8 th quarter prior employment	0.48	0.67	-0.39	0.54	0.60	-0.13
Study Entry and Exit Indicators	(n = 54)	(n = 64)		(n = 54)	(n = 64)	
Number of days from beginning of study window to program entry	93.48	92.91	0.01	94.68	94.00	0.01
Number of days from exit to the end of economic quarter of exit	52.33	50.47	0.08	49.76	50.33	-0.03



BENCHMARK ANALYTIC RESULTS

Study 1 | FLE Program

Table C8: Benchmark Analytic Model Results, Study 1

	Wages		Employment	
	β	SE	β	SE
TIME	28.97	34.49	0.02***	0.00
Program Impact Estimate	473.47**	165.11	0.03	0.03
Number in Sample	194		194	

*** p<0.001, ** p<0.01, * p<0.05

Study 2 | TTDT Program

Table C9: Benchmark Analytic Model Results, Study 2

	Wages		Employment	
	β	SE	β	SE
Comparison group at baseline	5823.44	971.40	0.76	0.05
Difference between treatment and comparison group at baseline	314.74	1210.04	-0.01	0.08
Pre-intervention slope (Trend) for comparison group	45.81	113.73	0.02*	0.01
Difference in trend for treatment and comparison groups	78.61	126.75	0.00	0.01
Post-intervention deviation from trend for comparison group	234.75	996.90	-0.01	0.06
Estimate of Program Impact	1247.35	1270.38	0.08	0.09
Number in Sample	118		118	

*** p<0.001, ** p<0.01, * p<0.05



APPENDICES

VU LTEC Final Evaluation Report

Figure C4: Unweighted Estimated Pre-Intervention Earnings Trend and Adjusted Post-Intervention Earnings, by Treatment Group

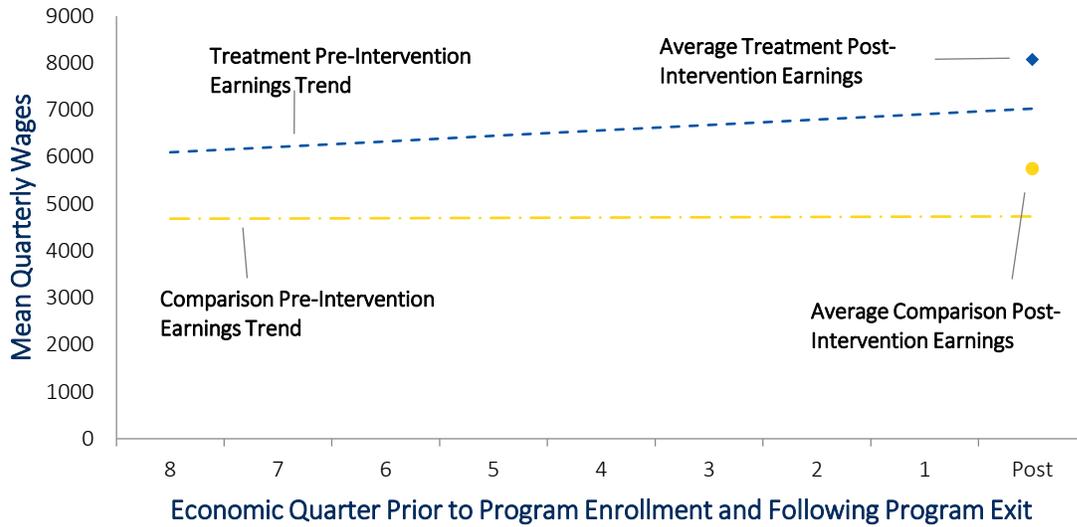
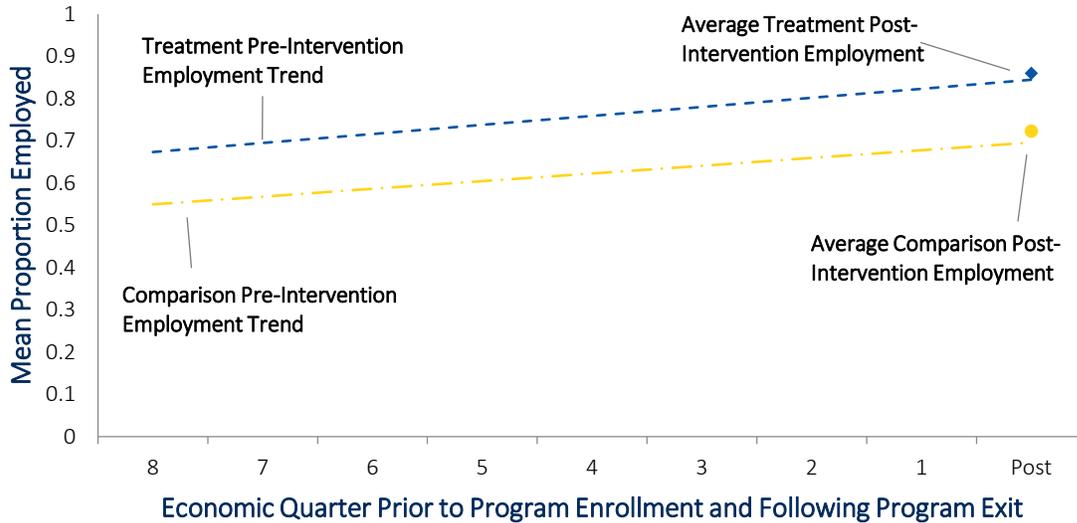


Figure C5: Unweighted Estimated Pre-Intervention Employment Trend and Adjusted Post-Intervention Proportion Employed, by Treatment Group





SENSITIVITY STUDIES

Study 1 | FLE Program

Sensitivity Analysis 1: Pre/Post Model

For Sensitivity Analysis 1, the Evaluation Team employed a multi-level pre-/post-model. The pre-/post-model is specified as:

$$Y = a_0 + \beta_1 TIME + e_i$$

where Y is the outcome of interest, a_0 is the intercept (baseline mean) of the estimated comparison (counterfactual) group at time = 0, and X_p is a vector of relevant participant-level covariates, contextual control variables and time-varying economic condition variables. TIME is a dichotomous indicator for pre/post receipt of training, where each quarter prior to training is coded 0 and the quarter after training is coded 1. In this case the coefficient of interest is β_1 . The results in this case were inconsistent with the benchmark findings. The import of these differences are discussed elsewhere in this report.

Sensitivity Analyses 2-6

To test the validity of the benchmark parsimonious model, the Evaluation Team employed a number of sensitivity analyses that included and excluded various individual-level and time-variant variables. Although these variables should in expectation have been controlled for given the weighting procedures and balance statistics, the Evaluation Team decided to test this empirically.

- For Sensitivity Analysis 2, the Evaluation Team included individual-level covariates but did not permit imputations; consequently this represented a sample that was reduced by the number of cases with at least one missing variable.
- In Sensitivity Analysis 3, the Evaluation Team included individual-level covariates whose missing values had been imputed to 0 (categorical) or the mean (continuous), time-variant contextual variables related to when the individual entered and exited the study, and regional economic variables related to employment statistics.
- In Sensitivity Analysis 4, the Evaluation Team included just the study context and regional economic indicators in the analytic model.
- In Sensitivity Analysis 5, the Evaluation Team included individual-level covariates and regional economic controls in the model.
- In Sensitivity Analysis 6, the Evaluation Team included individual-level covariates and study contextual variables in the model. Results in all cases were substantively equivalent to the benchmark findings.



Sensitivity Analyses 7: Exclusion of Wage Outliers

In Sensitivity Analysis 7, the Evaluation Team excluded both pre-intervention and outcome wage outliers from the model. Outliers were defined as more than three standard deviations away from the mean for each outcome variable. Results were substantively equivalent to the benchmark findings.

Table C10: Results of Sensitivity Analyses on Wage and Employment Outcomes, Study 1

	Estimated Program Impact on Wages		Estimated Program Impact on Employment Probability	
	β	SE	β	SE
Preferred model	473.47**	165.11	0.03	0.03
Sensitivity analysis 1 (pre-post)	517.62***	156.51	0.07**	0.03
Sensitivity analysis 2 (reduced sample; include all covariates without imputation)	223.26	185.75	0.01	0.03
Sensitivity analysis 3 (full sample, imputations allowed; individual level covariates, study context and regional economic variables)	473.47**	165.11	0.03	0.03
Sensitivity analysis 4 (full sample; study context and regional economic variables only)	473.47**	165.11	0.03	0.03
Sensitivity analysis 5 (full sample, imputations allowed; with individual level covariates and regional economic variables only)	473.47**	165.11	0.03	0.03
Sensitivity analysis 6 (full sample, imputations allowed; with individual level covariates and study context variables only)	473.47**	165.11	0.03	0.03
Sensitivity analysis 7 (exclude wage outliers)	623.55***	151.07	--	--

*** p<0.001, ** p<0.01, * p<0.05

NOTE: For sensitivity analysis 6, the Evaluation Team report the 2nd quarter post-program effects on wages and employment status. The first quarter results for this analysis were identical to the preferred model.

Study 2 | TTDT Program

Sensitivity Analysis 1: Unweighted Model

For Sensitivity Analysis 1, the Evaluation Team estimated the benchmark empirical model but used no weighting procedures. The Evaluation Team did not believe that this model was methodologically defensible as an alternative model, given the baseline equivalence statistics. However, it was included because it helped to test whether in the (unknowable) case the matching procedures had somehow imbalanced the groups on unobserved variables. If the results of this and the benchmark models were inconsistent, then this would remain an open question. This was not the case for either outcome. The results of both sets of analyses were substantively equivalent to the benchmark findings and indicate that the results were not meaningfully sensitive to the weighting procedures.



Sensitivity Analysis 2: DID Model

For Sensitivity Analysis 2, the Evaluation Team employed a DID model that operationally defined pre-intervention wages and employment status as the average of the eight-quarters reported prior to program exposure. The impact estimate was the treatment group's deviation from the comparison group's post intervention deviation from their respective pre-program means and assumed parallel growth. The typical DID model follows:¹⁷⁶

$$Y = a_0 + \beta_1 TX + \beta_2 TIME + \beta_3 TX * TIME + e_i$$

where Y is the outcome of interest, a_0 is the intercept (baseline mean) of the estimated comparison group at time = 0, and TX is the treatment group indicator. $TIME$ is a dichotomous indicator for pre/post receipt of training, where each quarter prior to training is coded 0 and the quarter after training is coded 1. In this case the coefficient of interest is β_3 , the one associated with the interaction term $TX * TIME$. The interaction coefficient estimated the difference between treatment group and the comparison group post-intervention while accounting for parallel maturation. Results were substantively equivalent to the benchmark findings.

Sensitivity Analyses 3-6

To test the validity of the preferred parsimonious model, the Evaluation Team employed a number of sensitivity analyses that included and excluded various individual-level and time-variant variables.

- In Sensitivity Analysis 3, the Evaluation Team included individual-level covariates, time-variant contextual variables related to when the individual entered and exited the study, and regional economic variables related to employment statistics.
- In Sensitivity Analysis 4, the Evaluation Team included just the study context and regional economic indicators in the analytic model.
- In Sensitivity Analysis 5, the Evaluation Team included individual-level covariates and regional economic controls only.
- In Sensitivity Analysis 6, the Evaluation Team included individual-level covariates and study contextual variables only. Results were substantively identical to the benchmark results.

Sensitivity Analyses 7: Trimming on the Propensity Score

In Sensitivity Analysis 7, the Evaluation Team tested the benchmark approach of including all members of the initial analytic sample – including those with propensity scores that were above or below levels that may adversely affect the internal validity of subsequent estimates. For this study, the Evaluation Team analyzed reduced samples of individuals whose linearized propensity scores were within a range of acceptable propensity scores. Results were consistent with benchmark findings.

Sensitivity Analysis 8: Exclusion of Wage Outliers

In Sensitivity Analysis 8, the Evaluation Team excluded outcome wage outliers, which were defined as more than three standard deviations away from the mean for each outcome variable. Results were substantively

¹⁷⁶ Again, for the sake of simplicity and legibility multi-level subscripts were not used. This model was, however, a multi-level model. The Evaluation Team used the mixed command in Stata to estimate this empirical model with student time-varying observations nested in students. A multi-level linear probability model was used for dichotomous outcomes.



APPENDICES

VU LTEC Final Evaluation Report

equivalent to the benchmark findings.

Sensitivity Analyses 9 and 10

In Sensitivity Analysis 9, the Evaluation Team used Comparison Contrast 1, the historical comparison group who received TTDT programming at LTEC during the year prior to the treatment group. In sensitivity analysis 10, the Evaluation Team used Comparison Contrast 2, the contemporaneous comparison group who received TTDT programming during the same period as the treatment group, but at the Fort Branch campus. Results of these analyses are discussed elsewhere.

Table C11: Results of Sensitivity Analyses on Wage and Employment Outcomes, Study 2

	Estimated Program Impact on Wages		Estimated Program Impact on Employment Probability	
	β	SE	β	SE
Preferred model	1247.35	1270.38	0.08	0.09
Sensitivity analysis 1 (unweighted)	33.40	621.24	-0.01	0.06
Sensitivity analysis 2 (DID)	1601.10	1293.36	0.07	0.09
Sensitivity analysis 3 (with all control variables)	1247.35	1270.38	0.08	0.09
Sensitivity analysis 4 (with study context and regional economic variables only)	1247.35	1270.38	0.08	0.09
Sensitivity analysis 5 (with individual-level covariates and regional economic variables only)	1247.35	1270.38	0.08	0.09
Sensitivity analysis 6 (with individual-level covariates and study context variables only)	1247.35	1270.38	0.08	0.09
Sensitivity analysis 7 (reduced sample; using trimmed propensity scores)	1253.09	1307.66	0.11	0.09
Sensitivity analysis 8 (exclude wage outliers)	1718.08	1254.17	--	--
Sensitivity analysis 9 (comparison contrast 1)	2068.66	1957.00	0.24*	0.12
Sensitivity analysis 10 (comparison contrast 2)	1308.95	1588.29	-0.06	0.09

*** p<0.001, ** p<0.01, * p<0.05

CONCLUSIONS

On balance, findings from Study 1 and Study 2 indicate that TAACCCT-funding did not have an impact on the short-term employment status of students who completed Logistics Training and Education Center (LTEC) programming and that only Fork-Lift Essentials (FLE) participants experienced a statistically significant improvement in quarterly earnings during the first quarter post program completion. Tractor-Trailer Driver Training (TTDT) participants did not experience an increase in income post program.¹⁷⁷

¹⁷⁷ Impact for Study 1 was evident when the test statistic associated with the post-program deviation in the participant’s earnings/employment status from a baseline trend in that same group’s pre-program earnings was statistically significant at the .05 level. Impact for Study 2 was evident when the test statistic associated with the difference between the treatment and comparison group in post-intervention change (accounting for their different trajectories) in earnings/employment status was statistically significant at the .05 level.



Study 1 | FLE Program

Research Question 1: FLE Program Effect on Employment Status

Empirical findings for Research Question 1 do not support the hypothesized relationship between FLE program completion and the improved likelihood of employment. Although results in Table C8 show a very slight (three percent) increase in the pre- to post-intervention probability of employment, this difference is not statistically significant. All but one of six sensitivity studies corroborate the non-significant findings of the benchmark analysis. Only the pre/post study – which models all pre-intervention outcomes as a mean baseline instead of a trending baseline – produced an estimate that achieved statistical significance. The reason for this is clear; by disregarding the evident upward trend, the pre-/post-mean baseline underestimates the expected employment likelihood, and therefore produces an upward-biased impact estimate. While these results help to highlight the fact that the results are sensitive to analytic decisions, the Evaluation Team feels confident that the benchmark approach is the most defensible and analytically correct.¹⁷⁸

Research Question 2: FLE Program Effect on Earnings

The second research question in Study 1 asked whether the TAACCCT-funded FLE program improved quarterly wages for program completers. Results produced by the benchmark analysis suggest that quarterly wages were improved by the program. Statistical tests indicate that completing the FLE program in fact improved earnings in the first quarter immediately following program completion. FLE participants demonstrated a statistically significant increase in quarterly earnings (\$473.47) from what was projected by the baseline trend.

With one exception, results of sensitivity studies were consistent with the benchmark findings. The single estimate of impact that is below the threshold level of statistical significance was derived from a model which excluded about one fourth of the cases included in the benchmark analytic sample. In this model, all covariates were included without any imputation for missing values. Instead, the Evaluation Team applied case-wise deletion for any individual missing data for one or more of the covariates. Consequently, the sample size dropped from 194 to 152. This loss of information resulted in a reduction in the estimated impact and a large loss of statistical power and in turn the statistically significant impact disappeared. The most reasonable interpretation is that the difference between this finding and the other findings was being driven by changes in the samples rather than the explanatory power of additional covariates.¹⁷⁹ Furthermore, the reduced sample is less compelling because it represents a much narrower portion of those participants who completed the program, which is to say it is less representative of the population of students who completed FLE training.

Taken together, these results suggest that while the FLE program did not improve the likelihood of employment, it did have a positive impact on wages for participants. Interpreting these results lies somewhere beyond the data, but findings suggest that FLE participants may be on a sort of “improvement

¹⁷⁸ Aside from the graphical evidence demonstrated by the quarterly pre-intervention employment data, empirical evidence of a trend was provided by the parameter estimates in the benchmark model. In the results of that model, the coefficient for the *time* variable had a positive slope and was very statistically significant, which was a fairly convincing indication that on average participants’ probability of employment was improving in the eight quarters prior to enrollment in the FLE program.

¹⁷⁹ The analytic model that excluded the covariates entirely (benchmark) and the model that included covariates but imputed the missing values of those covariates both provided consistent results.



track” at their work and that by completing the FLE program they were able to improve their earnings – either by increased work or by improved hourly wages. Put another way, the students who most benefited from FLE programming were not those who were unemployed at baseline but those who sought improved wages or increased work hours at their place of employment.

Study 2 | TTDT Program

Research Question 1: TTDT Program Effect on Employment Status

Benchmark empirical findings for Research Question 1 suggest that TTDT program completion has not improved the likelihood of employment. Secondary analyses, however, suggest that this study likely has statistical power limitations that may have inhibited the capacity to detect an effect.

Results of sensitivity analyses indicate that post-TTDT employment probabilities for treatment and comparison groups are quite different. The comparison group had a slightly reduced probability of employment, while the treatment group appeared to improve its likelihood of employment by around ten percentage points. What is curious is that although this impact estimate seems substantial, the observed difference remains statistically insignificant. Further analyses suggest that this uncertainty may have been produced by variability in outcomes for the two constituent groups that make up the pooled contrast. The Evaluation Team found that estimates for employment outcomes were sensitive to the identified comparison group (contemporaneous vs. retrospective). That is to say that while TAACCCT-funded TTDT had no differential impact on the likelihood of employment when the treatment group was compared to the pooled sample or the contemporaneous group, it did have a significant and differential impact when the treatment group was compared to the retrospective comparison group.

As a consequence of this sensitivity, the Evaluation Team is less confident in the benchmark results for the first research question. The secondary analyses, however, do not provide enough evidence at this point to discount the benchmark results (the scope of the data did not permit this). The composite sample still offers the most representative contrast for the treatment group. Moreover, the sensitivity study findings were not as robust as the benchmark results.^{180, 181}

¹⁸⁰ Sensitivity Analysis 9 (see Study 2 under the Sensitivity Analyses section of Appendix B) compared the probability of employment for the treatment group post-program completion with that of the retrospective comparison group post-program completion. While results from Sensitivity Analysis 9 were not consistent with findings from the benchmark approach, all other sensitivity analyses (1 through 8 and 10) for Study 2 supported the benchmark findings.

¹⁸¹ The treatment group appears to have experienced significant increase in likelihood of employment post program as compared to the retrospective comparison group under some modeling assumptions, but that effect disappears when those assumptions are changed. Given that the employment trend demonstrated within the retrospective group was not as clearly linear when compared to trends among the other comparison groups, it remains possible that the latter approach (DID) was better suited than the former (CSITS) for this particular analysis. On the other hand, there should have been fewer selection issues with the retrospective group. Economic conditions represented the only confound in the design and when the Evaluation Team statistically controlled for them at entry and exit, the results remained significant. However, these statistical controls have very little variability in the sample. In the end, the Evaluation Team cannot be confident in a treatment effect on employment probability for the TAACCCT-funded TTDT program; however they do believe that the small sample size was likely motivating this result.



Research Question 2: TTDT Program Effect on Earnings

Results produced by the benchmark and secondary analyses indicate that completion of the TAACCCT-funded TTDT program had no detectable impact on participants' first-quarter post-program earnings. While estimates from the benchmark study (reproduced in Table B.8 of Appendix B) show a \$1,247.35 average improvement in quarterly wages relative to the comparison group who received non-TAACCCT-funded TTDT, hypothesis testing statistics show that this difference is statistically insignificant. The Evaluation Team is comparatively confident in these results because the variability in quarterly wages is large and is consistently large across all comparison contrasts. As partial confirmation of this interpretation, the effect size, which was a function of the estimated effect and the standard deviation of that measure, was comparatively small (hedges' $g = .04$). Findings produced by multiple sensitivity studies (reported in Table B.11 in Appendix B) were substantively identical to the benchmark findings.

In summary, based on the data gathered for this report, the results suggest that the TTDT program did not have an impact on participants' short-term economic outcomes. The Evaluation Team is less confident in the findings produced by the analysis for the first research question than they are for the second. Even though the sample size may have limited the potential to observe significant effects in the case of the first research question, a satisfactory and conclusive answer to that question lies outside the scope of the data collected here. The Evaluation Team believes the benchmark sample and analysis remains the most reliable and credible assessment of program impact.



APPENDIX D. STAKEHOLDER CONTRIBUTIONS

Below is a compiled list of all stakeholder contributions made throughout the LTEC Initiative grant. Donations from employers totaled \$880,224, and other investments and partnerships (explained below) were made to assist in the progression and implementation of the LTEC Initiative.

Table D1: Stakeholder Contributions

	Stakeholder	Contribution(s)
Employers	Amazon	Employee training (TTDT program)
	Schneider	Donated TTDT equipment
	EmployIndy	Employee training (GLA program)
	Indianapolis Fruit Company	Hiring LTEC graduates
	Old Dominion	Hiring LTEC graduates
	enVista	Discounted technology for warehouse
	Raymond/Associated Solutions	Donated FLE equipment
	Newcastle Systems	Donated carts and small equipment
	SpaceGuard Products	Donated guarding for warehouse
	Toyota Material Handling	Employee training (GLA program) and donated equipment (fork-lift and engine cut-aways)
	Shorr Packaging	Donated equipment (e.g., packaging machines)
	Frito Lay	Attended ELG
	Global Plastics	Hiring LTEC graduates
	Ozburn-Hessey Logistics (OHL)	Attended ELG, employee training
	QPSI	Employee training (FLE program)
	Vital Solutions/MS Companies	Staffing company for logistics field; sent customers through FLE program prior to employer placement
	“Save”ty Yellow Products	Donated warehouse safety equipment
	Create-a-Soft	Donated Simcad software
	Hannibal Industries	Donated racking display
	Pitney Bowes	Donated conveyor
	Driving Ambition	Donated flatbed trailer
	Big Ass Fans	Donated industrial fan
	Conway	Donated TTDT equipment
	New Age Industrial	Donated picking carts
	Cascade	Donated fork-lift extension kit
	Worldwide Material Handling	Donated folding carts
	NAPA Balkamp	Internship programs and other assistance
	MD Logistics	Internship programs and hiring agreements
Online Transport	Donated trailers	
SalesForce	Donated CRM software	
Local High Schools and High School Programs	Plainfield High School	Student training (GLA plus Fork-Lift/OSHA)
	Excel Center	Student training (TTDT, GLA, and FLE programs)
	TeenWorks	Summer internship program with FLE certification
	Hire Tech	Credit toward Introduction to Supply Chain Management
	Area 31	Student training (TTDT plus FLE and GLA programs)



Other Organizations	Stakeholder	Contribution(s)
	Town of Plainfield	Investments made toward facility and programs (\$500,000)
	Vincennes University	Investments made toward facility and programs (\$525,000)
	IN Department of Corrections	Grant totaling \$80,000
	IN Department of Transportation	Grant totaling \$165,578
	Volunteers for America	Re-entry training (TTDT program)
	VU's Veterans Upward Bound Program	Recruiting and marketing to veterans
	DVOPs and Director of Veteran Affairs	Recruiting, marketing, and referring veterans



APPENDIX E. LTEC PROGRAM DESCRIPTIONS

NON-CREDIT PROGRAMS

Fork-Lift Essentials (FLE)

The FLE course is an OSHA-compliant course intended to provide students an understanding of the basic functions of warehousing and material handling. Concepts included in this course are: safety, operator training, hazard identification and safe load handling. Students receive a certificate of completion and VU LTEC Powered Industrial Truck Operator (PITO) license upon successfully passing both a written exam and driving skills practical.

Team Lead Essentials (TLE)

The TLE course is designed for logistics employers and incumbent workers within their organization whom currently have a leadership role, or have been identified with leadership potential. The TLE program focuses on developing those individuals that hold a Team Lead role within a logistics company. The program focuses on equipping these Team Leads with the skills necessary to manage and lead high-performing teams. Concepts included in the course are: The role of a leader, soft skills, leadership styles, effective communication, on-the-job training, leadership vs. management, team work, conflict resolution, motivating employees and performance metrics.

Global Logistics Associate (GLA)

The GLA is a nationally-recognized certificate program sponsored by APICS (Association for Operations Management), a premier professional association for supply chain and operations management. The GLA is a hybrid training program, consisting of online, classroom, and hands-on content. This certificate program focuses on the general knowledge in several key areas, including: workplace essentials, supply chain management, logistics and transportation, warehouse operations, and SCM information technology. The award of the GLA certificate requires passing the GLA Certificate Exam.

ACADEMIC/CREDIT PROGRAMS

Supply Chain Logistics Management (SCLM) Associate Degree and Certificate

The SCLM Associate degree (60 credit hours) prepares students for a variety of entry-level positions in the field of supply chain, logistics and distribution. The curriculum includes a core of business and general education courses, as well as extensive specialized training in procurement, transportation, production, planning/scheduling and materials management. Likewise, the SCLM Certificate (30 credit hours) is a condensed program that focuses on an overview of supply chain concepts.

Tractor-Trailer Driver Training (TTDT)

The TTDT program is a six-week training course designed to prepare students to enter the tractor-trailer driver marketplace at an entry level driving position. Included in the training is 1) Classroom instruction relating to federal regulations governing commercial motor vehicle operation, inspection procedures, proper maintenance practices and vehicle safety; 2) Lab instruction on the backing range learning to master a variety of backing skills; 3) Road driving instruction in which students can expect to drive under a variety of conditions.



APPENDIX F. LTEC PRE-/POST-ASSESSMENT TRENDS

Three grant-funded programs at the Logistics Training and Education Center (LTEC) were assessed in the following ways. For all three programs; Fork-Lift Essentials (FLE), Team Lead Essentials (TLE), and Global Logistics Associate (GLA), a pre- and post-assessment was administered to gauge the level of knowledge gains through the program. The same test was used for both the pre-test and post-test, allowing for direct comparisons. The tests for the FLE program and the TLE program are listed in the Program Assessment section.

FORK-LIFT ESSENTIALS

Data for 261 students that enrolled in the FLE program was used for these calculations. Other students were removed from the analysis due to insufficient data. The following table breaks down how many students went through the FLE program in each ‘project quarter;’ that is, quarters starting from the beginning of the project.

Table F1: Project Quarter and Corresponding Participant Numbers

Quarter	# of Students	Quarter	# of Students
1	18	7	32
2	33	8	37
3	37	9	26
4	21	10	7
5	29		
6	21	Total	261

Of those 261 students, the typical student scored a 71 percent on the pre-test and a 93 percent on the post-test. The standard deviation for the pre-test was 16.5 percentage points, while the standard deviation for the post-test scores was roughly nine percentage points. A total of 254 students included in this analysis passed the course, while seven students did not pass the course.¹⁸²

Figure F1: Pre-/Post-Test Averages



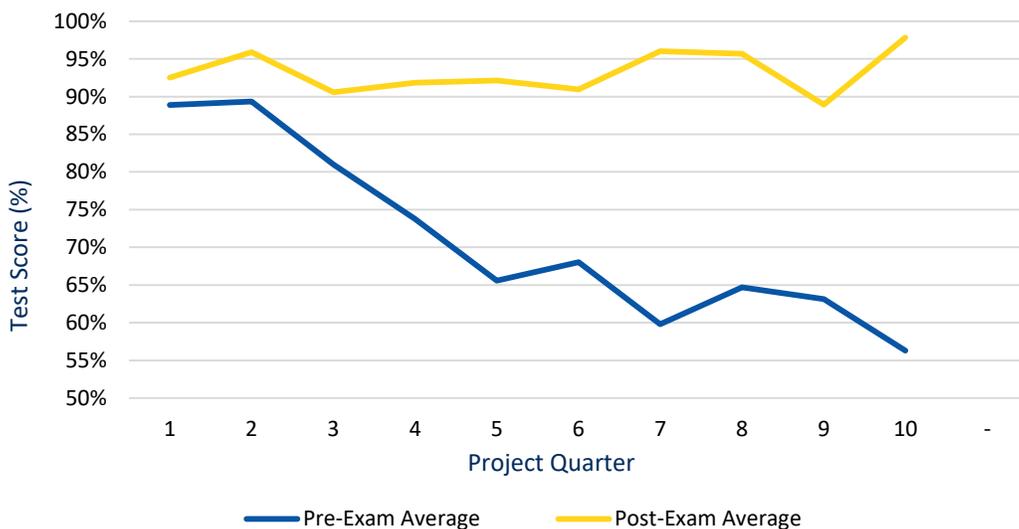
¹⁸² Passing requires scoring an 80 percent or better in both the “Sit Down” test and the final exam.



Improvement over Time

The following chart tracks the pre- and post-exam results over time. Rather than months or years, the periods were broken up into “project quarters,” with quarter one indicating the first quarter in which the grant was active.

Figure F2: Assessment Scores over Time



Over course of the grant program, the average students’ score on the pre-test decreased; from more than 80 percent for each of the first three quarters to below 70 percent for the subsequent six quarters. One possible explanation for this decline was that the test itself was redesigned for more rigor in March 2014, corresponding to the third quarter of the project. Breaking the pre-test scores into two periods, quarters 1-3 and quarters 4-10, yields the following pre-test averages:

Table F2: Pre-Test Averages

Period	Pre-Test Average
Q1-Q3	83%
Q4-Q10	64%

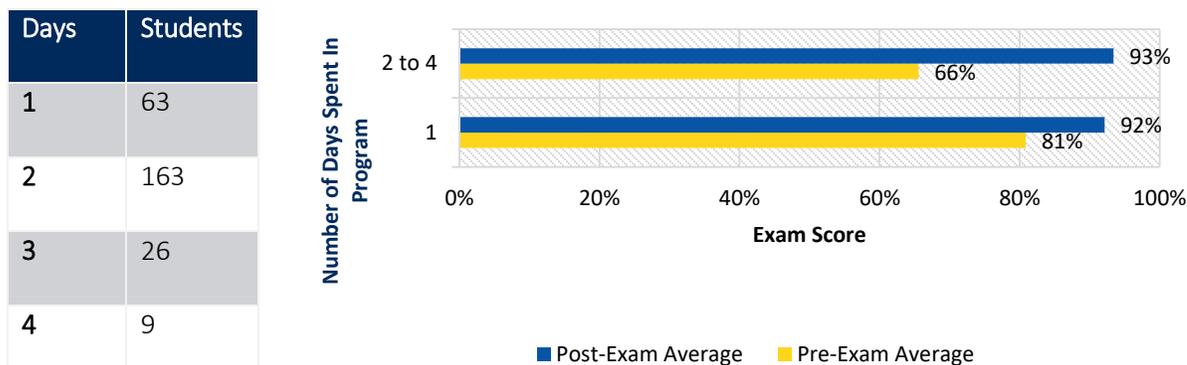
Clearly, scores appeared to drop off after the pre-test was altered. This is an indicator that the test may have increased in difficulty. Nevertheless, the post-assessment scores remained stable over time, indicating that the program itself had been consistent in terms of equipping students with the appropriate knowledge level. Both the original and revised assessments have been included in the Program Assessments section.



Improvement in Scores by Days of Instruction

Though students were administered the same test and received the same instruction during the FLE course, students could complete the course in one day or up to four days. While the course was still equivalent to 12 hours, some employers preferred to send their employees to LTEC for different periods of time. The breakdown of the number of students that took the course for one day versus four days is outlined below:

Figure F3: Exam Averages and Participant Numbers



Of special interest is the difference between students in the course for one day versus those that were in the course from two to four days. When broken down into these two categories, the pre-test score was higher for students enrolled in the program for one day likely due to the structure of the program (i.e., the one-day program is designed for experienced individuals while the two-day program is designed for beginners). However, the average post-test score was nearly the same for both groups. Students that completed the program in one day appeared to more likely come from a company cohort, which could explain the superior performance on the pre-assessment.

Test Scores by Group

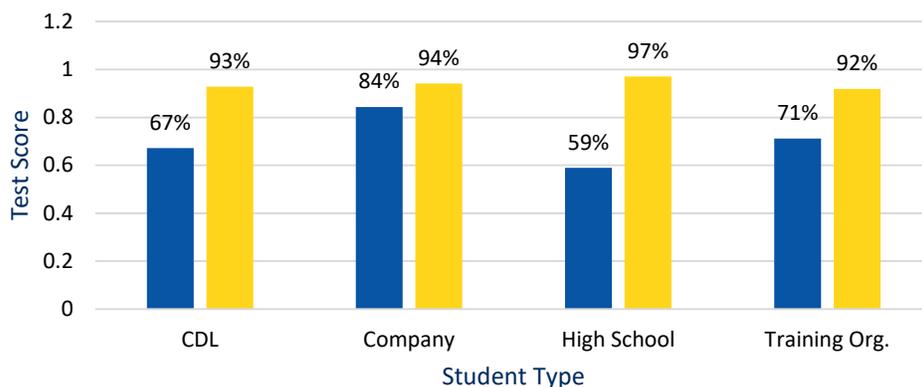
Students in the FLE program came from a wide variety of backgrounds and employment situations. Here, “student type” will be considered the student’s company, cohort, or status. Over a quarter of the total students were part of the Tractor-Trailer Driver Training (TTDT) program. Another 20 percent came from one of the Excel Centers, an adult high school. The remaining 55 percent of students came from a wide range of companies and institutions. The following table shows the average scores for various types of students (i.e., TTDT program, company, training organization, and high school). The table shows that students coming from companies scored the highest on the pre-test, while those from high schools started off with lower scores. Nevertheless, all of the post-test scores showed significant increases.

Table F3: Student Group Test Scores and Participant Numbers

Group	#	Pre-Test	Post-Test
High School	14	59%	97%
Training Org.	82	71%	92%
TTDT	72	67%	93%
Company	51	84%	94%



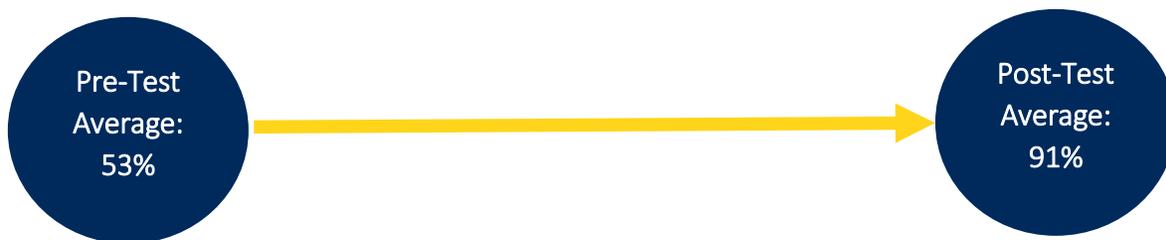
Figure F4: Score Averages by Type



TEAM LEAD ESSENTIALS

The TLE program was administered to eight different classes, each course equivalent to 12 credit hours, which were spread between two and eight days for various cohorts. A total of 90 students were recorded as having completed the TLE program. For the following figures, several students' data were removed due to its incompleteness, including eight students that were not able to finish the program. Of the remaining 80 students, the breakdown of average pre- and post-assessment scores is as follows.¹⁸³

Figure F5: Pre-/Post-Assessment Test Averages



The typical student entered the course with a pre-exam score of 53 percent, which increased on the post-examination by 38 points (i.e., a 72 percent score increase). Over time, there was no clear trend in whether or not the scores improved, largely due to the varying backgrounds of students entering the program. The following charts averaged pre-test and post-test scores for each 'project quarter,' in which the program was taught to a group. Some quarters have multiple class sections, while others just have one.

¹⁸³ Students had to score an 80 percent or higher on the final in order to receive a passing grade for the program.

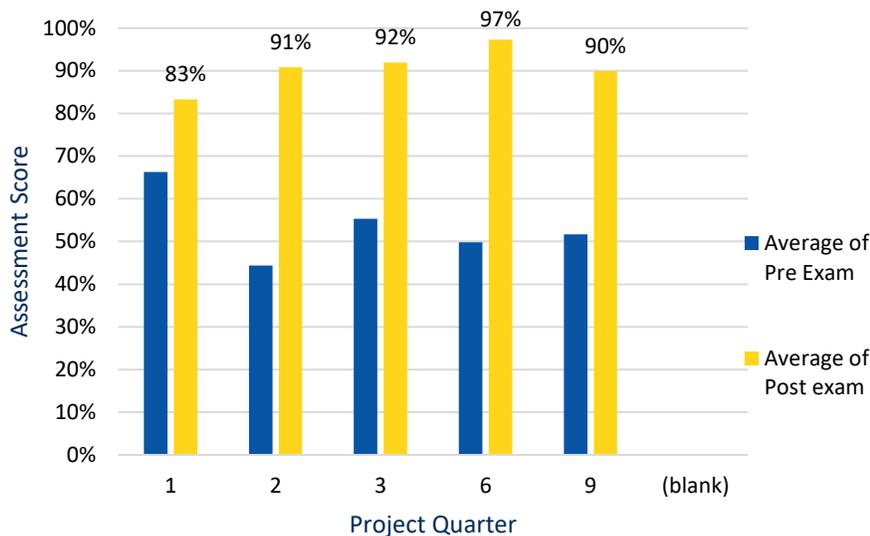


APPENDICES

VU LTEC Final Evaluation Report

Figure F6: Assessment Scores by Quarter and Participant Numbers

QUARTER	STUDENTS
1	7
2	5
3	24
6	13
9	31



The TLE students came from a total of three separate companies. When broken down by company, there were no significant differences in assessment scores. For all three companies, the average pre-exam score fell between 44 percent and 53 percent, while the average post-exam score for each group fell between 91 percent and 93 percent.

Table F4: Assessment Scores by Company

Company	Pre-Exam	Post-Exam	Students
A: NT Supply	44%	91%	5
B: OHL	53%	92%	46
C: TOA	52%	93%	31

The eight students that did not complete the course came from OHL, with seven of the students enrolled in the December 2013 course. However, the courses reportedly took place during the peak seasons for the company, with work schedules complicating course attendance and leading to lower course completion rates. These students are not included in the above table since they did not have post-exam scores, although they certainly represent a significant portion of students.



GLOBAL LOGISTICS ASSOCIATE

A total of 37 students enrolled in the GLA program, offered at varying times.¹⁸⁴ Of this total, 62 percent passed the program, with the remaining 38 percent either not completing or receiving a failing grade. More detail relating to the students that either did not complete or failed the program can be found later in this section, including a breakdown by group/company, as well as reported reasons that students were not able to pass the course.¹⁸⁵

Table F5: Student Assessment Score Outcomes

Outcome	# of Students	% of Total
DNF	7	19%
Failed	7	19%
Passed	23	62%
Total	37	100%

The average pre-exam score was 42 percent, which the program increased to an average post-exam score of 74 percent, for a percentage increase of 76 percent. Because there was relatively little data for the program, it was not useful to look at exam score trends over time. Also, seven out of 37 students do not have post-assessment data, indicating that these students did not complete the final exam, which likely inflated the post-exam scores. This was due to the possibility that the non-completers would have scored below average on the post-assessment.

Figure F7: Pre-/Post-Assessment Test Averages



¹⁸⁴ The high school students completed over the course of a semester but other groups could complete the program in a two-week, full-day format; six-week, three hour format; and other formats that equal 80-100 contact hours (dependent on whether student completed the FLE program).

¹⁸⁵ Note that to pass the GLA program, a student had to receive a grade of 70 percent or higher on the final exam.



Comparisons between Groups

While students came to the program from a variety of companies and organizations, 34 out of the 37 total came from four groups, including three training organizations and one local high school.

The primary difference between the four types of students was in the average pre-test scores. The High School Cohort started off only scoring an average of 28 percent on the initial assessment, while the training cohorts scored an average of 55 percent, nearly twice as high. However, despite this, the post-test scores of the two groups were almost identical, with the High School Cohort averaging 76 percent and the training cohorts averaging 78 percent.

There was also variation in the rate at which students in each of these groups successfully passed the course. Over half of the students coming from the second and third training cohorts failed to successfully pass the course, while 88 percent of students from the first training cohort ultimately passed. The remaining student that did not finish the course was from a company sponsor.

Table F6: Student Outcomes by Cohort

Group	Failed/DNF	Passed	Pass Rate
Training Cohort 1: Employ Indy/Goodwill	1	7	88%
Training Cohort 2: Excel Center	5	4	44%
Local High School	2	5	71%
Training Cohort 3: Employ Indy/Powertrain	5	5	50%

Of the students that did not finish the course, there were a number of reasons reported including: language barriers, special education needs, and obstacles using computers.



APPENDICES

VU LTEC Final Evaluation Report

LTEC PROGRAM ASSESSMENTS

(New) Fork-Lift Essentials Program Assessment

Name: _____

Date: _____

Instructor _____

Directions: Read each questions carefully and write your response in the space provided.

1. Put these step in order by numbering them 1-6. When controlling the vehicle, you should:
 - _____ a. Park or leave your truck in a safe area away from traffic.
 - _____ b. Use 3 points of contact to exit the cab of the vehicle
 - _____ c. Lower the forks and tilt the tips until they are flat on the floor.
 - _____ d. Remove the seat belt
 - _____ e. Turn off the lights and engine.
 - _____ f. Set the park brake and set the directional control to neutral
2. When is it permissible to allow a trained person to operate a forklift? Check all that apply:
 - _____ a During supervised training / OJT
 - _____ b If she/he states they have forklift training
 - _____ c When no trained operator is available
 - _____ d When operator can present approved training record or valid PITO license.
3. If a lift mechanism on your forklift fails, who is authorized to make repairs (choose all that apply)
 - _____ Trained forklift operator
 - _____ Supervisor
 - _____ Certified mechanic
 - _____ Anyone with knowledge of the equipment
4. Walking under a raised forklift is permitted? T/F
5. If an operator has questions about the load capacity of a particular forklift, where would this information be found? _____
6. The OSHA forklift certification is valid for _____ years unless revoked by your employer for safety violations.
7. All trucks and railcars must be chocked prior to loading and unloading: T/F
8. What does 6-6-6 stand for?
_____ 6 inches from the forklift, 6 feet away from the load, 6 inches away from the pallet



APPENDICES

VU LTEC Final Evaluation Report

- _____ 6 inches off the ground, 6 feet away from the pallet rack, 6 inches from the pallet
- _____ 6 feet away from the pallet, 6 inches away from the load, 6 inches away from the pallet rack

9. When traveling with a load downgrade, on should:

- _____ a. travel with the load up off the ground 6 feet
- _____ b. travel with the load forward
- _____ c. travel with the load in reverse
- _____ d. do not take the load down an incline

10. It is imperative that the operator of a forklift see where she/he is traveling,

If the vision is obstructed, you should:

- _____ a. Raise the load so that you can see under it
- _____ b. Leave the load for later
- _____ c. Ask someone to walk in front of you so that they can warn you of trouble
- _____ d. Travel in reverse

11. Modification to the forklift must have written approval from the forklift manufacturer before making any changes to the forklift: T/F

12. When traveling on a forklift the operator must:

- _____ a. Adhere to all traffic regulations and signs
- _____ b. Yield the right of way to all emergency vehicles
- _____ c. Maintain a safe distance from other vehicles
- _____ d. All of the above

13. After you have picked up a load you should tilt the mast forward to give stability to the forklift? T/F

14. What organization establishes the standard for forklift trucks and other equipment used in the warehouse?

- _____ Department of Transportation
- _____ Occupational Safety and Health Administration
- _____ National Safety Board
- _____ Company Policy

15. Once a driver of a truck or train tells you that the brakes are locked, you can begin to process the load. Nothing else is required before the loading/unloading process can be performed safely? T/F



APPENDICES

VU LTEC Final Evaluation Report

16. If the data plate is missing, what other source can provide the operator with the same information?
- a. Co-worker
- b. The operator's manual
- c. Supervisor
- d. None of the above
17. Forklifts will always travel backwards when descending down a grade more than _____ degrees.
18. Speeding of forklifts is ok, as long as:
- a. Depends on the drivers experience
- b. Never
- c. When required
- d. None of the above
19. A forklift is considered unattended when the operator is more than _____ feet away.
20. Upon discovery of repair issues, the repair should be made:
- a. immediately
- b. Before you use the forklift for work
- c. Whenever time permits
- d. Only on scheduled maintenance days
21. Mr. Jones from the 1st shift has been using the forklift all day, there is no reason for Ms. Williams from the second shift to perform pre-operation checks: T/F
22. All forklifts have the same capabilities and should be operated in that manner? T/F
23. Power operated industrial forklifts shall not be used in an atmosphere containing (mark all that apply)
- Gases
- Vapors
- Dust
- None of the above
24. When forklifts are moving product throughout the warehouse (Check all that apply)
- a. The pedestrian must stop and allow the forklift driver to proceed since it is loaded



APPENDICES

VU LTEC Final Evaluation Report

_____ b. The forklift driver must be looking and if there is a pedestrian, she/he should stop, make eye contact, and allow the pedestrian to pass

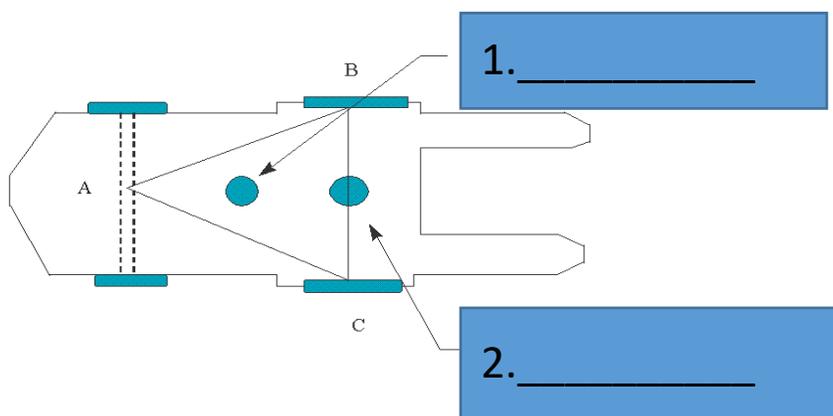
_____ c. Whoever is at the crossing first has the right of way

_____ d. The forklift is bigger, therefore has the right of way

25. Per OSHA regulation, the designated battery changing storage and smoking area can be co-located because batteries are not flammable like gas products: T / F

26. All drivers must slow down and _____ at cross aisles and other locations where vision is obstructed.

27. See the picture below: label the vehicle center of gravity unloaded and the center of gravity on the vehicle at maximum load.



28. The A.B.C denoted in the middle of the picture above is known as the _____ triangle.

29. When do you add water to the battery?

_____ a. Empty battery connected to the charger

_____ b. Full battery connected to the charger

_____ c. Empty battery connected to the forklift

_____ d Full battery disconnected from the charger and forklift

30. See picture below, place the corresponding number from the diagram:

_____ Forward / Neutral / Reverse

_____ Gas

_____ Horn



APPENDICES

VU LTEC Final Evaluation Report

- _____ Ignition
- _____ Raise / Lower
- _____ Park Brake
- _____ Brake Pedal
- _____ Tilt Control
- _____ Slide Shift
- _____ Nothing





(Old) Fork-Lift Essentials Program Assessment

1. When parking or leaving your truck, you should:

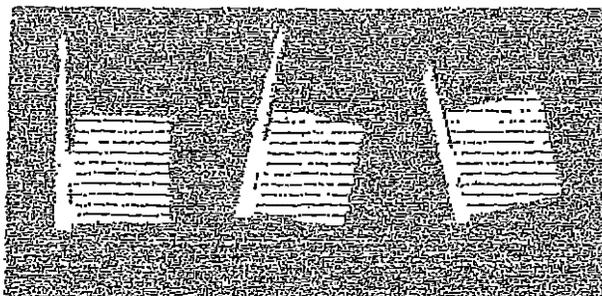
- 1) Park or leave your truck in a safe area away from traffic
- 2) Lower the forks until they are flat on the floor
- 3) Turn off the engine
- 4) Set the parking brake and set the directional control to neutral
- 5) All of the above**

2. All industrial trucks (lift trucks) are equipped with controls which allow you to raise/lower and tilt the forks.

- 1) True
- 2) False**

3. Of the three load positions illustrated, which is most stable?

- 1) 1
- 2) 2
- 3) 3**



4. Rear wheel steering is used on lift trucks because it gives the operator greater control when using the forks.

- 1. True**
2. False

5. Always check the air pressure in the tires from the side, not by facing the tread.

- 1) True**
- 2) False

6. All industrial trucks (lift trucks) are equipped with a clutch.

- 1) True
- 2) False**

7. Which of the following is NOT a type of lift truck?

- 1) Gasoline powered
- 2) Diesel powered
- 3) Air-cooled powered**



- 4) Electric powered
8. Wide and long loads are more unstable than other types of loads.
- 1) True**
- 2) False
9. If the lift mechanism on your lift fails, you should try to repair the chains or hydraulic system yourself.
- 1) True
- 2) False**
10. The load capacity of a truck can be found on its data plate.
- 1) True**
- 2) False
11. It is part of your job to complete a daily operators report after you have thoroughly inspected your lift truck.
- 1) True**
- 2) False
12. If your truck starts to tip over:
- 1) Don't jump
- 2) Stay in your seat
- 3) Grip the wheel securely
- 4) Brace yourself with your feet
- 5) All of the above**
13. You can stand under the forks, if the engine of the lift truck is turned off.
- 1) True
- 2) False**
14. A brake pedal that sinks to the floor under continued pressure is in good operating condition.
- 1) True
- 2) False**
15. You can drive a lift truck over any type of surface
- 1) True



2) False

16. The most important safety device on your lift truck is _____

- 1) Horn
- 2) Seat Belt
- 3) Warning light
- 4) Backup alarm

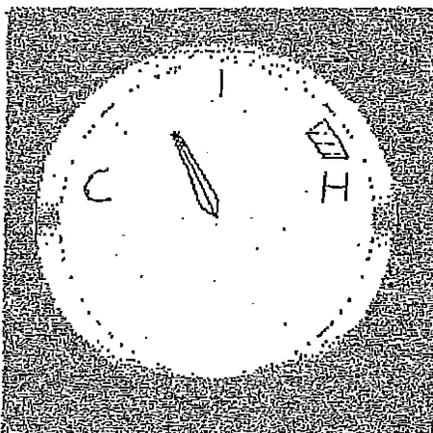
5) You

17. Anyone who has a valid driver's license can operate a lift truck.

- 1) True
- 2) False

18. The gage below is a/an:

- 1) Gas gauge
- 2) Amperes Gauge
- 3) Oil gauge
- 4) Total hour meter
- 5) None of the above

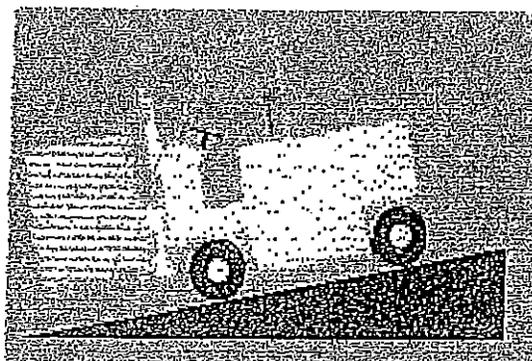


19. The three major parts of a lift truck are the body (truck), overhead guard, and hydraulic lift.

- 1) True
- 2) False

20. What is wrong with this illustration?

- 1) Driving in the wrong direction
- 2) Load is too high
- 3) Nothing



21. In order to solve an "inch pound equation", you must use information provided on a trucks data plate.

- 1) True
- 2) False



22. The front wheels of a lift truck serve as the _____ between the weight of the truck and the weight of the load being carried.

- 1) Balance point
- 2) Fulcrum point**
- 3) Center of gravity
- 4) Seesaw Center

23. Which of the following should NOT be allowed during the refueling or recharging process?

1. Park your lift truck in a designated refueling/recharging area.
2. Do not block doorways or access to production or emergency equipment
- 3. Keep a flame burning nearby to burn off unwanted vapors or gases.**
4. Check to see that there is a fire extinguisher nearby

24. Is it safe to give someone a ride on your lift truck?

- 1) True
- 2) False**

25. Before loading or unloading a trailer at a loading dock, you should:

- 1) Inspect the floor of the trailer to ensure that it will support the lift truck and the load.
- 2) Chock the wheels of the trailer
- 3) Make sure that dock plates, boards, and ramps are in place secure.
- 4) All of the above**

26. When transporting a load, you should not raise your load more than 8 inches from the ground.

- 1) True**
- 2) False

27. You can place your hands and feet outside of the operator's compartment, as long as your head and body are protected.

- 1) True
- 2) False**

28. Lift trucks use a hydraulic cylinder attached to chains to raise and lower the forks.

- 1) True**
- 2) False



APPENDICES

VU LTEC Final Evaluation Report

Team Lead Essentials Program Assessment

Name _____

Date _____

Instructor _____

Directions: Read each question carefully and write your response in the space provided.

1. What is the definition of a team leader?
2. What is the role of a team leader?
3. Name 10 soft skills.
4. Name three non-verbal skills?
5. Name three requirements of listening?
6. What is the function of the team?
7. What is a goal?
8. What is conflict?
9. What are three ways to deal with conflict?
10. What is the definition of ethics?
11. What is OJT?
12. What is kaizen?
13. What are three styles of leadership
14. What are five drains on your time?
15. Give five examples of body language?
16. What is 5 "S"?
17. List five unethical acts.
18. List three ways to communicate.
19. What is an unsafe act?
20. What is the goal of this training?