

RESEARCH REPORT

A Synthesis of Impact Findings from the Round 3 Trade Adjustment Assistance Community College and Career Training Third-Party Evaluations

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Executive Summary

The Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program awarded \$1.9 billion to institutions of higher education that offer programs of two years or less, mostly community colleges, to build their capacity to provide workforce education and training to adults in need of new skills for in-demand jobs. The grant program, which ran from 2011 to 2018, was also designed to address other key issues—changing education and workforce systems to be better connected and integrated, more effectively addressing employer needs for skilled workers, and transforming how community colleges deliver education and training to adult learners. This report is part of a series of publications from the TAACCCT national evaluation that spans the four rounds of the grants.¹ Focused on the third round, this report synthesizes the findings from the 23 Round 3 grantee-sponsored, third-party evaluations that assessed the impact of TAACCCT on the education and employment outcomes of participants.

The synthesis addresses a key research question from the TAACCCT national evaluation: *what service delivery and/or system reform innovations resulted in improved employment outcomes and increased skills for participants?* To address this question, Urban Institute researchers reviewed 56 final evaluation reports to determine which of the evaluations used quasi-experimental methods necessary for assessing the impact of the grant projects on participant outcomes, and then summarized the findings.² Of these 56 reports, researchers found that 23 evaluations met these standards for inclusion in the synthesis. Since most projects bundled multiple strategies and evaluated them jointly, the synthesis cannot assess the contributions of specific strategies to participant impacts. It can only provide broad evidence on whether the strategies implemented by grantees generally improved educational and employment outcomes.

¹ All publications from the TAACCCT national evaluation are available on DOL's Chief Evaluation Office website, found at <https://www.dol.gov/agencies/oasp/evaluation/completedstudies>.

² The synthesis does not summarize participant outcomes, as reported by the third-party evaluators. The outcomes are similar to the performance outcomes grantees report to DOL. DOL releases this information separately, and a program summary can be found at <https://doleta.gov/taaccct/pdf/TAACCCT-Fact-Sheet-Program-Information.pdf>. In addition, a brief on the early results of the TAACCCT grants with information on performance outcomes can be found at <https://www.urban.org/research/publication/early-results-taacct-grants>.

Background

The national evaluation seeks to build evidence about the capacity-building strategies and career pathways approaches implemented by grantees.³ In addition to the national evaluation, grantees procured third-party evaluators as part of their grant-funded projects. A key component of the national evaluation is synthesizing the findings from the third-party evaluation findings to develop an understanding of the career pathways approaches and systems innovation that were implemented and assess their impact on participants' educational attainment and employment outcomes (see box ES.1).

BOX ES.1

TAACCCT National Evaluation Components and This Report

- An **implementation analysis** (Rounds 1–4) of the service delivery approaches developed and the systems changed through the grants based on a survey of colleges and visits to selected colleges
- **Syntheses of third-party evaluation findings** (Rounds 1–4) to draw a national picture of the implementation of the TAACCCT capacity-building strategies and build evidence of the effectiveness of the strategies on participants' education and employment outcomes
 - **A Synthesis of Impact Findings from the Round 3 Trade Adjustment Assistance Community College and Career Training Third-Party Evaluations – Final Report (this report)**
- An **outcomes study** of nine Round 4 grantees using survey data and administrative records to better understand the characteristics of TAACCCT participants, their service receipt, and their education and employment outcomes
- A **study of employer relationships** with selected Round 4 employer-partners to better understand employers' perspectives on how to develop and maintain strong relationships with colleges

This report presents the impact findings from the final reports for the 23 Round 3 third-party evaluations that provided quasi-experimental impact analyses.⁴ DOL encouraged third-party evaluators to use the most rigorous design feasible for the impact analysis—namely experimental and quasi-experimental evaluation designs.⁵ Because of challenges discussed in this report, none of the

³ For the purpose of the national evaluation, career pathways approaches to workforce development offer articulated education and training steps between occupations in an industry sector, combined with support services, to enable individuals to enter and exit at various levels and to advance over time to higher skills, recognized credentials, and better jobs with higher pay.

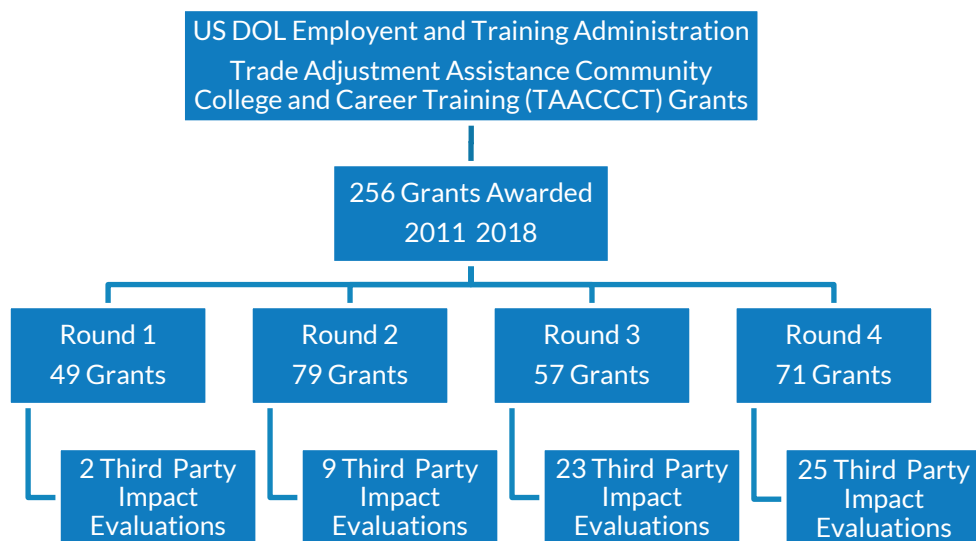
⁴ While there were 57 Round 3 grantees, only 56 final evaluation reports were submitted.

⁵ An **experimental design** assigns individuals to participate or not participate in the TAACCCT project at random, so differences in outcomes can be attributed to TAACCCT with greater certainty due to the control that evaluators have over assignment to treatment. In an experiment, the experiences of participants can be compared to the experiences of non-participants to estimate the impact of the TAACCCT project. A **quasi-experimental design** is used if participants cannot be randomly assigned, potentially resulting in confounding differences between

Round 3 third-party evaluators used experimental evaluation methods, and fewer than half (23 of 56) of the evaluators used quasi-experimental methods (see figure ES.2 for the number of impact analyses across the rounds). The remaining third-party evaluators used methods such as regression analyses that included outcomes as the dependent variable or analyses of participant outcomes with no comparison group. Although regression analysis and outcomes analysis are informative, these methods are not designed to estimate project impacts. All third-party evaluations included implementation analysis, for which a separate synthesis report focused on the third round has been produced as part of the national evaluation. Findings from the Round 4 third-party evaluations are also synthesized in a separate report.

FIGURE ES.2

Grants Awarded and Third-Party Impact Evaluations Across All Rounds of the TAACCCT Grants



Source: Urban Institute's review of the third-party evaluation reports across all rounds.

Note: Only a subset of third-party evaluations included impact analyses.

Urban Institute researchers reviewed the Round 3 third-party evaluations to determine whether the impact findings met basic standards for quasi-experimental methods.⁶ To be included in this

participants and non-participants. A confounding difference between participants and non-participants would be some factor that is related to both treatment status and the outcome, but which is not caused by the treatment. For example, in training programs an individual's underlying, unmeasured motivation to build their skills and better themselves is a potential confounding factor. In a quasi-experimental design, researchers try to statistically control for these differences, typically through a combination of matching participants to similar non-participants and multivariate regression modeling. The quality of a quasi-experimental design largely turns on the design's success in controlling for confounding factors.

⁶ The authors reviewed the methods used by the Round 3 third-party evaluators to implement the quasi-experimental evaluations to ensure the methods met basic standards. Third-party evaluators had to use a

synthesis, the impact evaluation had to use a recognized quasi-experimental method to ensure that the difference in outcomes between the treatment and comparison group is a valid estimate of the program impact. Each quasi-experimental impact evaluation discussed here has its own strengths and weaknesses, as well as strategies for overcoming methodological challenges. Inclusion in this synthesis only indicates that the third-party evaluators used a quasi-experimental design and is not a reflection of any individual study's quality or reliability. Thus, the evidence of effectiveness from the Round 3 third-party evaluations is only suggestive, as the methods have not been fully vetted.

Synthesis of the Impact Findings

Table ES.1 provides a summary of the results of the 23 impact analyses. Impacts are considered to be “positive” if at least one estimate is positive and statistically significant and none of the main results presented⁷ are negative and statistically significant; “negative” if at least one estimate is negative and statistically significant and none are positive and statistically significant; “mixed” if there are positive and negative estimates that are statistically significant; and “no impact” if no estimates are statistically significant.

Overall, the findings highlighted mainly positive impacts of the grant projects on educational and employment outcomes. Of the 22 evaluations that reported impact estimates for educational outcomes, 13 showed consistently positive impacts, one showed negative impacts, three showed statistically insignificant results (no impact), and five evaluations showed mixed results. There were 11 evaluations that provided impact estimates on participants' employment outcomes; others did not include employment outcomes, often because of data limitations. Of these 11 evaluations, six suggested that the grant projects had a positive impact on employment outcomes, one had a negative impact, and four had no statistically significant impacts. While there were fewer evaluations included in the Rounds 1 and 2 impact synthesis, their results follow a similar pattern to the Round 3 impact findings.

recognized experimental or quasi-experimental method for identifying project impacts. In almost all cases, the evaluator used some form of propensity score matching. A regression analysis alone was not sufficient to be included in this synthesis because of the risk that the regression model alone would not fully account for the non-random ways that participants differed from non-participants. Not all of these quasi-experimental evaluations are well-executed or convincing. This report discusses the major weaknesses in the execution of the quasi-experimental methods in the evaluation.

⁷ Some impact studies had additional detailed sub-group analyses. This report uses sub-group analyses for individual colleges as the main result if no total estimate was presented, but otherwise does not report all sub-group analyses.

TABLE ES.1

Direction of Education and Employment Impact Estimates for Round 3 TAACCCT Grant Projects

TAACCCT grant project (listed in order of consistently positive impact results), followed by other grant projects listed alphabetically)	Educational outcomes	Employment outcomes
1. Golden Triangle Modern Manufacturing	Positive	Positive
2. IMPACT	Positive	Positive
3. INTERFACE	Positive	Positive
4. Rural Information Technology Alliance	Positive	Positive
5. Advanced Manufacturing, Mechatronics, and Quality Consortium	No impact	Positive
6. BOOST	Mixed	Not studied
7. Bridging the Gap	Mixed	No impact
8. Central Georgia Healthcare Workforce Alliance	Positive	Not studied
9. DC Construction Academy and DC Hospitality Academy	Positive	Not studied
10. Greater Cincinnati Manufacturing Career Accelerator	Mixed	Not studied
11. Health Science Pathways for Academic Career and Transfer Success	Positive	Not studied
12. Linn-Benton iLearn	Positive	No impact
13. Maine is IT!	Mixed	Not studied
14. Mississippi River Transportation, Distribution, and Logistics	Positive ^a	Not studied
15. North Dakota Advanced Manufacturing Skills Training Initiative	Positive	Negative ^b
16. Northeast Resiliency Consortium	Positive	Not studied
17. Orthopedics, Prosthetics, and Pedorthics (HOPE) Careers Consortium	No impact	Not studied
18. PA Manufacturing Workforce Training Center	Not studied	No impact
19. Pathways to Success	Positive	Not studied
20. RevUp	Negative	Not studied
21. Southeastern Economic and Education Leadership Consortium	No impact	No impact
22. Southwest Arkansas Community College Consortium	Positive ^a	Not studied
23. XCEL-IT	Mixed	No impact
Total number of evaluations with positive impacts	13 of 22 studies with educational outcomes	6 of 11 studies with employment outcomes

Sources: Findings from the final evaluation reports from the 23 TAACCCT grants. See Anonymous (2017a, 2017b); Center for Applied Research (2017a, 2017b); Good and Yeh-Ho (2017); Harpole (2017); Hong, Boyette, and Saklis (2017); Horwood et al. (2017); Jensen, Horohov, and Waddington (2017); Lawrence (2017); Negotia et al. (2017); Price et al. (2017); Smith et al. (2017); Swan et al. (2017); Takyi-Laryea et al. (2017); Takyi-Laryea, Passa, and Gall (2017); Tan and Moore (2017); The Improve Group (2017); Thomas P. Miller & Associates (2017); Thomas P. Miller & Associates and Hamai Consulting (2017); Thomas P. Miller & Associates and The Policy Research Group (2017); Woodke, Graf, and Driessen (2017); and WorkED (2017).

Notes: For outcomes that evaluators did not measure, the table cells have been shaded in gray. Educational outcomes include credential attainment, credits earned, grade point averages, and completion of programs of study. Employment outcomes include employment after participation in the program and quarterly earnings. "Mixed" means both negative and positive results. Positive means at least one positive result. Negative means at least one negative result. A full set of impact estimates and details on the impact analysis are provided in table 3. ^aOne of the colleges has a negative effect, but the average treatment effect for all colleges is positive. ^bThe estimated impacts are negative but statistical significance levels are not reported.

Four of the 23 evaluations showed positive educational and employment impacts of the grant projects on participants (see table ES.1). The key components of these four projects were not exceptionally different from other Round 3 projects, which used a similar combination of strategies. Of the four projects with positive educational and employment impacts, two focused on manufacturing (*Golden Triangle Modern Manufacturing* and *IMPACT*), and two focused on information technology (*INTERFACE* and *Rural Information Technology Alliance*). The *IMPACT* project also included courses of study in utilities, construction, and transportation and logistics. Three projects had an explicit focus on career pathways (*Golden Triangle Modern Manufacturing*, *IMPACT*, and *INTERFACE*), and the *Rural Information Technology Alliance* included elements of career pathways like transfer and articulation agreements. Two projects utilized coaches and navigators (*INTERFACE* and the *Rural Information Technology Alliance*), and two other projects utilized enhanced student supports (*IMPACT* and *INTERFACE*).

Overall, the Round 3 synthesis suggests that a career pathways model that combines accelerated learning strategies, persistence and completion strategies, and connections to employment strategies results in consistently positive educational impacts. The 23 TAACCCT projects that had impact evaluations all used a similar set of career pathways strategies, with each project bundled multiple strategies together to serve their participants. Thus, a synthesis of these third-party evaluations cannot pin-point specific successful strategies. Less is understood about career pathways' impact on employment due to limitations of the evaluations but the positive employment findings, especially for the four projects with consistently positive impacts, offer some promise for improving employment outcomes for adult learners.

Implications for Evaluations of Future Community College and Workforce Initiatives

The 23 TAACCCT third-party evaluators whose findings were included in this report were able to produce impact estimates on educational and employment outcomes for participants but not without challenges, as highlighted in section 3.3. They used quasi-experimental methods rather than an experimental design with random assignment, which generally provides more reliable impact estimates but can be difficult to implement due to reluctance of community colleges and conditions for the intervention that are not suited to random assignment. In addition, the remaining 33 third-party evaluators did not conduct impact analyses using experimental or quasi-experimental designs. There are several implications for strengthening evaluation efforts as a part of future community college and

workforce initiatives, based on the authors' review of the third-party evaluations and their evaluation experience:

- ***The challenges experienced by the third-party evaluators suggest that providing additional evaluation support or enhancing grant evaluation requirements could make experimental evaluations more feasible for community colleges.*** For some federally-funded education and workforce grant initiatives, such as the Health Profession Opportunity Grant (HPOG) and the Investing in Innovation Fund (i3) grant programs, grantees must participate in rigorous evaluations, including experimental design, led by either a national evaluator (HPOG) or third-party evaluators (i3). Grantees receive significant evaluation technical assistance through their grants to help make rigorous evaluation feasible while implementing their programs as designed:
 - evaluation technical assistance could help grantees and third-party evaluators develop recruitment strategies and identify target populations that could produce an oversubscription to program (e.g., more individuals are interested in and eligible for the program), making random assignment more palatable due to limited space and resources to enroll participants. and bring colleges that have used experimental designs before to help new grantees understand how to implement random assignment to minimize disruption and burden to staff and students and to understand the value of the evaluation findings for improving their programs.
 - including a requirement or offering an incentive for experimental evaluation in the grant announcement could signal the importance of developing rigorous evidence on the grant-funded interventions and ensuring grantees understand what to expect (e.g., evaluation design plan review and approval, participation in a national evaluation using experimental design, and evaluation technical assistance), should they be awarded a grant.
- ***Several conditions appear to create more opportunities for successful experimental and quasi-experimental evaluations.*** Grantees and evaluators using these rigorous methods for estimating project impacts could benefit from grant requirements or guidance that require or encourage:
 - state community college offices and systems to support the evaluation by allowing evaluators access to data on students at other community colleges to develop comparison groups that are not exposed to the TAACCCT-funded intervention being tested. These commitments by state community college systems could be obtained earlier in the evaluation process, including through letters of support in initial grant proposals;
 - state agencies that house Unemployment Insurance wage records to provide individual-level records for treatment and control/comparison groups so employment histories can be included in matching strategies and employment outcomes can be measured. Again, these commitments could be obtained earlier in the evaluation process, including through letters of support in initial grant proposals; and
 - grant or program developers to allow for a long enough follow-up period for the evaluation to ensure outcomes such as credential attainment and postprogram employment can be measured. Follow-up periods will vary depending on the type of project. Working with evaluation experts within the funding agency or

organization can help determine appropriate evaluation timelines to allow for measuring these outcomes.

- **Consumers of the evaluations may need assistance with interpreting evaluation results to understand what worked, what did not, and why.** Even after supporting a rigorous evaluation, consumers of the findings—policymakers, community college leaders, and others—may need assistance to be able to interpret and use the evaluation’s results. While technical information about the evaluation design and methods are needed, more accessible language about the findings can help consumers who may not have evaluation expertise understand the findings and what they mean. To support use and interpretation of the impact findings, evaluators can:
 - include information on the strengths and limitations of the analysis to provide important context for interpreting the impact findings, especially differences in experimental and quasi-experimental methods used. For example, when members of the comparison group are enrolled in a training program similar to a grant-funded program provided to the treatment group, it may be difficult to detect effects unless the approach being tested has impacts that are large enough to be detectable statistically.⁸ Saying a program is ineffective based on the results of the evaluation that compares similar interventions may be misleading; the grant-funded program may be help participants complete training or obtain a job but not substantially better than what would be available without the grant.
 - set the impact findings for the evaluation within the context of findings from evaluations of similar community college or workforce interventions. It is helpful to understand how well participants fared in the intervention of focus relative to participants of similar interventions to consider did the intervention perform better or worse than expected. Implementation findings can help explain why the findings would be the same or different and what about the intervention did or did not work.

Replicating and improving on the strategies and experiences of the TAACCCT grantees across all rounds can inform future grant initiatives to build the capacity of community colleges to serve adult learners. A separate report synthesizing the Round 3 third-party evaluation implementation findings focuses on understanding how grantees implemented capacity-building efforts to change their systems to better serve adult learners.⁹ A report synthesizing the Round 4 third-party evaluation findings will also examine systems change efforts by grantees, building on the findings from this report. Other publications from the national evaluation—a series of briefs providing an overview of the grant program, a synthesis of the Rounds 1 and 2 third-party evaluation findings, and reports examining the implementation of the Rounds 1 and 2 grants and the Round 3 grants—are also available. These reports are designed to support learning across the grant program to draw lessons and implications for future

⁸ The minimum detectable size of an effect is different for different sample sizes and different standard deviations of the outcome variable.

⁹ All publications from the TAACCCT national evaluation are available on DOL’s Chief Evaluation Office website, found at <https://www.dol.gov/agencies/oasp/evaluation/completedstudies>.

community college and workforce initiatives that support career pathways and capacity-building efforts at community colleges.

1. Introduction

The Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant program was a \$1.9 billion federal workforce investment. It was aimed at helping community colleges across the nation increase their capacity to provide education and training programs for unemployed workers and other adult learners to prepare for in-demand jobs. The US Department of Labor (DOL) administered the grant program from 2011–2018 in partnership with the US Department of Education.¹⁰ Across four rounds of grants, TAACCCT reached over 60 percent of the nation's publicly-funded community colleges and included at least one college from every U.S. state, the District of Columbia, and Puerto Rico in each round (Cohen et al. 2017).

To build a body of evidence on the strategies implemented by the grantees, the TAACCCT national evaluation uses a mix of qualitative and quantitative methods to understand and assess the capacity-building strategies and career pathways approaches funded by the grant program to inform future federal workforce investments and policy. A key component of the national evaluation are the syntheses of the findings from the grantee-sponsored third-party evaluations. DOL required Rounds 2–4 grantees and encouraged Round 1 grantees to use grant funds to procure an independent third-party evaluator to design and conduct an evaluation of their grant projects. The third-party evaluations had to document and assess the implementation of capacity-building activities funded by TAACCCT and examine participants' educational and employment outcomes and impacts.

As a part of the national evaluation, this report synthesizes impact findings from 23 Round 3 third-party evaluations that used quasi-experimental methods to estimate the impact of the TAACCCT projects on participants' education and employment outcomes.^{11,12} Evaluators used statistical strategies to draw comparison groups that were similar on observable characteristics to the TAACCCT participant groups. The most common strategy was propensity score matching, which estimates the probability of being a member of the treatment group and then using that predicted probability of treatment to adjust the comparison group so that it matches the treatment group's baseline

¹⁰ The seven years are federal fiscal years, from October 1, 2011 through September 30, 2018.

¹¹ The TAACCCT national evaluation will release a separate report synthesizing the implementation findings from the Round 3 third-party evaluation reports

¹² A quasi-experimental design is used if participants cannot be randomly assigned, potentially resulting in confounding differences between participants and non-participants. In a quasi-experimental design these differences are statistically controlled for, typically through a combination of matching participants to similar non-participants and multivariate regression modeling.

characteristics. These syntheses are designed to support a growing body of evidence on career pathways approaches (as described in section 1.1). The impact findings offer some promising evidence about whether the strategies implemented by grantees may have improved on participants' educational and employment outcomes, compared with groups of similar students.

This chapter first introduces the TAACCCT grant program and explains how it supports the development of career pathways. It then describes the national evaluation activities, including the syntheses, and the grantee-sponsored third-party evaluations. Finally, it provides an overview of the Round 3 impact synthesis and the remainder of the report.

1.1. The TAACCCT Grant Program and Career Pathways

Congress authorized the TAACCCT grant program as part of the American Recovery and Reinvestment Act of 2009 to increase the capacity of community colleges to meet local and regional labor demand for a skilled workforce. The Health Care and Education Reconciliation Act, signed in March 2010, provided the grant program with \$2 billion in funding over fiscal years 2011–14, or approximately \$500 million annually over four rounds of grants.¹³ DOL, which administered the grants, funded 256 three- to four-year grants to institutions of higher education offering programs of study that can be completed in two years or less. The 57 Round 3 grants, the focus of this report, ended in September 2017.

The overarching goals of the TAACCCT grant program, as described in the Rounds 1–4 grant announcements¹⁴, are to:

1. better prepare the Trade Adjustment Assistance-eligible workers¹⁵ and other adults for high-wage high-skill employment or reemployment in growth industry sectors by increasing their attainment of degrees, certificates, diplomas, and other industry-recognized credentials that match the skills needed by employers;

¹³ The total amount for the grant program was reduced to \$1.9 billion due to rescissions under the 2013 budget sequestration.

¹⁴ DOL announced the Grant Announcements in spring of FY 2011 (Round 1), FY 2012 (Round 2), FY 2013 (Round 3), and FY 2014 (Round 4). For more information, see “Applicant Information,” Trade Adjustment Assistance Community College and Career Training Grant Program, last updated April 27, 2017, <https://www.doleta.gov/taaccct/applicantinfo.cfm>.

¹⁵ The Trade Adjustment Assistance for Workers program, administered by the US Department of Labor, seeks to provide workers adversely affected by trade with opportunities to obtain the skills, credentials, resources, and support necessary to (re)build skills for future jobs. More information on the program can be found at <https://www.doleta.gov/tradeact/>.

2. introduce or replicate innovative and effective methods for designing and delivering instruction that addresses specific industry needs and leads to improved learning, completion, and other outcomes for Trade Adjustment Assistance-eligible workers and other adults; and
3. demonstrate detect improved employment outcomes for TAACCCT participants.

To achieve these goals, the grantees from all four rounds focused on developing and implementing career pathways approaches to build colleges' capacity for providing education and training to adult learners.¹⁶ *Career pathways approaches* to workforce development offer an articulated sequence of education and training programs focused on an industry sector, combined with support services, to enable individuals to enter and exit at various levels and to advance over time to higher skills, recognized credentials, and better jobs with higher pay.¹⁷ Appendix A provides the full definition of career pathways from the Workforce Innovation and Opportunity Act of 2014 (WIOA), which this definition reflects.

Across all four rounds, there are many strategies that grantees developed and implemented to build their capacity for providing education and training programs to adult learners as a part of career pathways. To better understand the range of grant-funded strategies implemented by grantees, the national evaluation team identified three categories of strategies—*accelerated learning*, *college persistence and completion*, and *connections to employment*. Figure 1.1 provides definitions of each of these categories and highlights the participant outcomes measured within each of the categories.¹⁸

¹⁶ More information on the goals of the TAACCCT grant program and by round can be found at <https://www.dol.gov/asp/evaluation/completed-studies/20170308-TAACCCT-Brief-1.pdf>.

¹⁷ There are many definitions of career pathways in the literature. The definition used for the TAACCCT national evaluation aligns with the definition for the Career Pathways Design Study, which provides a high-level synthesis of the findings from career pathway research and design. See Sarna and Strawn (2018) and Schwartz, Strawn and Sarna (2018) for more information.

¹⁸ In each TAACCCT evaluation report, different strategies will be highlighted based on which round(s) of the grants and data sources are the focus of the report.

FIGURE 1.1.

Types of Strategies Identified by the TAACCCT National Evaluation

ACCELERATED LEARNING	PERSISTENCE AND COMPLETION	CONNECTIONS TO EMPLOYMENT
<p>Colleges reduce adult learners' time to completing a program of study by:</p> <ul style="list-style-type: none"> redesigning curriculum, credentials, and programs to help students move through coursework more quickly and earn credentials as they progress through programs; aligning college enrollment, credit award, and other college policies; and using technology and course scheduling to support learning for working students or students with families. 	<p>Colleges support adult learners' enrollment, progress, and completion of programs of study by:</p> <ul style="list-style-type: none"> providing academic and nonacademic support services; redesigning developmental and adult education programming for students who are underprepared for college; and helping students easily transfer to more advanced programs of study and applying credits that they have already earned to persist in postsecondary education. 	<p>Colleges connect adult learners to the workforce by:</p> <ul style="list-style-type: none"> developing curriculum to help students learn technical skills through on-the-job and simulated work experiences; preparing students for the workforce by providing guidance on career options, building job readiness skills, and helping support job search activities; and building partnerships with employers, industry associations, the public workforce system, and other organizations to support successful transitions to the workforce.

OUTCOMES FROM STRATEGIES THAT ARE HIGHLIGHTED IN THIS REPORT

Accelerated Learning	Persistence and Completion	Connections to Employment
<ul style="list-style-type: none"> Course completion Time to completion 	<ul style="list-style-type: none"> Grade point average Program completion Credential attainment 	<ul style="list-style-type: none"> Employed Earnings gains Job retention or promotion

Source: Eyster 2019.

1.2. TAACCCT Evaluation Efforts

An important goal of DOL is to build a body of evidence through evaluation of the career pathways and capacity-building strategies implemented by TAACCCT grantees, to understand how these strategies worked, and how they may have contributed to participants' educational attainment and employment outcomes. The TAACCCT grant program's two major evaluation efforts are the national evaluation and the grantee-sponsored third-party evaluations.

The national evaluation uses a mix of qualitative and quantitative methods to understand and assess the capacity-building strategies funded by the grant program to inform future federal workforce investments and policy.¹⁹ The main components of the national evaluation are highlighted in box 1.1.

The third-party evaluation of each grant documents and assesses the implementation of capacity-building activities funded by the grant and examines participants' educational and employment outcomes and impacts.²⁰ Beginning in Round 2, DOL required grantees to use grant funds to engage and procure an independent third-party evaluator to design and conduct an evaluation of their grant projects. (Nearly 20 percent of Round 1 grantees also sponsored independent evaluations but were not required to do so.) All Rounds 2–4 grantees had to provide evaluation design plans in their grant application. The Urban Institute reviewed and provided feedback on Rounds 3 and 4 evaluation design plans to help improve the rigor and quality of the evaluations; DOL approved the plans before evaluators could proceed.²¹

¹⁹ More information on the national evaluation activities can be found at <https://www.dol.gov/asp/evaluation/completed-studies/20170308-TAACCCT-Brief-1.pdf>.

²⁰ For more information on the Round 3 requirements for third-party evaluations, see pp. 59-62 in "Notice of Availability of Funds and Solicitation for Grant Applications for Trade Adjustment Assistance Community College and Career Training Grants Program" at https://www.doleta.gov/grants/pdf/taaccct_sga_dfa_py_12_10.pdf.

²¹ For more detailed information on the planned evaluation designs and data collection methods used by TAACCCT third-party evaluators, see "TAACCCT Goals, Design, and Evaluation Designs" at <https://www.dol.gov/asp/evaluation/completed-studies/20170308-TAACCCT-Brief-1.pdf>.

BOX 1.1

TAACCCT National Evaluation Components and Publications

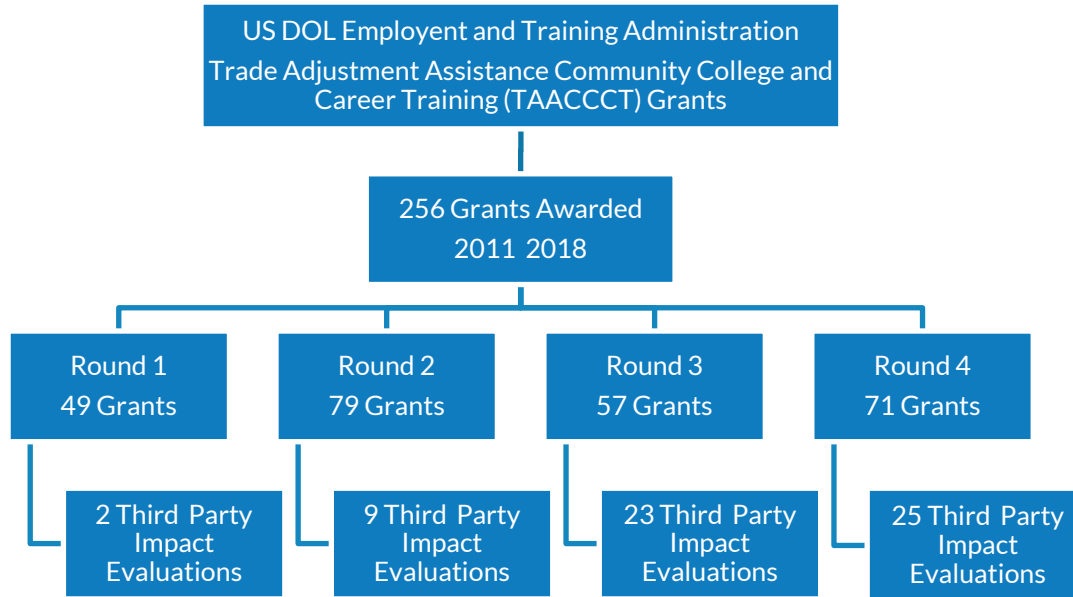
- An **implementation analysis** (Rounds 1–4) of the service delivery approaches developed and the systems changed through the grants based on a survey of colleges and visits to selected colleges
 - *The Trade Adjustment Assistance Community College and Career Training Grant Program: Implementation of the Rounds 1 and 2 Grants – Final Report*
 - *Implementation of the Round 3 Trade Adjustment Assistance Community College and Career Training Grants – Final Report*
 - *A Picture of the Trade Adjustment Assistance Community College and Career Training Grants: Results from a Survey of Round 4 Colleges – Final Report*
 - *Topic Briefs from Round 4: Context, Infrastructure, and Alignment Matter: Statewide Systems Change in Round 4 of TAACCCT; Building Career Pathways Programs and Systems: Insights from TAACCCT Round 4; and Employer Perspectives on Building Partnerships with Community Colleges: Lessons for Local Leaders and Practitioners*
 - *Early Descriptive Briefs: TAACCCT Goals, Design, and Evaluation; Grantee Characteristics; Approaches, Targeted Industries, and Partnerships; and Early Results of the TAACCCT Grants*
- **Syntheses of third-party evaluation findings** (Rounds 1–4) to draw a national picture of the implementation of the TAACCCT capacity-building strategies and build evidence of the effectiveness of the strategies on participants' education and employment outcomes
 - *A Synthesis of Findings from the Rounds 1 and 2 Trade Adjustment Assistance Community College and Career Training Third-Party Evaluations – Final Report*
 - *Systems Change in Community Colleges: Lessons from a Synthesis of the Round 3 TAACCCT Third-Party Evaluation Findings – Final Report*
 - ***A Synthesis of Impact Findings from the Round 3 Trade Adjustment Assistance Community College and Career Training Third-Party Evaluations – Final Report (this report)***
 - *Implementation and Impact Synthesis Report: Round 4 TAACCCT Third-Party Evaluation – Final Report*
- An **outcomes study** of nine Round 4 grantees using survey data and administrative records to better understand the characteristics of TAACCCT participants, their service receipt, and their education and employment outcomes
 - *Trade Adjustment Assistance Community College and Career Training Grants: Round 4 Outcomes Study – Final Report and Grantee Profiles*
- A **study of employer relationships** with selected Round 4 employer-partners to better understand employers' perspectives on how to develop and maintain strong relationships with colleges
 - *The Employer Perspectives Study: Insights on How to Build and Maintain Strong Employer-College Partnerships – Final Report*

Figure 1.2 shows the number of TAACCCT grants awarded in each of the four rounds and the number of third-party evaluations determined to have experimental or quasi-experimental impact estimates for each round. The number of third-party impact evaluations has grown steadily from Round 1 to Round 3, with 23 third-party impact evaluations of Round 3 projects included in this synthesis report. The final number of Round 4 third-party impact evaluations is uncertain, although a preliminary

review of the Round 4 grantees' final reports suggests that even more impact evaluations were conducted in Round 4 than in Round 3.

FIGURE 1.2

Grants Awarded and Third-Party Impact Evaluations Across All Rounds of the TAACCCT Grants



Source: Urban Institute’s review of the third-party evaluation reports across all rounds. One Round 3 grantee did not complete an evaluation so the number of evaluations included in the Round 3 syntheses is 56.

Evaluation requirements written into the grant announcement were an important factor driving the number of grantees that conducted third-party evaluations. Figure 1.3 shows how evaluation requirements in the grant announcement changed across the rounds.

FIGURE 1.3

Third-Party Evaluation Requirements across All Rounds of the TAACCCT Grants

Round 1	Round 2	Round 3	Round 4
Not required, but evaluation of grant projects was encouraged	Required; grantees had to submit short evaluation design plan with application	Required; grantees had to submit short evaluation plan with application and detailed evaluation plan at a later date; plans were reviewed and subject to DOL approval	Required; grantees had to submit short evaluation plan with application and detailed evaluation plan at a later date; plans were reviewed and subject to DOL approval

Source: Appendix Table A in “TAACCCT Goals, Design, and Evaluation Designs” at <https://www.dol.gov/asp/evaluation/completed-studies/20170308-TAACCCT-Brief-1.pdf>.

The third-party evaluation designs had to include a 1) project implementation analysis, and 2) a participant outcome and/or impact analysis. For the implementation analysis, third-party evaluators had to document and assess the implementation of the key grant activities, specifically new and enhanced programs of study, support services, curriculum development, participant assessments and career guidance, and partnership development. Per the grant announcement, the participant outcome and impact analysis had to assess education and employment outcomes such as program completion, credential attainment, placement into employment, and employment retention, but third-party evaluators could use other outcome measures (e.g., time to completion or employment in a related field) to reflect the goals of the strategies being tested. For the impact analysis, DOL encouraged evaluators to use the most rigorous evaluation design feasible to estimate the grant activities' impact on participants, using either an experimental design with random assignment or a quasi-experimental design. DOL required that third-party evaluators submit interim and final reports with findings from these analyses.^{22, 23} This synthesis uses the final reports for the review of only the evaluations that had impact findings, as discussed in the next section.

Evaluation Designs Proposed in the Grant Application

Mikelson et al. (2017) present information on the proposed methods and data sources of the third-party evaluations, based on the Rounds 1–4 grant applications and evaluation design documents.²⁴ Figures from that research brief summarizing the planned evaluation designs, anticipated data sources, and planned comparison groups are reproduced here. These methods and sources are not the final evaluation designs evaluators used, as the feasibility or appropriateness of the evaluation approaches proposed may have changed during the grant activities. Using proposed methods allows for a comparison of evaluations across rounds that are not included in this synthesis. Actual methods for Round 3 evaluations are reported in subsequent tables. Information on Round 1 evaluation is minimal as third-party evaluations were optional for grantees in that round.

Figure 1.4 summarizes the methods proposed by the third-party evaluators for measuring impacts and outcomes. Experimental methods are often considered the 'gold' standard of evaluations, where

²² The national evaluation team provided guidance on the final report and a recommended outline for an executive summary.

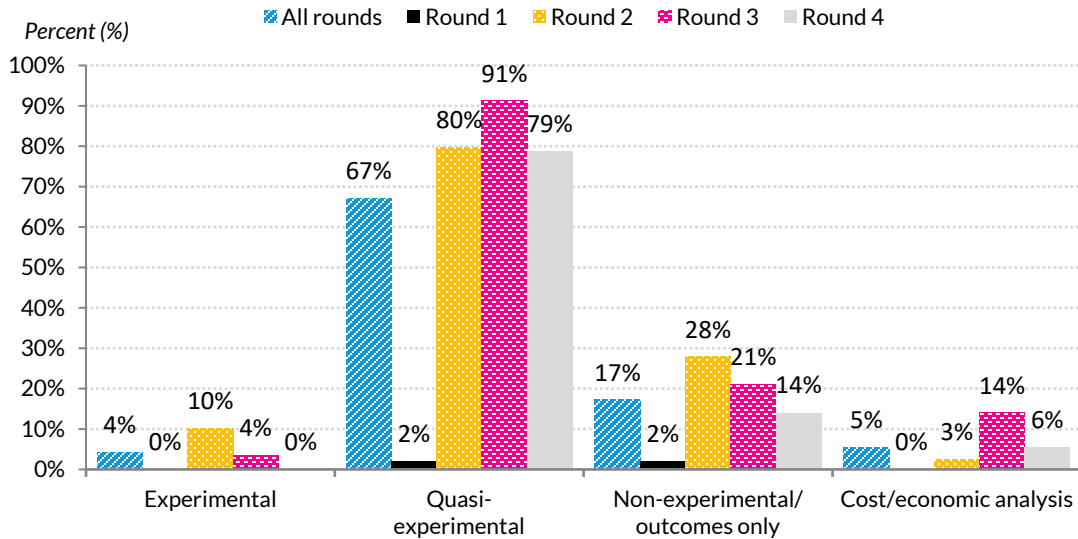
²³ The final evaluation reports can be found at www.SkillsCommons.org. Created with DOL funding, SkillsCommons is an online repository of job-driven workforce development materials where grantees posted these reports and other grant products.

²⁴ For more detailed information on the planned evaluation designs and data collection methods used by all TAACCCT third-party evaluators, see "TAACCCT Goals, Design, and Evaluation Designs" at <https://www.dol.gov/asp/evaluation/completed-studies/20170308-TAACCCT-Brief-1.pdf>.

study participants are randomly assigned to the treatment or control group, and evaluators can be more confident that the results are due to the treatment and can rule out other explanations.²⁵ Four percent of Round 3 evaluators proposed using experimental methods. However, none of the Round 3 evaluators actually used experimental methods.

FIGURE 1.4

Evaluation Plans that Proposed Various Methods to Measure Outcomes and Impacts, Rounds 1–4



Source: Urban Institute TAACCCT grantee database of the review of the grant evaluation plans.

Notes: n=256 across all rounds; n=49 in Round 1; n=79 in Round 2; n=57 in Round 3; n=71 in Round 4. In Round 1, an evaluation plan was not required, and 48 of the 49 grantees did not submit an evaluation plan. Round 2 grantees were required to submit 10-page summary evaluation plans, and their planned evaluation methods were culled from those summaries. Round 2 awarded a total of 79 grantees, and 10 grantees did not report on any outcomes. In Rounds 3 and 4, grantees were required to select a third-party evaluator to conduct an evaluation of their project and to submit a detailed evaluation plan. In Round 3, all 57 grantees submitted a detailed evaluation plan. In Round 4, 11 grantees had not submitted an approved detailed evaluation plan at the time this brief was published. The experimental category consists of evaluation plans with a full experimental design or regression discontinuity. The quasi-experimental category includes evaluation plans with designs using propensity score matching. The nonexperimental design category is composed of evaluation plans using outcomes or correlational and pre- and postanalysis.

Although not all evaluations described the obstacles to random assignment in detail, the explanation provided by the evaluation of the RITA project is illustrative: “RITA was implemented as a set of integrated strategies and improvements to pre-existing IT departments at the community

²⁵ See for example the “gold standard” evaluation of WIA adult and dislocated worker programs at <https://www.dol.gov/asp/evaluation/completed-studies/WIA-30mo-main-rpt.pdf>. See also the Clearinghouse for Labor Evaluation and Research causal evidence guidelines, which reserve the highest rating for well executed randomized control trials and interrupted time series (https://clear.dol.gov/sites/default/files/CLEAR_EvidenceGuidelines_V2.1_0.pdf).

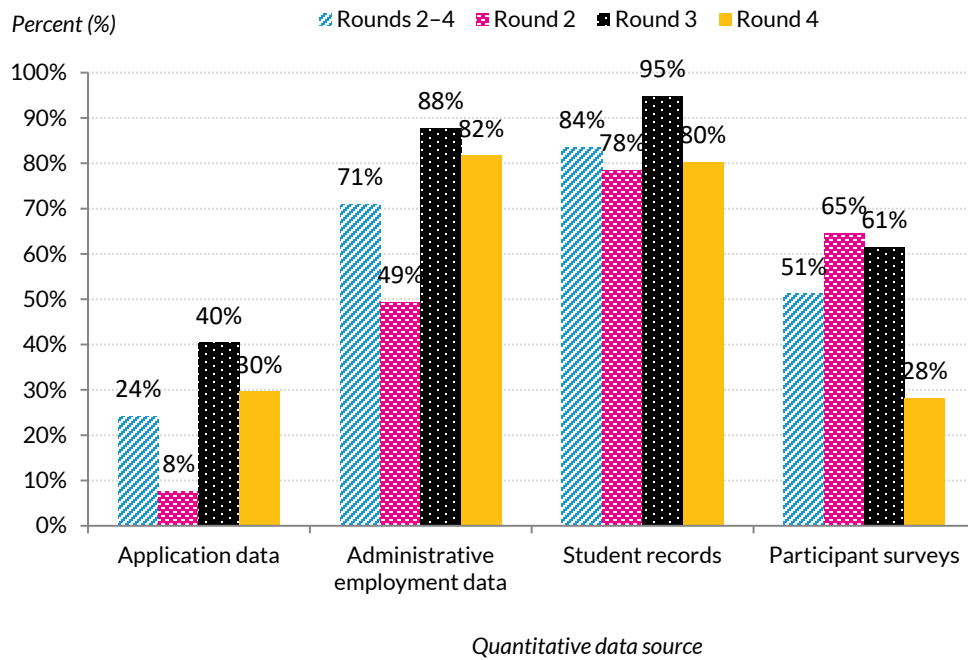
colleges. As such, random assignment was “impractical” (The Improve Group 2017, p. 6). Grant projects were often wholesale improvements on existing programs in the context of an open access community or technical college system. These factors made it difficult to randomly deny students the services enhanced by grant funding. The lack of random assignment evaluations is similar to Rounds 1 and 2 evaluations, where 10 percent proposed experimental designs but did not end up using it for their evaluation. These challenges are discussed in more detail later in this report and in the Rounds 1 and 2 synthesis report (Eyster 2019).

Across all rounds, about two-thirds of the third-party evaluators proposed using quasi-experimental methods. If performed well, quasi-experimental methods can attribute the difference between participants’ education and employment outcomes and those of a similar group of individuals who did not participate in grant-funded activities to the activities themselves. However, quasi-experimental methods are not considered as strong as experimental design as the analysis often cannot account for all characteristics that affect an individual’s participation in the grant-funded activities. Although there are challenges to conducting quasi-experimental analyses, many third-party evaluators opted to use these methods when experimental design was not feasible. The share of evaluators proposing quasi-experimental methods increased dramatically after Round 1 and peaked in Round 3, with 91 percent of evaluators indicating a plan to use a quasi-experimental method. Evaluators also proposed nonexperimental and outcomes only analysis and cost/economic analyses but findings from those analyses are not covered in this report.

Third-party evaluators planned to use a variety of different data sources (figure 1.5) for their impact analyses, including information from program applications, administrative employment records, students’ college records, and surveys. Although these data are of interest in this synthesis report because of their contribution to the impact analysis, the data may be used by third-party evaluators for other purposes than to inform the impact analysis. For example, some administrative and survey data would be important for outcomes reporting or services received in an implementation study.

FIGURE 1.5

Grant Evaluations Proposing Various Data Sources, Rounds 2–4



Source: Urban Institute TAACCCT grantee database of the review of the grant evaluation plans.

Note: n=256 across all four rounds; n=49 in Round 1; n=79 in Round 2; n=57 in Round 3; n=71 in Round 4. In Rounds 2 and 4, some grantees did not report their quantitative data sources. Four Round 4 grantees had not submitted an approved detailed evaluation plan at the time these data were published.

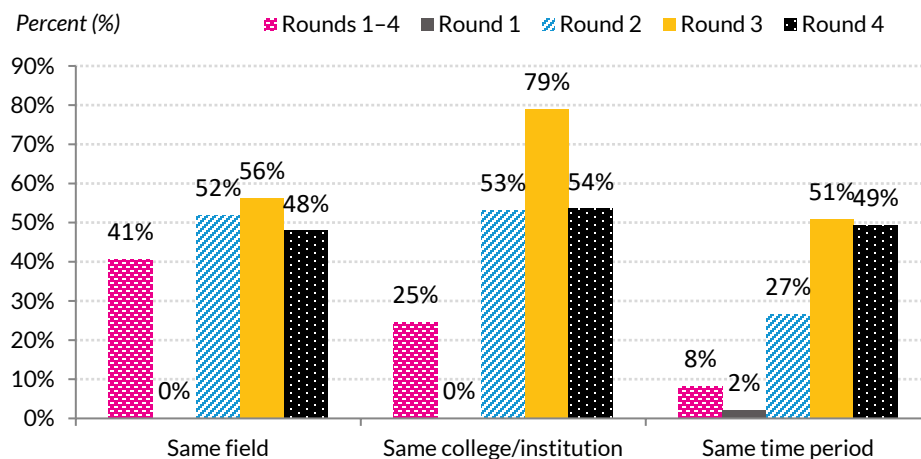
Although these data may be used in different ways, most of the data sources in figure 1.5 were used in the impact analyses. Student records were the most common planned data source due to their general availability to grantees. Administrative employment records and participant surveys were somewhat less common but were also widely proposed by third-party evaluators. Unemployment Insurance (UI) wage records can be difficult to obtain from the relevant state agencies. Each type of administratively collected data (application data, employment records, and student records) were more commonly included in evaluation plans in Rounds 3 and 4 than they were in Round 2, indicating an improvement in expected data quality and availability over time. Participant surveys can be costly to administer, and planned use of participant surveys declined in Round 4, possibly due to increased access to alternative administrative data.²⁶

²⁶ See Groves and Heeringa (2006) on the increasing costs of survey administration.

As shown in figure 1.6, third-party evaluators planned to use the comparison groups from a variety of sources, including other students in the same field, other students in the same college, and students from the same time period who were in different programs or in some cases different colleges. In some cases, if the grant-funded projects did not include all programs in the same field at a participating college, the students in the same field and college were used as the comparison group. Frequently, though, students from prior cohorts were selected as a comparison group to ensure that they were not affected by the project. However, evaluators had to be cautious about any temporal issues that could introduce unobserved differences between participant and comparison group cohorts. Each of these comparison group options has strengths and weaknesses and no approach is preferred a priori.

FIGURE 1.6

Grant Evaluations Proposing Various Sources of Comparison Groups, Rounds 1–4



Source: Urban Institute TAACCCT grantee database of the review of the grant evaluation plans.

Note: n=256 across all four rounds; n=49 in Round 1; n=79 in Round 2; n=57 in Round 3; n=71 in Round 4. Four Round 4 grantees had not submitted an approved detailed evaluation plan at the time the data was published, and their information is not included here.

Figures 1.4 through 1.6 identify few improvements over time in the likelihood that planned third-party evaluations will be able to identify an unbiased impact of the grant projects, with the exception of increased reliance on administrative data (figure 1.5). The high percentage of Round 3 third-party evaluators that expected to use quasi-experimental methods (figure 1.4) for impact findings highlights the challenges with implementing an experimental design. Experimental designs require extensive planning and adjustments program intake procedures that is not required in quasi-experimental studies. Often project staff implement random assignment during their intake process, therefore must

be trained in study procedures and closely monitored. These and other considerations may significantly raise the costs of an experimental design over quasi-experimental alternatives. Of the 56 final evaluation reports, 23 (41 percent) used quasi-experimental methods to estimate the impact of the grant-funded project on participants in their final reports.²⁷ This report synthesizes the results of these 23 quasi-experimental Round 3 impact analyses, more than double the 11 quasi-experimental impact analyses in Rounds 1 and 2 together.

Improvement in the number of third-party evaluations using quasi-experimental methods is perhaps most attributable to higher standards required of third-party evaluators in the grant announcement requirements over time. Beginning in Round 2, DOL required grantees to use grant funds to procure a third-party evaluation of their grant projects to document and assess the implementation of capacity-building activities and examine participants' educational and employment outcomes and impacts.²⁸ Round 1 grantees were not required to include third-party evaluations, but nearly 20 percent did so. Because of the new requirement in Round 2, the large majority of the evaluation reports reviewed the synthesis of Round 1 and 2 third-party evaluation findings came from the second round (Eyster 2019).

Eyster (2019) discusses 11 third-party impact evaluations from Rounds 1 and 2 that met minimum standards for a quasi-experimental evaluation design. However, these evaluations had notable weaknesses and limitations, summarized by Eyster (2019) and often highlighted in the evaluation reports themselves.

This report summarizes the impact findings from 23 Round 3 third-party evaluations that met the same review standard of being either an experimental or quasi-experimental evaluation (although none in Round 3 used experimental design). The quality of Round 3 evaluations varied, as was the case with Rounds 1 and 2, but the number of evaluations that executed a quasi-experimental analysis was considerably higher than in Rounds 1 and 2 as shown in figure 1.2 above.

1.3. Synthesis of Round 3 TAACCCT Impact Findings

The synthesis addresses a key research question from the TAACCCT national evaluation: *what service delivery and/or system reform innovations resulted in improved employment outcomes and increased skills*

²⁷ While there were 57 Round 3 grantees, only 56 final evaluation reports were submitted.

²⁸ For more information on the Round 2 requirements for third-party evaluations, see pp. 33-35 in "Notice of Availability of Funds and Solicitation for Grant Applications for Trade Adjustment Assistance Community College and Career Training Grants Program" at https://doleta.gov/grants/pdf/taaccct_sga_dfa_py_11_08.pdf.

for participants? To address this question, Urban Institute researchers reviewed 56 final evaluation reports to determine which of the evaluations used quasi-experimental methods necessary for assessing the impact of the grant projects on participant outcomes, and then summarized the findings.²⁹ Of these 56 reports, researchers found that 23 evaluations met these standards for inclusion in the synthesis. Since most projects bundled multiple strategies and evaluated them jointly, the synthesis cannot assess the contributions of specific strategies to participant impacts. It can only provide broad evidence on whether the strategies implemented by grantees generally improved educational and employment outcomes.

Third-party evaluators had to use a recognized experimental or quasi-experimental method for identifying project impacts. A regression analysis alone without an experimental or quasi-experimental strategy for addressing selection bias and other types of bias in the impact estimates was not sufficient to be included in this synthesis. No experimental or quasi-experimental method guarantees an unbiased impact estimate, but to be included in the synthesis the evaluator was required to utilize some type of design-based strategy for mitigating bias.

Although the report does not systematically assess the rigor of the methods, the review was also designed to better understand the challenges evaluators had in evaluating the grant-funded projects. The key challenges included major threats to internal validity such as finding a viable comparison group, a lack of data on students in the comparison groups, unobservable characteristics,³⁰ and small sample sizes. Thus, the synthesis can only suggest whether the impact findings presented offer some evidence of effectiveness. In the future, the Clearinghouse of Labor Evaluation and Research (CLEAR), administered by DOL, may formally review some TAACCCT third-party evaluations to assess the evidence's strength.³¹ The synthesis also highlights lessons for implementing experimental and quasi-experimental methods that can be useful for others considering studying similar initiatives.

²⁹ The synthesis does not summarize participant outcomes, as reported by the third-party evaluators. The outcomes are similar to the performance outcomes grantees report to DOL. DOL releases this information separately, and a program summary can be found at <https://doleta.gov/taaccct/pdf/TAACCCT-Fact-Sheet-Program-Information.pdf>. In addition, a brief on the early results of the TAACCCT grants with information on performance outcomes can be found at <https://www.urban.org/research/publication/early-results-taaccct-grants>.

³⁰ Unobservable characteristics that may affect impact estimates for TAACCCT projects include underlying abilities or skills, motivation to complete the program of study, or family support networks. These characteristics are not randomly distributed across students, and may be correlated both with enrollment in grant activities and student outcomes.

³¹ Information on the clearinghouse and its review process can be found at <https://clear.dol.gov/>.

The remainder of the report is organized as follows. Chapter 2 first summarizes the impact findings for each of the 23 third-party evaluations, noting the educational and employment outcomes measured and how programs and comparison groups were selected for evaluation. Chapter 3 synthesizes the findings by outcome—credential attainment, program completion, other educational outcomes, employment, and wages and earnings. The chapter ends with a discussion the challenges faced by third-party evaluators in implementing experimental and quasi-experimental evaluation designs. Chapter 4 concludes the report, providing a summary of the findings and implications for policymakers, practitioners, and researchers seeking to evaluate similar initiatives.

2. Round 3 TAACCCT Strategies and Evaluation Findings

As a part of the TAACCCT grant program, DOL encouraged grantees to test a range of capacity-building strategies to build career pathways and improve systems that serve adult learners. Thus, the third-party evaluations examined a grant-funded project that comprised a combination of strategies. Although each project is different in its details and its focus, all grantees implemented strategies that accelerate learning support persistence and completion, and connect participants to employment, as described in figure 1.1 (p. 4). This chapter describes the projects and strategies implemented by the 23 Round 3 grantees that are the focus of this report to provide context for understanding the impact findings presented in chapter 3. Most of these grantees developed or expanded career pathways as a core feature of their project, or utilized important elements of career pathways models (Eyster et al., 2020). The impact findings synthesized here are, therefore, relevant to the broader policy conversation on career pathway programs.

2.1. Overview of the Projects and Strategies Implemented by the Round 3 Grantees

There are many strategies that grantees in Round 3 developed and implemented to build their capacity for providing education and training programs to adult learners but the overarching strategy was career pathways. The national evaluation team identified three categories to summarize the wide variety of strategies implemented by the grantees within career pathways—accelerated learning, college persistence and completion, and connections to employment. These three strategies are closely associated with outcomes that are studied in the final impact evaluations. Accelerated learning strategies are aimed at increasing course completion and time to completion of a course of study. College persistence and completion strategies are aimed at raising grade point averages, program completion, and credential attainment. Finally, connections to employers are intended to improve participants' employment rates, earnings gains, and retention in employment.

The strategies used by each of the 23 grantees that are the focus of this report are described in table 2.1. The table includes strategies organized by category and a summary of the estimated impact of the grant project. As in table ES.1, impacts are considered to be “positive” if at least one estimate is positive and statistically significant and none of the main results presented are negative and statistically significant; “negative” if at least one estimate is negative and statistically significant and none are positive and statistically significant; “mixed” if there are positive and negative estimates that are statistically significant; and “no impact” if no estimates are statistically significant.

These impact summaries can provide a general sense of the effect that a project’s chosen strategies had on participants. However, the third-party evaluations were generally not in a strong position to test the effect of specific strategies or a particular intervention model, as grant projects typically bundled multiple strategies together for a comprehensive and customized learning experience for participants and targeted to the workforce needs of local and regional employers. While combining different strategies was often critical for meeting the needs of participants and employers, it makes it difficult to attribute impacts to specific strategies within projects. Although each grant project is unique, they generally included strategies that fell in all three overarching categories of accelerated learning, support for persistence and completion, and connections to employment but the strategies within each of these categories could varied substantially in design and implementation. For example, one project could focus on contextualized learning while another may have provided enhanced student supports. In addition, multiple colleges within a consortium often implemented the strategies in different ways to align their local projects with the needs of their participants and employers. Given the mix of strategies used within a project, it is difficult to correlate positive or negative impact estimates within and across projects with specific strategies.

TABLE 2.1

Round 3 Evaluations with Quasi-Experimental Findings on Education and/or Employment Outcomes for TAACCCT Participants

TAACCCT grant project, consistently positive impact results listed first followed by other grant projects listed alphabetically	Direction of Impact Estimates	Industr(ies) of Focus	Accelerated Learning Strategies	Persistence and Completion Strategies	Connections to Employment Strategies
Golden Triangle Modern Manufacturing (East Mississippi Community College)	educational outcomes positive , employment outcomes positive	advanced manufacturing	development and enhancement of career pathways, stacked and latticed industry-recognized credentials, and online and technology-enabled learning	contextualized learning	career readiness certificate, sector partnership, and work-based learning
IMPACT (Gateway Community and Technical College)	educational outcomes positive , employment outcomes positive	manufacturing, utilities, construction, and transportation and logistics	enhancement of career pathways, new curriculum, stacked and latticed credentials, credit for prior learning, and online and technology-enabled learning	enhanced student supports	work-based learning, career mapping, and industry partnerships
INTERFACE (Northcentral Technical College)	educational outcomes positive , employment outcomes positive	information technology	enhancement of career pathways, new curriculum, stacked and latticed credentials, prior learning assessment, and online/hybrid learning	enhanced student supports	career navigator and career readiness support
Rural Information Technology Alliance (RITA) (Pine Technical and Community College)	educational outcomes positive , employment outcomes positive	information technology	creation of new programs and technology-enabled learning	education and employment advisors	soft-skills coaching
Advanced Manufacturing, Mechatronics, and Quality Consortium (AMMQC) (Mount Wachusett Community College)	educational outcomes no impact , employment outcomes positive	advanced manufacturing	curriculum development, technology-enabled learning, self-paced learning, and industry-recognized credentials	enhanced student supports and articulation agreements	work-based learning, employer partnerships and job placement
BOOST (Midlands Technical College)	education outcomes mixed , employment outcomes not tested	healthcare	short-term stacked credentials and technology-enabled learning	core pre-health courses, comprehensive wrap-around services, case management, and referral to services	work simulation, career coaching, and job placement services

TAACCCT grant project, consistently positive impact results listed first followed by other grant projects listed alphabetically	Direction of Impact Estimates	Industr(ies) of Focus	Accelerated Learning Strategies	Persistence and Completion Strategies	Connections to Employment Strategies
Bridging the Gap (Bridgemont Community and Technical College)	education outcomes mixed , employment outcomes no impact	energy, advanced manufacturing, information technology, and construction	creation and enhancement of career pathways, guided pathways, and online/hybrid learning	peer coaches, co-requisite model, tutoring, intrusive advising, and transfer and articulation agreements	work simulation, work-based learning, and employer partnerships
Central Georgia Healthcare Workforce Alliance (Central Georgia Technical College)	education outcomes positive , employment outcomes not tested	healthcare	online/hybrid learning, technology-enabled learning for rural students	general education and pre-health courses, comprehensive wrap-around services, academic advising and referral to services	career coaching
DC Construction Academy and DC Hospitality Academy (University of the District of Columbia-Community College)	education outcomes positive , employment outcomes not tested	construction and hospitality	online learning, curriculum development, and stacked and latticed credentials	learning assessments, student supports, and integrated teaching	work-based learning
Greater Cincinnati Manufacturing Career Accelerator (Cincinnati State Technical and Community College)	education outcomes mixed , employment outcomes not tested	advanced manufacturing	creation and enhancement of career pathways, self-paced online learning	contextualized and adaptive learning, bootcamps, intrusive advising, and tutoring	job fairs, career advising, and interview and resume preparation
Health Science Pathways for Academic Career and Transfer Success (H-PACTS) (Los Angeles Trade Technical College)	education outcomes positive , employment outcomes not tested	healthcare	enhancement of career pathways and development of core competencies, stacked and latticed credentials, and credit for prior learning	orientation, foundational skills, online basic skills refresher courses, and adaptive learning	work simulation
Linn-Benton iLearn (Linn-Benton Community College)	education outcomes positive , employment outcomes no impact	healthcare, business and office administration, and communications	online learning, credit for prior learning	student navigator and transfer and articulation agreements	employer partnerships and career services

TAACCCT grant project, consistently positive impact results listed first followed by other grant projects listed alphabetically	Direction of Impact Estimates	Industr(ies) of Focus	Accelerated Learning Strategies	Persistence and Completion Strategies	Connections to Employment Strategies
Maine is IT! (Central Maine Community College)	education outcomes mixed , employment outcomes not tested	information technology	creating and enhancing programs, stacked credentials, technology-enabled learning, and credit for prior learning	student navigators, articulation of noncredit to credit programs, competency-based learning, and improvement of remediation strategies	work-based learning
Mississippi River Transportation, Distribution, and Logistics (MRTDL) (Lewis and Clark Community College)	education outcomes positive , ^a employment outcomes not tested	transportation, distribution, and logistics	development and enhancement of career pathways and stacked and latticed credentials		sector partnerships and work simulation
North Dakota Advanced Manufacturing Skills Training Initiative (North Dakota State College of Science)	education outcomes positive , employment outcomes negative ^b	advanced manufacturing	online learning, curriculum development, stacked and latticed credentials, and prior learning assessment	transfer and articulation agreements	employer partnerships and work-based learning
Northeast Resiliency Consortium (Passaic County Community College)	education outcomes positive , employment outcomes not tested	healthcare, information technology, hospitality, and environmental technologies	development of career pathways, industry-recognized credentials, and prior learning assessment	comprehensive student supports, contextualized learning, adaptive learning programs, digital tutors, and competency-based learning	employer partnerships and career coaching
Orthopedics, Prosthetics, and Pedorthics (HOPE) Careers Consortium (Century College)	education outcomes no impact , employment outcomes not tested	healthcare	enhancement of credentials, online and technology-enabled learning, and prior learning assessment	case management	employer partnerships, work-based learning, and career navigator
PA Manufacturing Workforce Training Center (Thaddeus Stevens College of Technology)	education outcomes not tested , employment outcomes no impact	advanced manufacturing and energy	enhancement of degree programs and development of new certificate programs		career services and sector partnerships
Pathways to Success (Northern Wyoming Community College District)	education outcomes positive , employment outcomes not tested	energy	enhancement of programs, online and technology-enabled learning, and prior learning assessment	targeted advising, contextualized learning, and bootcamps	work simulation and employer partnerships

TAACCCT grant project, consistently positive impact results listed first followed by other grant projects listed alphabetically	Direction of Impact Estimates	Industr(ies) of Focus	Accelerated Learning Strategies	Persistence and Completion Strategies	Connections to Employment Strategies
RevUp (Great Falls College)	education outcomes negative , employment outcomes not tested	advanced manufacturing	development of short-term certificate programs, stacked and latticed credentials, online and technology-enabled learning, and credit for prior learning	proactive advising and coaching, contextualized learning, competency-based assessments, and transfer and articulation agreements	apprenticeship, work simulation, career navigator, employer partnerships, and sector partnerships
Southeastern Economic and Education Leadership Consortium (SEELC) (Pellissippi State Community College)	education outcomes no impact , employment outcomes no impact	advanced manufacturing	development of career pathways, industry-recognized credentials, stacked and latticed credentials, and technology-enabled learning	completion coach, transfer and articulation agreements, and competency-based assessments	regional workforce and economic development partnership
Southwest Arkansas Community College Consortium (SWACCC) (South Arkansas Community College)	education outcomes positive ^a employment outcomes not tested	advanced manufacturing	development of career pathways, industry-recognized credentials, stacked and latticed credentials, and credit for prior learning	basic skill bridge modules	sector partnerships and work-based learning
XCEL-IT (College of Central Florida)	education outcomes mixed , employment outcomes not tested	information technology	development of career pathways, online and technology-enabled learning, and prior learning assessment	proactive advising	employer partnerships, work-based learning, and soft-skills training

Source: Findings from the final evaluation reports from the 23 grants. See Anonymous (2017a, 2017b), Center for Applied Research (2017a, 2017b), Good and Yeh-Ho (2017), Harpole (2017), Hong, Boyette, and Saklis, (2017), Horwood et al. (2017), Jensen, Horohov, and Waddington (2017), Lawrence (2017), Negotia et al. (2017), Price et al. (2017), Smith et al. (2017), Swan et al.(2017), Takyi-Laryea et al. (2017), Takyi-Laryea, Passa, and Gall (2017), Tan and Moore (2017), The Improve Group (2017), Thomas P. Miller & Associates (2017), Thomas P. Miller & Associates and Hamai Consulting (2017), Thomas P. Miller & Associates and The Policy Research Group (2017), Woodke, Graf, and Driessen (2017), and WorkED (2017).

Notes: Educational outcomes include credential attainment, credits earned, grade point averages, and completion of programs of study. Employment outcomes include employment after participation in the program and quarterly earnings. “Mixed” means both negative and positive results. Positive means at least one positive result. Negative means at least one negative result. A full set of impact estimates and details on the impact analysis are provided in table 3. ^aOne of the colleges has a negative effect, but the average treatment effect for all colleges is positive. ^bThe estimated impacts are negative but statistical significance levels are not reported.

2.2. Project Summaries and Summaries of Quasi-Experimental Findings

This section presents summaries of the projects and their quasi-experimental findings on the education and employment outcomes from the third-party evaluations. Each third-party evaluation report was first reviewed to identify which impact evaluation design used, if any. This review identified 23 evaluations that used either experimental or quasi-experimental methods that are discussed in this synthesis. The evaluations are typically identified by project name, when available, rather than by consortium or college name.

Golden Triangle Modern Manufacturing. East Mississippi Community College patterned the Golden Triangle Modern Manufacturing project after the Round 2 Missouri Manufacturing Workforce Innovation Networks project to improve and better articulate career pathways in advanced manufacturing. The evaluation used propensity score matching to assess the Golden Triangle Modern Manufacturing project, and used a regression adjustment after matching to estimate the impacts. The evaluators matched participants to students in similar manufacturing programs before the implementation of the grant-funded project. The impact findings from this evaluation were:

- Participants experienced higher retention rates (31 percentage points) and completion rates (51 percentage points) relative to the comparison group as a result of the project.
- They were more likely to continue their education (4 percentage point increase) and find employment (38 percentage point increase) as well. These impacts were significant at the 10 percent level.
- More participants who were employed at the beginning of training (i.e., incumbent workers) experienced an increase in earnings (1.3 percentage points more) relative to the comparison group as a result of the project (Harpole 2017).

IMPACT. Gateway Community and Technical College developed the IMPACT project to enhance and accelerate career pathway preparation in logistics, manufacturing, heating and cooling, and energy. Evaluators estimated the impact of the project using propensity score matching techniques, using prior cohorts of students in the programs affected by IMPACT as the comparison group. They estimated impacts for both the full sample of participants and also separately for participants after the spring 2015 term who experienced the fully matured program. Despite fairly modest sample sizes (321 students were included in the analysis), the IMPACT project improved all of the outcomes analyzed. The impact findings from this evaluation were:

- For participants that experienced the full implementation of IMPACT, the project resulted in 14 more courses taken.
- Participants saw a 48.8 percentage point increase in credentials awarded.
- IMPACT raised quarterly earnings increases from the pre-enrollment to the post-enrollment period by \$3,133. The analysis used a richer set of matching variables than most other evaluations, including English, reading, and math skill levels. However, they did not match on prior earnings histories despite the availability of these data (Jensen, Horohov, and Waddington 2017).

INTERFACE. A consortium of 16 Wisconsin community colleges, led by Northcentral Technical College, created the INTERFACE project to strengthen computer skill competency and career pathways in information technology programs. The INTERFACE project enrolled a larger number of participants, serving 4,962 participants, and was evaluated using propensity score methods. Evaluators compared participants to similar students that did not participate in the INTERFACE project at the 16 colleges. Unlike many other Round 3 evaluations, the comparison group included all non-participating students rather than a targeted academic program. However, the propensity score matching strategy included program of study as a matching variable, ensuring that the comparison group would primarily be drawn from IT programs. INTERFACE impacts were often statistically significant due to the large sample size, but not always meaningfully large. The impact findings from this evaluation were:

- Participants had pass rates that were higher than comparison cases and the difference was statistically significant, but the total impact was only an increase of 0.2 percentage points in the pass rate (the pass rate was 72.4 percent for participants and 72.2 percent for comparison students).
- The impact on one-year retention rates was small (a 3-percentage point increase), and not statistically significant.
- INTERFACE had a stronger impact on program completion, raising the completion rate by 112 percent.
- Participants also saw employment rates increase by 31 percent, although many participants were missing employment data.³² Ninety-three percent of the 55 treatment group participants with data on employment outcomes were employed. There was no statistically significant difference in earnings (Smith et al. 2017).

Rural Information Technology Alliance (RITA). Pine Technical and Community College led a consortium including Ridgewater College, Central Lakes College, and North Central Texas College to develop RITA, an IT-focused project to support students through intensive advisor coaching,

³² The evaluation indicates that wage and employment data was provided by the college but was “pulled” only once a year, presumably from UI administrative wage records. Only one pull of wage and employment records was usable for TAACCCT participants, in November, 2016. This resulted in significant levels of missing data for the treatment group.

infrastructure improvements, and new learning technologies. Evaluators estimated the impact of RITA on participants using a propensity score matching strategy, with prior cohorts of students in similar programs as the comparison group. Unlike other third-party evaluations that used a retrospective comparison group, the evaluator for RITA contacted and surveyed students in the comparison group as a source of data. Evaluators imputed missing data. The impact findings from this evaluation were:

- Participants were 58 percent more likely to earn an associate's degree than the comparison group.
- They were 24.1 times as likely to earn a certificate than the comparison group.
- Participants were 87 percent less likely to earn a diploma.³³
- The impact results for employment outcomes are difficult to summarize because the full trajectory of outcomes was estimated for each college in the consortium, all in the same model. Across all colleges, participation in RITA tended to increase earnings and the likelihood of employment relative to the comparison group immediately after program enrollment, but the comparison group's performance catches up to RITA participants over time. Unfortunately, problems executing the propensity score matching approach make these unreliable estimates. Rather than being used to match or reweight the comparison group to look more like the treatment group, the propensity score was used as a control variable in the outcomes regression.³⁴ Although the evaluator obtained UI wage records, these records were not used in the propensity score matching process (The Improve Group 2017).

Advanced Manufacturing, Mechatronics, and Quality Consortium (AMMQC). Mount Wachusett Community College led a consortium of four colleges to develop the AMMQC project to enhance advanced manufacturing career training. Although the project model varied across consortium colleges, the AMMQC project focused on employer engagement, curriculum development, student support and job placement services, technology-enabled learning, and industry recognized credentials. Unlike most other third-party impact evaluations, the evaluation did not use propensity score matching. Instead, it used difference-in-differences to measure the impact of participation on program completion and comparative interrupted time series models to estimate the impact on employment outcomes. The comparison group for the completion analysis was composed of students in similar programs at the

³³ Odds ratios are calculated from log odds in Tables 2, 4, and 6, which estimate impacts across all consortium colleges. Estimates by college show some variability, but they do not include an uninteracted treatment indicator in the model. This suggests that the impact estimates in the model are estimated relative to a combined treatment and control group in the reference college, which will not produce an unbiased estimate of the impact of the project.

³⁴ Although using the propensity score as a control variable will improve the impact estimates by controlling for the probability of selection into the program, this approach relies heavily on the proper specification of the outcome equation rather than flexibly balancing the characteristics of the treatment and comparison cases.

same college, while the comparison group for the employment analysis was WIOA participants who received no training.³⁵ The impact findings from this evaluation were:

- The difference-in-differences models indicated that AMMQC did not have a statistically significant impact on program completion.
- Employment rates increased by 38.9 and 54.2 percentage points in the third and fourth quarters after program enrollment, respectively. Participation in the AMMQC activities did not have a statistically significant impact on employment in the first two quarters after enrollment, (Negota et al.2017). The programs of study evaluated were short (1 to 6 weeks), so the lack of an impact in the first and second quarters is likely not attributable to remaining in education and training activities.

BOOST. A consortium of six colleges spanning North Carolina, South Carolina, and Alabama, led by Midlands Technical College, established the BOOST project to implement short-term stacked credentials in healthcare that utilized human simulation and 3-D technology. The goal of these efforts was to accelerate program completion and increase retention. Evaluators estimated the impacts of the BOOST project using propensity score methods, with students in pre-health holding codes selected as the comparison group. The evaluators compared the baseline characteristics of the treatment and comparison groups and determined that the comparison group was well balanced before matching, and the matching process further improved the similarity of the comparison group to the treatment group. The impact findings from this evaluation were:

- Participants had grade point averages that were 0.2 points higher than the comparison group, although there were no differences in the number of credits completed.
- A much higher share of participants earned a credential (33 percent) relative to the comparison group (5 percent), a statistically significant finding.
- The evaluator also conducted a pre-post analysis of employment outcomes (employment and earnings) for BOOST participants. Although the analysis of employment outcomes could not produce reliable causal effects of the project, the pre-post analysis did show an increase in employment and earnings.
- One of the weaknesses of the evaluation design for the BOOST project was that the comparison group was composed of pre-health students at the consortium colleges. Although comparison group students were taking health courses, they may have never enrolled in a health program. The treatment group was, by definition, enrolled in a health program at the colleges (Center for Applied Research 2017b).

Bridging the Gap. Bridgemont Community and Technical College led a consortium of nine West Virginia community and technical colleges to launch the project, which created and enhanced career

³⁵ WIOA participants were used as the comparison group because wage records could only be accessed for one college in the consortium, but that college had no program that was similar to its TAACCCT project to use as a comparison group.

pathways in energy, advanced manufacturing, information technology, and construction. Evaluators estimate the impact of the project on participants using a propensity score matching and difference-in-differences strategy. Matching variables included gender, age, race and ethnicity, economic and academic disadvantage, limited English proficiency, disability status, preprogram employment and earnings, and local labor market conditions. The impact analysis used prior cohorts of students in the same program without the grant activities or students from a similar program as the comparison group. The impact findings from this evaluation were:

- Participants acquired 0.1 fewer credits than the comparison group, and were 14 percent more likely to drop out.
- Participants were 1.0 percent more likely to earn a certificate or associate's degree than the comparison group.
- The estimated earnings and employment impacts of the project were positive but not statistically significant (\$286 more per quarter and a 2-percentage point increase in employment) (Thomas P. Miller & Associates and The Policy Research Group 2017).

Central Georgia Healthcare Workforce Alliance. Central Georgia Technical College created a collaborative, blended learning, technology-driven approach (called BlendFlex) to healthcare education. The flexibility of the approach was also designed to provide remote access to rural students. Evaluators estimated the impact of the project activities on participants using a propensity score matching strategy. Matching variables included gender, age, race and ethnicity, Pell status, and participation in developmental education. The comparison group for the propensity score analysis was composed of other students attempting to major in healthcare programs who did not participate in BlendFlex. The impact findings from this evaluation were:

- Participants had cumulative grade point averages that were 0.2 points higher than the comparison group, and they accumulated 8.2 more credits.
- Participants were 47 percent more likely to complete a diploma, certificate, or degree, 28 percent more likely to complete their program of study, and enroll in 0.3 additional terms than the comparison group.
- Participants were 25 percent less likely to transfer to another institution than the comparison group.
- Evaluators could not estimate the impact of the project on employment outcomes because these outcomes were reported only for the treatment group, but were not available for the comparison group (Center for Applied Research 2017a).

DC Construction Academy. University of the District of Columbia-Community College developed the DC Construction Academy project to address the workforce development needs in construction

highlighted by the DC Workforce Investment Council.³⁶ Evaluators estimated the impact of the project using propensity score matching techniques. The comparison group was drawn from prior cohorts of students in the core construction classes. Matching variables included gender, age categories, marital status, race, and English language skills. The impact findings from this evaluation were:

- The project had no statistically significant effect on program completion rates.
- The project was associated with a 16.5 percentage point increase in credential attainment.
- The evaluators were not able to obtain UI wage records for either participants or the comparison group, so the only employment information available was self-reported by participants. Since this information was not available for the prior cohort comparison group, evaluators could not estimate the impact of DCCA on employment or earnings (Takyi-Laryea, Passa, and Gall 2017).

Greater Cincinnati Manufacturing Career Accelerator. Cincinnati State Technical and Community College (CSTCC) founded the Greater Cincinnati Manufacturing Career Accelerator (career accelerator) project to prepare workers for employment in manufacturing using career pathways, integrated support services, adaptive learning, and new equipment and facilities. Evaluators estimated the impact of the career accelerator for the welding and mechanical engineering technology (MET) using a propensity score matching strategy. The comparison group was drawn from participants in similar programs of study. The variables used for the propensity score matching included race, age, and English and math test scores (gender was excluded because of the high number of males in the program). The welding program could only be evaluated for the impact of on dropping out, since treatment status perfectly (or near perfectly) predicted the other outcomes. The impact findings from this evaluation were:

- The program reduced the likelihood of dropping out within a year. MET participants were 52 percent less likely to drop out than members of the comparison group.
- The evaluator was able to estimate the impact of GCMCA's MET program on several other educational outcomes. MET participation was associated with reduced completion, (82 percent less likely than the comparison group), increased persistence through the school year (3.4 times as likely as the comparison group), and a reduced likelihood of dropping out within a year (94 percent less likely than the comparison group).
- The evaluators could not estimate the impact of the project on employment outcomes, as UI wage records were not available (Thomas P. Miller & Associates 2017).

Health Science Pathways for Academic, Career and Transfer Success (H-PACTS). Los Angeles Trade Technical College led the Los Angeles Healthcare Competencies to Careers Consortium (LAH3C)

³⁶ UDC-CC also had a similar program in hospitality. However, evaluators did not include it in the impact analysis as there was no viable comparison group for the analysis.

to restructure healthcare career pathways and promote student progress through these pathways. The consortium implemented the Health Science Pathways for Academic, Career and Transfer Success (H-PACTS) model, which redesigned educational pipelines leading to health careers, developed core competencies in healthcare, and expanded credential opportunities in these fields. Evaluators estimated the impact of the H-PACTS model using a propensity score matching approach with a prior cohort of healthcare students as a comparison group. H-PACTS model participants were matched to the comparison group using information on demographic characteristics, residency and citizenship, low-income status, educational attainment, campus, and educational goals. Impacts were estimated in a regression framework after matching. The impact findings from this evaluation were:

- Participants had higher grade point averages that were 0.18 points higher than the comparison group on a four-point scale,
- They saw greater retention to the second term than the comparison group. Participants were 81 percent more likely to be retained than the comparison group.
- Participants had program completion rates that were 7.2 times as high as the comparison group.
- The third-party evaluator only had access to aggregated employment and earnings data. These data showed that participants experienced employment and earnings growth after participation in the program, but these changes could not be attributed to the program without access to microdata on employment and earnings (Tan and Moore 2017).

Linn-Benton (LB) iLearn. Linn-Benton Community College (LBCC) in Albany, Oregon developed the LB iLearn project to prepare participants for a wide range of in-demand fields, including healthcare, accounting, business and office administration, and communications and marketing/social media. Evaluators estimated the impact of the iLearn project using propensity score matching with a comparison group selected from students enrolled at the traditional LBCC campus. The evaluation of LB iLearn was one of the few evaluations to present diagnostic tests clarifying the degree of bias reduction resulting from the use of propensity score matching. As shown in the results of the balancing tests, matching reduced or eliminated bias from observable characteristics in almost all cases (Thomas P. Miller & Associates and Hamai Consulting 2017). The impact findings from this evaluation were:

- Participants were more 37.2 times as likely to complete their program as the comparison group.
- They did not earn any more credits or have higher retention than the comparison group.
- LB iLearn had no effect on employment outcomes.³⁷

³⁷ The paragraph in the evaluation reporting the wage impacts appears to be a paragraph inadvertently copied and pasted from the section on credit impacts without being edited to include the wage impacts. Thus, while descriptive statistics on wages are reported in Table 19 of the evaluation, there is no way to determine the impacts.

Maine is IT! Central Maine Community College (CMCC) lead a consortium of the states' community colleges to develop Maine is IT!, a project targeting the IT skills gap in the state. The project expanded and improved IT certification and credentials, built bridges between non-credit and credit programs in the colleges, and expanded PLA and remediation strategies. Evaluators estimated the impact of Maine is IT! using propensity score matching without replacement, with business administration students at the same colleges as comparison cases. The participants were matched to the comparison group using information on gender, race, age, English as a Second Language status, enrollment status, Accuplacer score (a basic academic skills test), and enrollment year. The impact findings from this evaluation were:

- Participants earned 0.7 more credit hours.
- They were 34 percent more likely to be persist in college and 40 percent more likely to earn a degree than the matched comparison group.
- Participants were 44 percent less likely to earn a credential.
- Wage data were only available to the evaluator in an aggregated form, so employment impacts could not be estimated (Horwood et al. 2017).

Mississippi River Transportation Distribution and Logistics (MRTDL). Lewis and Clark Community College led a consortium of nine colleges to create the MRTDL project to strengthen sector training partnerships and a system of stacked and latticed credentials in transportation, distribution, and logistics. Evaluators estimated the impact of using a propensity score strategy, with gender, age, race, educational attainment, incumbent worker, veteran, disability, Pell, and TAA eligibility status as control variables. Unlike many others, the evaluation estimated impacts separately for each program of study, producing 23 completion rate impact estimates at both the college and program level. The impact findings from this evaluation were:

- Program level impacts were highly variable due to extreme cases that influenced the estimated impact in smaller samples, but at the college level, impacts ranged from John Wood Community College participants that were only 40 percent as likely to complete as comparison group students to West Kentucky Community and Technical College participants, who were 15.4 times as likely to complete.
- All programs outside of John Wood Community College were either not statistically significant or positive and statistically significant, although some had no statistically significant effect on participant outcomes (Anonymous 2017a).

North Dakota Advanced Manufacturing Skills Training Initiative (NDAMSTI). North Dakota State College of Science launched the NDAMSTI to develop the skills of dislocated workers and veterans in welding, manufacturing, and mechatronics. The project utilized online learning, a new curriculum, stacked and latticed credentials, prior learning assessments, and enhancement of transfer and

articulation options for completers. Evaluators estimated the impact of the NDAMSTI welding program using a propensity score matching strategy, using gender, age, and race as matching variables. Prior cohorts of participants from the welding program in the five years before NDAMSTI were used as a comparison group. The impact findings from this evaluation were:

- Participants had a 16-percentage point higher completion rate than the comparison group, but no measures of statistical significance were reported for any outcome, so it is not clear whether the impacts are statistically significant.
- Participants and the comparison group completed in a comparable number of semesters.
- Using UI wage data, the evaluator estimated that program completers who were incumbent workers who were still employed after completion were 6 percentage points less likely to have an earnings increase after completion.
- The impact of NDAMSTI is difficult to assess because of several weaknesses in the impact evaluation. Although the evaluator obtained UI wage records, these records were not used in the propensity score matching process. The evaluator also did not estimate the treatment effects in a regression framework after matching, which would have improved the quality of the estimates. Finally, the earnings impacts were only estimated on a subset of completers who were incumbent workers that maintain employment. Although this was consistent with TAACCCT performance measures, the impact of NDAMSTI on this subgroup cannot be generalized to other participants who did not complete or who lost their jobs (WorkED 2017).

Northeast Resiliency Consortium (NRC). A consortium of seven community colleges in Connecticut, Massachusetts, New Jersey, and New York, led by Passaic County Community College, formed NRC in response to a series of natural disasters and man-made disasters that hit the Northeast in the years before the Round 3 grants. The NRC provides education and training in fields associated with community resiliency, including healthcare, information technology, hospitality, and environmental technologies. Evaluators estimated the impacts of NRC participation using a propensity score matching design, with demographic information, educational attainment, and incumbent worker status as the matching variables. The NRC study evaluated the impacts of two different strategies: (1) comprehensive services, and (2) articulated pathway participation. NRC provided career services, personal services, and academic services, and defined “comprehensive services” as receiving at least two of the three types of services. To estimate the separate impacts of these two strategies, participants who received comprehensive services or who participated in articulated career pathways were compared to students in consortium colleges during the same time period who did not receive those services. This is an appropriate comparison group for measuring the contribution of those project

elements to participant outcomes, although the impact estimates do not provide an estimate of the full effect of the project.³⁸ The impact findings by strategy from this evaluation were:

(1) Comprehensive Services

- Participants' completion rates were 38 percentage points higher than the comparison group. Participants had a higher receipt of credentials by 37 percentage points.
- Participants also earned credits at a higher rate by 17 percentage points.
- Participants had a higher rate of matriculation to more advanced programs by 4 percentage points.

(2) Articulated Pathway

- Participating in an articulated pathway has no effect on program completion or receiving a credential.
- Participants also earned credits at a higher rate by 27 percentage points.
- Participants had a higher rate of matriculation to more advanced programs by 12 percentage points (Price, Childress, Sedlak, and Roach 2017).

Orthopedics, Prosthetics, and Pedorthics (HOPE) Careers Consortium.³⁹ The HOPE Careers Consortium was composed of five community colleges across several states, including Baker College, Century College, Oklahoma State University Institute of Technology, Spokane Falls Community College, and St. Petersburg College. The HOPE consortium developed or enhanced 19 certificate and degree programs and made significant upgrades in the lab facilities of participating colleges, all in an effort to improve student outcomes in the fields of orthopedics, prosthetics, and pedorthics. Evaluators estimated the impact of HOPE on participant education outcomes using a propensity score matching approach, although problems obtaining adequate data and sample size make the impact estimates unreliable. Evaluators conducted impact analyses separately for each participating college on a sub-sample of participants with adequate data available. These restrictions dramatically reduced the sample size from the full sample of HOPE participants, with college-level treatment group sample sizes ranging from 8 participants in the smallest treatment college to 31 in the largest. Unfortunately, a pooled sample of participants across the consortium likely would have provided a small but adequately powered impact analysis. The impact findings from this evaluation were:

³⁸ Incumbent worker participants are also compared to non-incumbent worker participants. This result is not discussed here, because this design measures the impact of incumbent worker status, not the project itself.

³⁹ Pedorthics is the modification of footwear to address conditions that affect the feet and lower limbs.

- Participants at one college were 8.9 times as likely to complete the program as the comparison group.
- Participants at a second college were 97 percent less likely to pursue further education than the comparison group.
- All other impact estimates were negative or statistically insignificant. The small sample sizes in all of these analyses make the results unreliable. (Good and Yeh-Ho 2017).

PA Manufacturing Workforce Training Center. Thaddeus Stevens College of Technology (TSCT) received a grant to support the PA Manufacturing Workforce Training Center. The grant was used to expand three degree programs: HVAC; machine tool and computer-aided manufacturing; and metals fabrication and welding. The grant also helped establish new programs in electro-mechanical technology, production welding, and metalcasting. Evaluators estimated the impact of the grant-funded programs enhanced by the grant in the PA Manufacturing Workforce Training Center on earnings using a quasi-experimental design. All other outcomes are either reported in an outcomes analysis or assessed using a comparison group, but did not use a quasi-experimental impact analysis design. Evaluators estimated earnings impacts across all programs using coarsened exact matching of participants to a comparison group of dislocated workers identified in the Workforce Investment Act Standardized Record Data (WIASRD). The impact findings from this evaluation were:

- The programs raised participants' average hourly wages by \$2.75, from a comparison group average of \$13.87 (Lawrence 2017).⁴⁰

Pathways to Success. Northern Wyoming Community College District designed a project to provide short-term training focused on supervisory foundational skills and enhance existing career and technical education programs through technology and targeted advising. The evaluator used prior cohorts of students in the same program as a comparison group in a propensity score matching analysis of the impact of the grant-funded project. A problem faced by the Pathways to Success evaluation was the small sample size of the treatment group (66 participants) and the comparison group (41 students). The impact findings from this evaluation were:

- The Pathways to Success program has a statistically significant, positive impact on persistence, although the exact estimates for the impact are not report.⁴¹

⁴⁰ This estimate comes from Table 11 of Lawrence (2017), which uses a regression adjustment to estimate the treatment effect after matching.

⁴¹ The Pathways to Success evaluation matches the treatment group to the comparison group to identify a positive impact on persistence, rather than matching the comparison group to the treatment group (Woodke, Graf, and Driessen, 2017). This practice generates an "average treatment on the untreated" estimate, or the expected impact of treatment on an untreated population. Although this is an important impact estimate, it is not as commonly

- Participants' completion rates were 13.4 percentage points higher as a result of the project,
- The project did not have a statistically significant impact on participant grade point average relative to the comparison group.
- The evaluator was not able to obtain reliable wage and employment data on participants, and they obtained no wage or employment data on the comparison group (Woodke, Graf, and Driessen 2017).

RevUp. A consortium of 13 Montana community colleges, led by Great Falls College-Montana State University, developed short-term credential programs in advanced manufacturing, energy, and related fields as a part of their grant-funded project. The consortium also implemented a comprehensive set of student support services delivered by college coaches and workforce navigators. Coaches and navigators ensured that students received the assistance, guidance, and referrals that they required in college and helped them obtain employment after the program. The evaluation used marginal mean weighting with stratification (MMW-S) to estimate the impact of programs in advanced manufacturing on participant outcomes. MMW-S combines the strengths of propensity score matching (PSM) and inverse probability of treatment weighting (IPTW).⁴² The evaluator used prior cohorts of participants in similar programs as the comparison group. The impact findings from this evaluation were:

- Participants experienced the same likelihood of completing their degree or certificate as comparison group members.
- Participants grade point averages were 0.2 points lower than the comparison group.
- They were 75 percent more likely than the comparison group to drop out of the program.
- The evaluators note that these outcomes were only tracked for a year after program enrollment, and they offered the standard caution about the possibility of unobserved differences between the two groups (Hong, Boyette, and Staklis 2017).

Southeastern Economic and Education Leadership Consortium (SEELC). Pellissippi State Community College lead a consortium of six community colleges across three states in developing SEELC to improve training in welding, computer-integrated machining, and advanced manufacturing technology. SEELC aligned college programs to national industry standards and certifications, implemented competency assessments, and promoted an economic and education collaborative council. Evaluators estimated the impact of SEELC on participants using a propensity score matching strategy. The comparison group was not as well defined as other evaluations, with the comparison group defined as students who did not take the WorkKeys assessment (a basic academic skills test) and

reported as the impact of treatment on the treated, nor is it exactly comparable to the other treatment effects synthesized in this report.

⁴² See Hong and Hong (2009) and Hong (2010) for more information on MMW-S.

the treatment group defined as students who did take the assessment. The evaluation does not clarify the programs from which the comparison group was selected. The impact findings from this evaluation were:

- The impact analyses indicated no statistically significant difference in program completion attributable to taking the WorkKeys assessment.
- Taking the WorkKeys assessment was associated with being 79 percent less likely to become employed than the comparison group.
- Problems executing the propensity score matching approach make these unreliable estimates of the impact of the SEELC program, much like the third-party evaluation of the RITA program. Rather than being used to match or reweight the comparison group to look more like the treatment group, the propensity score was used as a control variable in the outcomes regression (Takyi-Laryea et al. 2017).⁴³

Southwest Arkansas Community College Consortium (SWACCC). South Arkansas Community College lead a consortium of seven Arkansas community colleges in developing SWACCC to strengthen sector training partnerships in manufacturing and incorporating new models for education and training delivery. The consortium pursued new sector partnerships to enhance credentials offered at consortium colleges and better align them with industry-recognized credentials. SWACCC also promoted credit for prior learning and work-based learning, and basic skill bridge modules. Evaluators estimated the impact of SWACCC on participants' completion rates separately at each college using a propensity score matching strategy. Evaluators drew comparison cases from similar programs at the same college, and then matched using demographic information and Pell, disability, TAA eligibility, and veteran status. Similar to the MRTDL evaluation, the evaluation of SWACCC produced a range of impact estimates across colleges and programs. The impact findings from this evaluation were:

- Across all colleges in the consortium, SWACCC tends to increase completion rates relative to the comparison group.
- Impacts ranged from a reduced likelihood of completion associated with SWACCC participation at Rich Mountain Community College (80 percent less likely than the comparison group) to a high, positive impact on completion at South Arkansas Community College (11.6 times as likely as the comparison group). All programs outside of Rich Community College had positive effects on completion or effects that were not statistically significant. (Anonymous 2017b).

XCEL-IT. A single state consortium of seven Florida community colleges, led by the College of Central Florida, built capacity at participating colleges to provide specialized IT training in rural areas.

⁴³ Although using the propensity score as a control variable will improve the impact estimates for controlling for the probability of selection into the program, this approach relies heavily on the proper specification of the outcome equation rather than flexibly balancing the characteristics of the treatment and comparison cases.

The impact evaluation used propensity score matching methods to compare participants to students in similar programs. A strength of the XCEL-IT impact evaluation is that these comparison programs were deliberately selected by the colleges as being the most comparable and were restricted to programs that were not supported by other grant funding. Participants were matched to comparison cases across all the colleges based on a set of characteristics collected in the college data system. The impact of XCEL-IT was measured in using regression analysis after matching to minimize any residual bias. The impact findings from this evaluation were:

- Participants were nearly 8 times more likely to complete the program than comparison students.
- Non-completers were half as likely to be retained in other education.
- Participants were not more likely to be enrolled in education after completion than the comparison group.
- Participants were 6.2 times as likely to be employed as their comparison group counterparts.
- Participants' earnings were 1.2 times higher than earnings of the comparison group but was not statistically significant. (Swan et al. 2017).

3. Round 3 TAACCCT Participant Educational and Employment Impacts

This chapter summarizes the impact findings on participants' education and employment outcomes from the Round 3 TAACCCT third-party quasi-experimental evaluations. It first discusses the outcomes and programs of study included (or excluded) in the impact analyses of the grant projects. Then, the chapter presents the impact estimates related to the education and employment outcomes from the 23 third-party evaluations that used quasi-experimental methods.⁴⁴ It concludes with a discussion of common evaluation issues across the Rounds 1-3 third-party evaluations and strategies that evaluators used to overcome these issues, when feasible.

3.1. Outcomes and Programs of Study Included in the Impact Analyses

As shown in table 3.1, the 23 third-party evaluations used a wide variety of educational and employment outcomes to measure the impact of grant-funded projects on participants, as summarized in table 2. Twelve of the 23 evaluations included impacts on credentials, 8 out of 23 estimated the impact of the grant project on credits earned, and 17 out of 23 tracked program completion. Over half (13 out of 23) of the third-party evaluations studied some other educational outcome (typically retention or grade point average). Half of the evaluations included employment outcomes (10 estimated employment impacts and 9 estimated earnings impacts).

⁴⁴ CLEAR uses a specific protocol for assessing the rigor of the evaluation and the strength of the evidence based on the methods used. While this synthesis does discuss the rigor of each of the 23 evaluations, it does not apply a specific detailed protocol like the CLEAR protocol.

TABLE 3.1

Outcomes for Which Impacts of TAACCCT Projects on Participants Were Estimated, Selected Round 3 Grant Third-Party Evaluations

TAACCCT grant project, consistently positive impact results listed first, followed by other grant projects listed alphabetically	Educational Outcomes				Employment Outcomes	
	Credential completion	Credits earned	Program completion	Other education outcome ^a	Employed	Earnings
1. Golden Triangle Modern Manufacturing			✓	p, r	✓	✓
2. IMPACT	✓	✓		c	✓	✓
3. INTERFACE			✓		✓	✓
4. Rural Information Technology Alliance (RITA)	✓				✓	✓
5. Advanced Manufacturing, Mechatronics, and Quality Consortium (AMMQC)			✓		✓	
6. BOOST	✓	✓	✓	gpa, r		
7. Bridging the Gap	✓	✓		d	✓	✓
8. Central Georgia Healthcare Workforce Alliance	✓	✓	✓	gpa		
9. DC Construction Academy and DC Hospitality Academy	✓		✓			
10. Greater Cincinnati Manufacturing Career Accelerator			✓	d, p		
11. Health Science Pathways for Academic Career and Transfer Success (H-PACTS)			✓	gpa, r		
12. Linn-Benton iLearn		✓	✓	p, r	✓	✓
13. Maine is IT!	✓	✓		r		
14. Mississippi River Transportation, Distribution, and Logistics (MRTDL)			✓			
15. North Dakota Advanced Manufacturing Skills Training Initiative			✓		✓	✓
16. Northeast Resiliency Consortium	✓	✓	✓			
17. Orthopedics, Prosthetics, and Pedorthics (HOPE) Careers Consortium	✓		✓	p		
18. PA Manufacturing Workforce Training Center						✓
19. Pathways to Success	✓		✓	gpa		
20. RevUp	✓	✓	✓	gpa, d		

TAACCCT grant project, consistently positive impact results listed first, followed by other grant projects listed alphabetically	Educational Outcomes				Employment Outcomes	
	Credential completion	Credits earned	Program completion	Other education outcome ^a	Employed	Earnings
21. Southeastern Economic and Education Leadership Consortium (SEELC)	✓		✓		✓	
22. Southwest Arkansas Community College Consortium (SWACCC)			✓			
23. XCEL-IT			✓	r	✓	✓

Source: Findings from the final evaluation reports from the 23 grants. See Anonymous (2017a, 2017b), Center for Applied Research (2017a, 2017b), Good and Yeh-Ho (2017), Harpole (2017), Hong, Boyette, and Saklis, (2017), Horwood et al. (2017), Jensen, Horohov, and Waddington (2017), Lawrence (2017), Negotia et al. (2017), Price et al. (2017), Smith et al. (2017), Swan et al. (2017), Takyi-Laryea et al. (2017), Takyi-Laryea, Passa, and Gall (2017), Tan and Moore (2017), The Improve Group (2017), Thomas P. Miller & Associates (2017), Thomas P. Miller & Associates and Hamai Consulting (2017), Thomas P. Miller & Associates and The Policy Research Group (2017), Woodke, Graf, and Driessen (2017), and WorkED (2017).

Notes: “Other” educational outcomes include measures of persistence, grade point average, program withdrawal, course completion, time to completion, number of semesters completed, and course grades. To determine the other education variables studied, d=dropout, gpa=grade point average, r=retention or semesters completed, and p=persistence to further education

Data availability and sample size typically dictated which outcomes were feasible to measure. All but one impact evaluation tracked educational outcomes. The most commonly measured outcomes were program completion and credentials earned. Sometimes, the analyses were disaggregated by credential type (e.g., associate’s degree, certificate), if multiple credentials were available as a part of a career pathway. While 8 of the 23 evaluations considered only a narrow range of educational outcomes, most evaluations (14 of the 23) studied other educational outcomes, such as participants’ time to completion and number of semesters enrolled.⁴⁵ These additional outcomes may have been included because one of the grant’s goals was accelerating participants’ learning.

Third-party evaluators only captured employment outcomes if the evaluator had access to administrative data—specifically state UI quarterly wage records—for both the treatment and the comparison groups. Having these data allowed evaluators to track employment of participants and comparison group members over time and could estimate postprogram quarterly employment and

⁴⁵ Student records maintained by colleges typically include data such as enrollment dates so measuring these outcomes could be feasible. It is possible that evaluators did not explore these additional outcomes because of time, resource, and privacy constraints or because these outcomes were not required by the US Department of Labor.

earnings. Of the 23 evaluations considered in this synthesis, 11 were able to obtain and use wage records.⁴⁶

Four out of 23 third-party evaluators restricted their analyses to certain programs of study or colleges within a TAACCCT project, in response to sample size constraints or a lack of data available for all programs and colleges. In these cases, larger programs with available data could be analyzed separately even if other programs were excluded. Sometimes, evaluators excluded specific programs within the grant project if the evaluator felt that no appropriate comparison group was available for participants in that program. The value of a community college credential can vary considerably by field of study (Dadgar and Trimble 2015), so even if evaluators had strong methodological reasons for excluding specific programs from the analysis, these decisions could influence the results.

3.2. Synthesizing the Impact Findings

This section summarizes the impact of TAACCCT projects on participants' educational and employment outcomes. It also synthesizes the findings by the various educational and employment impacts estimated by the third-party evaluators. The relevant outcomes discussed in this section are:

- credential attainment
- program completion
- other educational outcomes
- employment
- wages and earnings

Similar to the Rounds 1 and 2 impact findings, more evaluations included educational impacts than employment impacts, and educational impact estimates were more consistently positive than employment impact estimates.

Promising results emerged from the 22 evaluations that estimated the impact of TAACCCT projects on educational achievement and attainment. (One of the 23 evaluations did not estimate educational achievement and attainment impacts). Thirteen of the 22 evaluations providing educational impact estimates found positive differences in educational outcomes for participants, where positive

⁴⁶ To obtain administrative wage records, an evaluator would generally have to negotiate a data sharing agreement with a state department of labor or similar agency responsible for maintaining wage records for the administration of the unemployment insurance system. Matching students to their wage data would typically require social security numbers for all TAACCCT participants and members of the comparison group.

outcomes is defined as at least one statistically significant positive result and no statistically significant negative results.

The following points highlight the key takeaways from the findings on the impact of the grant projects on participants' education outcomes:

- Nine of the 12 evaluations that estimated the impact of grant-funded projects on credential attainment found statistically significant, positive effects. Higher credential attainment among participants supports the career pathways program design, which aims to accelerate learning by embedding shorter-term, stacked credentials in occupational training.
- Fifteen of the 19 evaluations that estimated the impact of participation on completion found statistically significant, positive effects on completion. Higher completion rates for participants suggests that, for most projects, student supports were sufficient to ensure program completion.

Eleven of the 23 evaluations provided findings from the analysis on employment outcomes. Six of those 11 evaluations showed consistently positive differences in employment outcomes during the study period, although a commonly cited limitation of the design of the grant was that there was too short a follow-up period due to the timing of producing the evaluation. Although there is no precise follow-up period that is “too short,” employment impacts are likely to require at least a year or two to emerge, depending on the length of the training and the typical time that it takes for a participant to find a job, and can be constrained by the lag in when earnings records are available (at least six months). A recent synthesis of career pathway evaluations also cited this as a common issue (Schwartz, Strawn, and Sarna 2018). As discussed throughout this report and in the Rounds 1 and 2 synthesis report, relatively limited availability of state administrative data to estimate employment and earnings impacts made it difficult to provide a clear and consistent story about how the strategies implemented may have affected participants' employment and earnings. For several evaluators, UI wage records were more readily available for the treatment group than the comparison group, because the treatment group could provide the required consent to release the data. Three of the 23 evaluations specifically mentioned limitations on the availability of wage data, although presumably several more evaluations that did not mention this limitation faced obstacles obtaining wage data. Evaluators could not estimate impacts without wage data on the comparison group as well as the treatment group, although some provided a pre-post analysis of participants using the available wage data.⁴⁷

⁴⁷ A pre-post analysis compares the performance of program participants before the program (the “pre” period) with their performance after treatment (the “post” period). Pre-post analyses were not considered or included in the reviews in this report because they cannot compare the postprogram performance of TAACCCT participants to the counterfactual of how they would have performed in the absence of TAACCCT. In other words, pre-post analyses cannot provide the “impact” of the project because they do not include a comparison group.

The following points highlight the key takeaways from the findings on the impact of the grant projects on participants' employment outcomes:

- Five of the 10 evaluations estimating the impact of participation on employment found positive, statistically significant effects on employment.
- Only 2 of the 9 evaluations estimating the impact of participation on earnings found a positive, statistically significant effect on earnings.⁴⁸
- These weaker impacts on employment outcomes suggest that the grant projects could improve connections to employers or their targeting of high-demand industries and occupations. It could also suggest that the follow-up period for the evaluation was not long enough to capture employment outcomes.

Table 3.2 provides key information on the 23 third-party evaluations, including the intervention being evaluated, estimation methods, sample sizes of treatment and comparison groups, data, limitations cited by authors of the report, and the impact estimates.

⁴⁸ One of the evaluations estimating impacts on employment outcomes studied wages but not employment, which in addition to the 10 evaluations estimating impacts on employment totaled to 11 evaluations exploring either wage or employment outcomes.

TABLE 3.2

Round 3 Evaluations with Quasi-Experimental Findings on Education and/or Employment Outcomes for TAACCCT Participants

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Advanced Manufacturing, Mechatronics, and Quality Consortium (AMMQC) (Mount Wachusett Community College)	Negoita et al. 2017	Enhanced program through employer engagement, curriculum development, student support and job placement services, and technology labeled earnings. (Advanced manufacturing)	Propensity score matching with regression adjustment. Difference-in-differences model used for completion rates	Completion analysis N=423 Employment analysis N=2,044 <u>Treatment Group:</u> AMMQC participants <u>Comparison Group:</u> Students in similar programs at the same college for completion analysis, and WIOA participants in the employment analysis	Student records and WIASRD	The report pointed out that program immaturity may affect impact results, and noted the difficulties of obtaining UI wage records.	<u>Completion:</u> =13.3 percentage points	<u>Employment_Q1:</u> =9.2 percentage points <u>Employment_Q2:</u> =22.8 percentage points <u>Employment_Q3:</u> =38.9 percentage points* <u>Employment_Q4:</u> =54.2 percentage points*

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
BOOST (Midlands Technical College)	Center for Applied Research 2017b	New and enhanced career pathways, with stacked credentials and instruction using human simulations and 3-D technology. (Healthcare)	Propensity score matching with regression-adjusted mean outcomes	Full sample N=1,755 <u>Treatment group:</u> TAACCCT participants across all colleges. <u>Comparison group:</u> Students enrolled in pre-health codes (recruitment source for TAACCCT)	Student records	Limited information from the state department of labor and a job readiness assessment that was implemented late.	<u>Certificate completion:</u> All colleges=28 percentage point increase*** <u>Associate's completion:</u> All colleges=6 percentage point decline*** <u>Program completion:</u> All colleges: 3 percentage point increase <u>GPA:</u> 0.18*** <u>Semesters enrolled:</u> 0.23***	n.a.
Bridging the Gap (Bridgemont Community and Technical College)	Thomas P. Miller & Associates and The Policy Research Group 2017	Enhanced a wide range of programs using career pathways and student support services. (Energy, Advanced manufacturing, IT, and Construction)	Propensity score matching with regression adjustment	N=1,808 <u>Treatment Group:</u> TAACCCT participants <u>Comparison Group:</u> Prior cohort of students in similar programs	Student records and state wage data	The evaluation cited standard limitations of a quasi-experimental design, including selection on unobservable characteristics and low external validity.	<u>Credit acquisition:</u> =-0.06* <u>Dropping out:</u> =0.14* <u>Earning a certificate or associate's degree:</u> =0.01*	<u>Employment:</u> =0.02 <u>Earnings:</u> =258.76

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Central Georgia Healthcare Workforce Alliance (Central Georgia Technical College)	Center for Applied Research 2017a	Training was enhanced by a collaborative, blended learning approach. The program also provides remote access to rural students. (Healthcare)	Propensity score matching with regression adjustment	N=2,429 <u>Treatment Group:</u> BlendFlex participants <u>Comparison Group:</u> Healthcare students who were not enrolled in BlendFlex	Student records	The evaluation identified data limitations and limited follow up periods.	<u>Cumulative GPA:</u> =0.2* <u>Credits:</u> =8.23* <u>Credential:</u> Odds ratio=1.47*** <u>Completion:</u> Odds ratio=1.28***	n.a.
DC Construction Academy (DCCA) (University of the District of Columbia-Community College)	Takyi-Laryea, Passa, and Gall 2017	Enhanced programs to be “academies,” with expanded online programming, new curricula, learning assessments, and integrated teaching. (Construction and Hospitality)	Propensity score matching with no evidence of regression-adjustment	N=785 <u>Treatment group:</u> DCCA participants (no comparison group for DCHA participants) <u>Comparison group:</u> Prior cohort of construction students	Student records	There was no adequate comparison group for the participants in the hospitality program because it was new.	<u>Program completion:</u> =-1 percentage point <u>Credential attainment:</u> =16.5 percentage points***	n.a.

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Golden Triangle Modern Manufacturing (East Mississippi Community College)	Harpole 2017	New and enhanced programs, including professional development for faculty, new industry-endorsed credentials embedded in programs, online learning technology, self-paced remediation, and two navigators. (Advanced manufacturing)	Propensity score matching with 2-to-1 matching but did not seem to use any regression-adjustments for the estimates	N=921 <u>Treatment group:</u> TAACCCT participants <u>Comparison group:</u> Prior cohort of students enrolled in similar programs in 2009-2012	Student records	The evaluation cited standard limitations of a quasi-experimental design and a historical comparison group, including selection on unobservable characteristics and low external validity.	<u>Retention rate:</u> =31 percentage point*** <u>Completion rate:</u> =51 percentage point*** <u>Further education:</u> =4 percentage point*	<u>Employment:</u> =38 percentage points* <u>Job retention:</u> =36 percentage point <u>Earnings increase:</u> =1.34 percentage point***
Greater Cincinnati Manufacturing Career Accelerator (GCMCA) (Cincinnati State Technical and Community College)	Thomas P. Miller and Associates 2017	Enhanced programs in welding, mechanical engineering technology, and CNC programming with adaptive learning, boot camps, and contextualized basic skills classes. (Advanced manufacturing)	Propensity score matching with 1-to-1 matching and regression-adjusted mean outcomes	Welding N=110 MET N=315 <u>Treatment group:</u> TAACCCT participants in welding and MET programs <u>Comparison group:</u> Students enrolled in similar programs that did not participate in TAACCCT	Student records	The evaluation cited standard limitations of a quasi-experimental design, including selection on unobservable characteristics and low external validity.	<u>Dropping out:</u> Welding, odds ratio=0.48 MET, odds ratio=0.06* <u>Persistence through school year:</u> MET, odds ratio=3.35*	n.a.

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Health Science Pathways for Academic Career and Transfer Success (H-PACTS) (Los Angeles Trade Technical College)	Tan and Moore 2017	Redesigned healthcare educational pipeline programs, developed new core competencies, and expanded credential opportunities. (Healthcare)	Propensity score matching with regression adjustment	N=19,246 <u>Treatment Group:</u> TAACCCT Participants <u>Comparison Group:</u> Historical cohorts of healthcare students	Student records	The report noted the short study period and the lack of maturity of the program as it currently existed.	<u>GPA:</u> =0.18*** <u>Retention:</u> Odds ratio=1.81*** <u>Program completion:</u> Odds ratio=7.23***	n.a.
IMPACT (Gateway Community and Technical College)	Jensen, Horohov, and Waddington 2017	Enhanced and accelerated career pathways in logistics, manufacturing, HVAC, and energy. Enhancements included new curriculum, work-based learning opportunities, flexible course delivery, and support services. (Manufacturing, Utilities, Construction, and Transportation and Logistics)	Propensity score matching but no evidence of regression adjustment.	N=321 <u>Treatment group:</u> Participants in all TAACCCT and for full and advanced programs <u>Comparison group:</u> Prior cohorts from affected programs	Student records and state wage records from the Kentucky Center for Workforce Statistics (KCEWS), a state longitudinal data system	The evaluator noted the high likelihood of missing employment information due to the location of the Gateway on the border between Kentucky and Ohio.	<u>Courses passed:</u> =13.429** <u>Awarded a credential:</u> =0.470**	<u>Mean earnings increase:</u> =\$520 <u>Employed after enrollment (incumbent workers):</u> =-5.5 percentage points

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
INTERFACE (Northcentral Technical College)	Smith, Gregg, Roth, Stoeklen, Krueger, Lawton, and Knaeble 2017	New and enhanced pathways in IT with improvements in PLAs and supportive services. (IT)	Propensity score matching with regression-adjusted mean outcomes	N=65,115 (sample varied for certain outcomes, but the treatment group included 4,962 students) <u>Treatment group:</u> TAACCCT participants (sample was conditioned for some outcomes) <u>Comparison group:</u> All non-participating students at the same college. Matching on field of study ensured that IT students had the highest weight.	Student records (employment and wage data collected from the colleges as well, who received it from the state).	Evaluators received wage and employment data only once, in November 2016, no matter when a student completed. The evaluators also noted the short follow-up period for the evaluation.	<u>Program completion:</u> =112 percentage point increase (Report did not include p-values or standard errors. Report indicates that this estimate is statistically significant) <u>Retention:</u> =3 percentage point increase (Report did not include p-values or standard errors. Report indicates that this estimate is not statistically significant)	<u>Employment:</u> =31 percentage point increase in employment for incumbent workers in 2015-2016 (Report did not include p-values or standard errors. Report indicates that this estimate is statistically significant) <u>Earnings:</u> Report did not include p-values or standard errors. Report indicates that this estimate is not statistically significant., Estimate not reported.

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Linn-Benton iLearn (Linn Benton Community College)	Thomas P. Miller & Associates and Hamai Consulting 2017	Enhanced existing programs across a wide range of fields by developing an online platform. Expanded capacity by hiring staff and developing curriculum. (Healthcare, Business and Office Administration, and Communications)	Propensity score matching, 2-to-1 matching ratio with regression-adjusted mean outcomes	N=579 (after match) <u>Treatment group:</u> TAACCCT participants <u>Comparison group:</u> Students in comparable traditional programs	Student records and wage data from the Oregon Employment Department	The evaluation cited standard limitations of a quasi-experimental design, including selection on unobservable characteristics and low external validity.	<u>Program completion:</u> Odds ratio=37.21*** <u>Credits earned:</u> =-0.06	<u>Employed:</u> Reported that results were not statistically significant but no point estimate. <u>Earnings:</u> Reported that results were not statistically significant but no point estimate.
Maine is IT! (Central Maine Community College)	Horwood, Usher, McKinney, and Passa 2017	Enhanced IT programs by building bridges between non-credit and credit programs, expanding PLA, and remediation. (IT)	Propensity score matching with regression adjustment	N=1,624 <u>Treatment Group:</u> TAACCCT Participants <u>Comparison Group:</u> Business Administration students at the same schools	Student records	None identified.	<u>Credit hours:</u> =0.699 <u>Earned a degree:</u> Odds ratio ^c =1.4 <u>Earned a credential:</u> Odds ratio ^c =0.66	n.a.

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Mississippi River Transportation Distribution and Logistics (MRTDL) Lewis and Clark Community College	Anonymous 2017a	Enhances transportation, distribution, and learning programs with sector training partnerships and stacked and latticed credentials. (Transportation, Distribution, and Logistics)	Propensity score matching with regression adjustment	Sample size varies by college and program <u>Treatment Group:</u> MRTDL participants <u>Comparison Group:</u> Students in similar programs at the same school during the same time period	Student records	In addition to the normal limitations of quasi-experimental design and imperfect data, the report notes the limitations posed by small sample size.	<u>Completion:</u> Twenty-three impact estimates are provided across colleges and programs with no average impact. Impacts range from an odds ratio of 0.4 at John Wood Community College to 15.4 at West Kentucky Community and Technical College. All effects except John Woods is non-negative.	n.a.
North Dakota Advanced Manufacturing Skills Training Initiative (North Dakota State College of Science)	WorkED 2017	Enhancement of mechatronics pathways by expanding online options, tailoring to adult learners, and introduction of prior learning assessments. The intervention also included enhancement of articulation to four year schools. (Advanced manufacturing)	Propensity score matching, no evidence of regression adjustment	N=372 (Varies for other outcomes) <u>Treatment group:</u> TAACCCT participants in the welding program <u>Comparison group:</u> Prior cohort of participants in the welding program	Student records and UI wage records	A prior cohort of students is a weak comparison group if there are significant unobserved differences. The surveys could introduce non-response bias.	<u>Program completion:</u> =16 percentage point increase (no p-value reported)	<u>Employment (Completers):</u> =-2 percentage points (no p-value reported) <u>Experienced earnings increase (incumbent workers employed post-program):</u> =-6 percentage points (no p-value reported)

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Northeast Resiliency Consortium (Passaic County Community College)	Price, Childress, Sedlak, and Roach 2017	Enhanced and connected programs in resiliency-related fields with comprehensive services (personal, career, and academic). (Healthcare, IT, Hospitality, and Environmental Technologies)	Propensity score matching, no evidence of regression adjustment	Comprehensive Supports N=2,738 Articulated Pathway N=3,188 <u>Treatment group:</u> TAACCCT participants receiving comprehensive supports and enrolled in an articulated pathway <u>Comparison group:</u> Students in similar programs	Student records	The major limitation was the lack of UI wage records.	<u>Program completion:</u> Comprehensive supports=38 percentage point increase*** Articulated pathways=-1 percentage point increase <u>Credentials earned:</u> Comprehensive supports=37 percentage point increase*** Articulated pathways=4 percentage point increase	n.a.

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Orthopedics, Prosthetics, and Pedorthics (HOPE) Careers Consortium (Century College)	Good and Yeh-Ho 2017	Developed or enhanced 19 certificate and degree programs and invested in lab equipment. (Healthcare)	Propensity score matching with regression adjustment	Sample sizes vary by college and program, but all were small <u>Treatment Group:</u> TAACCCT participants <u>Comparison Group:</u> Other students, no details on selection procedure	Student records	The report notes limited sample size and inconsistent variable collection across colleges as the major limitation.	<u>Completion (odds ratio):</u> College A=1.40 College B=1.82 College C=2.80 College D=1.78 College E=8.88* <u>More than one credential earned (odds ratio):</u> =0.41 <u>Further education (odds ratio):</u> College A=0.49 College B=0.58 College C=0.07** College D=0.86 College E=1.81	n.a.
PA Manufacturing Workforce Training Center (Thaddeus Stevens College of Technology)	Lawrence 2017	Enhanced and established new programs by writing new curriculum and investing in equipment. (Advanced manufacturing)	Coarsened exact matching (CEM), (Iacus, King, and Porro, 2011).	N=114 <u>Treatment Group:</u> TAACCCT participants <u>Comparison Group:</u> Local WIOA supported workers	Student records and WIASRD	None identified	n.a.	<u>Hourly wage:</u> =\$2.75

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Pathways to Success (Northern Wyoming Community College)	Woodke, Graf, and Driessen 2017	The program used pre-assessments and math boot camps to improve the readiness of CTE students, provided online and technology-enabled learning, and expanded prior learning credit options. (Energy)	Propensity score matching, no regression-adjustment of estimates	N=107 <u>Treatment group:</u> TAACCCT participants <u>Comparison group:</u> Prior cohort of similar students.	Student records	The sample size for the analysis was small, with 66 treatment cases and 41 comparison group cases. The evaluators could not obtain individual wage records.	<u>GPA:</u> =0.18 <u>Credential attainment:</u> Statistically significant positive impacts noted, but no estimate provided <u>Program completion:</u> =13.4 percentage point increase. Noted as statistically significant, but no p-value reported.	n.a.
RevUp (Great Falls College)	Hong, Boyette, and Staklis (2017)	New and enhanced short-term credentials in advanced manufacturing and energy with comprehensive supportive services. (Advanced manufacturing and Energy)	Marginal mean weighting through stratification (MMW-S) with regression-adjusted outcomes (Hong and Hong, 2009; Hong, 2010)	N=1,192 <u>Treatment group:</u> TAACCCT participants who attempted at least 9 advanced manufacturing credits <u>Comparison group:</u> Prior cohorts from the same or similar programs at same colleges	Student records	The follow-up period may have been too short to observe effects. Limited time for students to complete credentials. Employment impacts are not reported, as the evaluators did not have access to student-level employment data.	<u>Dropout:</u> After 1 year, odds ratio ^c = 1.750* <u>Credential completion:</u> Odds ratio ^c = 1.127 <u>GPA:</u> = -0.2208***	n.a.

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Rural Information Technology Alliance (Pine Technical and Community College)	The Improve Group 2017	Enhances IT programs with intensive advisor coaching, infrastructure investments, and new learning technologies. (IT)	Propensity score matching with regression adjustment. Propensity score was used as a covariate in regression	Total sample not reported. Unmatched Treatment=1,895 <u>Treatment group:</u> TAACCCT participants <u>Comparison group:</u> Students who took at least two IT classes in the last five years and agreed to be surveyed.	Student records, student survey, UI wage records	The report noted selection on unobservable characteristics as a possible limitation, as well as restricted follow up time.	<u>Earned associate's degree:</u> Odds ratio ^c = 1.58 <u>Earned certificate:</u> Odds ratio ^c = 24.09 <u>Earned diploma:</u> Odds ratio ^c = 0.13	Participation had a positive impact on employment and earnings that declined over time and varied across schools. See text description for difficulties in reporting a single point estimate.
Southeastern Economic and Education Leadership Consortium (SEELC) (Pellissippi State Community College)	Takyi-Laryea et al. 2017	Programs were enhanced by aligning with industry standards and certifications, and by implementing competency assessments for incoming students. (Advanced manufacturing)	Propensity score matching with regression adjustment	Total sample varies by outcome. <u>Treatment group:</u> TAACCCT participants who took a WorkKeys assessment. <u>Comparison group:</u> Students who took similar courses and did not take a WorkKeys assessment.	Student records and UI wage records	None identified	<u>Completion:</u> Odds ratio ^c = 1.105 <u>Earned a degree:</u> Odds ratio ^c = 1.768 <u>Earned a certificate:</u> Odds ratio ^c = 1.010	<u>Employed at Q1:</u> Odds ratio ^c = 0.212

TAACCCT grant project (grantee)	Authors	Intervention for impact analysis (Industry)	Estimation methods	Sample (unmatched N)	Data	Limitations noted by authors in reports ^a	Impact Estimates (=Average Treatment Effect) ^b	
							Educational outcomes	Employment outcomes
Southwest Arkansas Community College Consortium (SWACCC) (South Arkansas Community College)	Anonymous 2017b	Programs were enhanced by pursuing sector partnerships, promote credit for prior learning, work-based learning, and basic skills bridge models. (Advanced manufacturing)	Propensity score matching with regression adjustment	Sample sizes vary by college and program <u>Treatment Group:</u> TAACCCT Participants <u>Comparison Group:</u> Students in similar programs at the same college	Student records	The report raised concerns about small sample sizes and inadequate comparison groups at some colleges.	<u>Completion:</u> Seven impact estimates are provided across colleges and programs with no average impact. Impacts range from an odds ratio of 0.2 at Rich Mountain Community College to 11.6 at South Arkansas Community College. All effects except Rich Mountain is non-negative.	n.a.
XCEL-IT (College of Central Florida)	Swan, Hahs-Vaughn, Fidanzi, Serpa, DeStefano, and Clark 2017)	Built capacity to provide specialized IT training in rural areas, including development of career pathways, online courses, and refined outreach to students (IT) .	Propensity score matching using 1-to-1 neighbor matching, with regression-adjusted outcomes	N=788 <u>Treatment group:</u> TAACCCT participants from Year 2 <u>Comparison group:</u> Students in similar programs	Student records and UI wage records	A comparison group was not available in one of the seven colleges and relatively few comparison cases were available in three other colleges, making balancing the treatment and comparison group more difficult.	<u>Program completion:</u> Odds ratio=7.675*** <u>Retained in other education:</u> Odds ratio=0.501**	<u>Employment:</u> Odds ratio=6.171* <u>Received a wage increase:</u> Odds ratio=1.165

Sources: Selected Round 3 final evaluation reports. See Authors column for citations.

Notes: GPA=grade point average, IT=information technology, n.a.=not available, PA=Pennsylvania, TAACCCT=Trade Adjustment Assistance Community College and Career Training, UI=unemployment insurance, WIOA=Workforce Innovation and Opportunity Act, WIASRD=Workforce Investment Act Standardized Record Data. ^a Nearly all evaluation reports acknowledge that the quasi-experimental methods used cannot rule out other explanations for the findings due to unobserved characteristics not included in the analysis. ^b

^c *0.10 significance level, **0.05 significance level, ***0.01 significance level. ^c Odds ratios are calculated from reported logistic regression coefficients.

Credential Attainment

Twelve of the 23 third-party evaluations estimated the impact of TAACCCT projects on the completion of a credential, using either a logistic regression or a linear probability model.⁴⁹ Nine of the 12 evaluations showed positive impacts of the projects on credential attainment, two evaluations did not identify a statistically significant impact on credential completion, and one evaluation indicated a negative impact on credential attainment. The estimated positive impacts ranged from a 1 percentage point increase in credential completion associated with the *Bridging the Gap* project to participants in the *Rural Information Technology Alliance (RITA)* project, who were 24.1 times more likely to attain a credential than the comparison group. Most impacts on credential attainment were less remarkable than the *RITA* results, but still indicated substantial improvement in the lives of participants. For example, in the evaluation of the *Golden Triangle* project, almost double the share of participants completed the program compared to the comparison group (90 percent compared to 46 percent).⁵⁰

The one project with a negative impact on credential attainment, *Maine is IT!* also had a positive estimated impact on completion of degrees as distinct from non-degree credentials. This distinction is particularly important because most programs at *Maine is IT!* are degree programs rather than certificate programs. Thus, even in the case of *Maine is IT!*, it is reasonable to interpret the evaluation as estimating positive impacts on the credentials awarded in most of their programs. One of the evaluations with statistically insignificant credential attainment impacts suffered from unusually small sample sizes.⁵¹ The second evaluation with statistically insignificant credential attainment impacts cited a short follow-up period of only one year for participants as an important reason for the lack of positive impacts.⁵²

The three projects that did not show a positive credential attainment impact were not distinctive from the programs that did have a positive impact. They provided training in a similar set of occupations (advanced manufacturing, information technology, and health care), provided similar enhancements and services, and used similar quasi-experimental methods. The lack of a positive credential attainment

⁴⁹ Modeling choices affect whether the results are expressed as odds ratios or percentage point changes. Alternative estimates are not directly comparable to each other.

⁵⁰ Odds ratios of this magnitude are the result of very low comparison group completion probabilities.

⁵¹ See Lawrence (2017). The grantee was the Orthopedics, Prosthetics, and Pedorthics (HOPE) Careers Consortium.

⁵² See Hong, Boyette, and Staklis (2017). The grantee was the RevUp project.

impact in these three programs is therefore difficult to attribute to a difference in methodology, and may instead be related to project characteristics.

Program Completion

Nineteen of the 23 third-party evaluations estimated the impact of TAACCCT projects on program completion. As in the case of the completion of credentials, these estimates were produced using either a logistic regression or a linear probability model.⁵³ Often, third-party evaluations that did not estimate credential attainment impacts estimated program completion impacts instead, and of course credential attainment is closely associated with program completion. Only one of 23 third-party evaluations (*PA Manufacturing Workforce Training Center*) did not provide estimates for impacts on either credential or program completion.⁵⁴

Fifteen of the 19 evaluations estimating program completion identified a positive impact of the TAACCCT project, while two found no statistically significant impacts, and two identified a negative impact. The estimated positive impacts ranged from a three-percentage point increase in program completion for the BOOST program to *Linn-Benton iLearn* participants, who were 37 times more likely to complete their program than students in the comparison group.⁵⁵

The two projects with a negative impact on program completion (*Bridging the Gap* and *RevUp*) and one of the projects with a statistically insignificant impact (*DC Construction Academy* and *DC Hospitality Academy*) were also the only three projects that used dropping out as an outcome variable rather than program completion.⁵⁶ In both projects with negative impacts, these grant-funded projects increased the dropout rate, which should be equivalent to reducing the completion rate. There is no obvious reason why this approach to measuring the outcome variable should affect the impact estimates. Both evaluations with negative impacts had large sample sizes (*Bridging the Gap* had a sample of 1,808 and *RevUp* had a sample of 1,192) and used prior cohorts of students as the comparison group, although those characteristics did not distinguish them from the other evaluations. The second project with a statistically insignificant program completion impact (*DC Construction Academy* and *DC Hospitality*

⁵³ Modeling choices affect whether the results are expressed as odds ratios or percentage point changes. Alternative estimates are not directly comparable to each other.

⁵⁴ *PA Manufacturing Workforce Training Center* only estimated impacts on employment and earnings outcomes.

⁵⁵ Odds ratios of this magnitude are the result of very low comparison group completion probabilities.

⁵⁶ *Bridging the Gap* and *RevUp* were the two projects with negative completion impacts. *Greater Cincinnati Manufacturing Career Accelerator* had a statistically insignificant impact.

Academy) increased credential attainment by 16.5 percentage points. This may signal the nature of career pathways where a participant can earn credentials before completing a program of study.

Additional Educational Outcomes

Program completion and credential attainment were by far the most common individual education outcomes included in the impact evaluations of the third-party evaluations (18 and 12 out of 23 evaluations, respectively). However, 15 of the 23 evaluators included at least one additional educational outcome measures, such as credit accumulation, grade point average (GPA), and continued education. These other educational outcomes tended to have more negative results. Three of the six evaluations that estimated credit accumulation impacts estimated a negative impact (although one of these was statistically insignificant).

One of the four evaluations that estimated GPA impacts, the *RevUp* evaluation, found that participation reduced GPA by 0.2 points.⁵⁷ The evaluation of *Pathways to Success* found that the project did not have a statistically significant impact on GPA, and neither of the two positive GPA impact estimates (for *Central Georgia Healthcare Workforce Alliance* and *H-PACTS*) were large (both 0.2 points). Therefore, while these additional educational impacts were more positive than negative, they were not as consistently positive as the credential attainment and program completion impacts.

Employment

Ten of the 23 evaluations estimated the impact of TAACCCT projects on employment, either through logistic regression or linear probability models.⁵⁸ Four of the 10 evaluations estimating impacts on employment identified a positive impact of the project, while six found no statistically significant impacts, and none identified a statistically significant negative impact (although the *North Dakota Advanced Manufacturing and Skills Training Initiative* found negative results and did not report statistical significance. This is counted a non-statistically significant result). The estimated positive impacts were large, ranging from a 38 percent increase in employment for *Golden Triangle* participants to employment rates that were 6.2 times higher for *XCEL-IT* participants compared to non-participants.

⁵⁷ DOL did not ask grantees to track performance on GPA outcomes as with other outcomes, which may be why few evaluators captured this outcome.

⁵⁸ Modeling choices affect whether the results are expressed as odds ratios or percentage point changes. Alternative estimates are not directly comparable to each other.

Wages and Earnings

Nine of the 23 third-party evaluations estimated the impact of TAACCCT projects on earnings, typically using a linear regression model, although in one case a logistic regression model estimating impact on an earnings increase. Two of the 9 evaluations estimating impacts on earnings identified a statistically significant positive impact of the project, while seven found no statistically significant impacts, and none identified a statistically significant negative impact (although the *North Dakota Advanced Manufacturing and Skills Training Initiative* found negative results and did not report statistical significance. This is counted a non-statistically significant result). The estimated positive impacts ranged from a 1.3 percent increase in earnings for *Golden Triangle* participants to a \$2.75 increase in the hourly wage for the *PA Manufacturing Workforce Training Center*, which was the only evaluation to look at hourly wages rather than total earnings. The comparison group for *PA Manufacturing Workforce Training Center* students earned \$13.87 an hour, so the \$2.75 increase was an almost twenty percent wage increase.

Although the employment and wage/earnings results are not as positive as the educational impacts because fewer projects resulted in increased employment and earnings for their participants, only one project, the *North Dakota Advanced Manufacturing Skills Training Initiative*, reported negative employment and earnings impacts (although statistical significance levels were not reported). One element of the North Dakota project was the enhancement of articulation agreements with four-year colleges, so it is possible that program completers are connecting to jobs at a lower rate because they are continuing in their education. The sample size of the North Dakota project is also relatively small, although large enough to identify statistically significant negative impacts. The projects with statistically insignificant estimated employment impacts operate fairly typical projects that are similar to the others insofar as they include career pathways, stacked and latticed credentials, and technology-enabled learning.

Few patterns in strategies implemented by grantees for their projects explain the positive and negative employment and earnings impacts, just as project characteristics did not provide a clear explanation for weaker performance on educational outcomes. We would expect sector strategies and employer partnerships to have a particularly strong effect on employment and earnings outcomes based on previous studies (e.g., Maguire et al. 2010), although in practice these strategies are difficult to correlate with positive and negative impact estimates because most, if not all, grantees had some form of employer engagement. Beyond project characteristics, the strength of the local labor market may have affected estimated impacts in important ways. Broader labor market conditions could have also impacted results. Grant projects may have been more effective in stronger labor markets where more jobs were available, or more effective in weaker labor markets where employers are more selective. In

either case, the possible role of local labor market conditions on measured impacts was not directly explored in the evaluations.

However, it is clear across multiple educational and employment outcomes that grant-funded projects had a more consistent positive impact on educational outcomes than on employment outcomes. This is a common finding in career pathways evaluations (e.g., Anderson et al., 2017) and may indicate that programs could improve their connection to the local labor market. Weaker employment impacts may also be attributable to short follow-up periods, which could have a greater effect on employment impact estimates than educational impact estimates.

3.3. Common Evaluation Issues across the Rounds 1–3 TAACCCT Grants

Similar to the Rounds 1 and 2 findings, the findings from the Round 3 third-party evaluations can only be suggestive of the impacts the TAACCCT projects had on participants' education and employment outcomes. The synthesis did not formally review the final evaluation reports as would occur when reviewed by a federal clearinghouse, such as CLEAR, that assesses the rigor of evaluation evidence.⁵⁹ However, the review for the synthesis reveals common issues across many of the evaluations in the first three rounds and highlights some strategies for overcoming them. These issues are broadly applicable to experimental and quasi-experimental evaluations of career pathways initiatives.

Lack of Findings from Experimental Evaluations. Similar to the Rounds 1 and 2 grants, no Round 3 third-party evaluators used experimental design, which provides the strongest evidence of the impact of an intervention on a treatment population. Based on informal discussions with some third-party evaluators, random assignment of treatment and control groups was challenging in the TAACCCT setting, as community colleges generally do not deny enrollment to any interested applicant because of open access policies. Also, it may have been difficult to randomly assign applicants because of the grant activities' nature. For example, many grant projects developed courses and tools that students across the college could access, introducing potentially serious problems with contamination of the control group if control group members accessed these grant activities. Finally, the grantees had to meet enrollment goals for the TAACCCT grants, which were often ambitious and difficult to meet. If grantees faced a difficult enrollment goal for their grant, it would be especially unlikely that there would be

⁵⁹ DOL's CLEAR uses a specific protocol for assessing the rigor of the evaluation and the strength of the evidence based on the methods used. While this synthesis does discuss the rigor of each of the 23 evaluations, it does not apply a specific detailed protocol like the CLEAR protocol.

oversubscription to TAACCCT programs. Grantees typically set enrollment goals that were aligned with the number of students they could feasibly recruit and serve under the grant, rather than planning a recruitment strategy designed to accommodate oversubscription and random assignment, which could better support experimental evaluation design.

Identification of a Viable Comparison Group. Evaluators often had difficulty finding viable comparison groups, especially those who could only draw comparison groups from students within the grant-funded colleges. Evaluators attempted to identify students in similar programs of study that were in current or prior cohorts but some could not for a few reasons. First, grantees may have designed new programs of study for an occupation or industry for which they did not have a similar program with students who did not participate in grant-funded activities. For example, among the 23 evaluations reviewed in this report, the final evaluation for the University of the District of Columbia Community College did not include an estimate of the impact of the *DC Hospitality Academy* because no appropriate comparison group was available (the *DC Construction Academy* was evaluated). A second reason why grantees may not have been able to identify a comparison group is that a full set of data on a comparison group may not have been available to the evaluators, due to privacy concerns or data limitations. A grant that requires coordination with the state education agency or board could help overcome these issues as the state could help grantees access data on students in colleges that did not develop grant-funded programs of study or other activities.

Unobservable Characteristics for the Quasi-Experimental Analyses. The impact findings often had selection issues that remained after the match due to unobservable characteristics. For example, only one of the evaluations, for the *Bridging the Gap* program, included preprogram earnings as a matching variable, a key predictor of program participation (Thomas P. Miller & Associates and The Policy Research Group 2017). Other evaluations could not use preprogram earnings as a matching variable because they could not access the necessary wage record data. Again, coordination with the state, this time the labor department which runs UI wage record databases, as a grant requirement could help alleviate this issue. Differences over time that could not be accounted for in the analysis could also cause selection bias. For example, prior cohorts may have been highly motivated to complete training as their enrollment may have occurred during the 2007 recession. However, they could also have had poorer employment outcomes than other cohorts during that period because of high unemployment across the economy, not the effect of the training.

Low Treatment Contrast. Low treatment contrast occurs when there are minimal differences between the program experiences of the treatment and comparison groups, making it difficult to statistically estimate program impacts. For example, if a class had substantially similar content but was

enhanced by the grant project to include a new simulator, students' experiences may not be improved enough to detect a substantial difference in outcomes. A higher treatment contrast, such as a wholesale redesign of the curriculum with substantial support services, might present a higher treatment contrast. The estimated impact of the grant-funded projects may be small because the comparison group received a similar program or services that participants also received. In other words, if evaluators draw a comparison group from a similar program and estimate a small impact, it does not necessarily mean that the program was not effective; it could mean that it was as effective as the programs in the comparison group. Findings from implementation studies would be useful for understanding the extent of these treatment contrasts.

The innovations supported by the grant would be the main difference between the treatment and comparison group, but these innovations would only contribute a part of the total impact of the grant-funded program. The evaluation of the BOOST program took an alternative approach and drew the comparison group from a pool of pre-health students that served as a recruitment source for the BOOST program itself. This comparison group allowed for the impact estimate to account for the full benefits of the project over the alternative options available to pre-health students rather than another type of training. Matching participants to a recruitment source is common in impact evaluations, but it requires access to data on a well-defined recruitment pool. The third-party evaluators for BOOST had a specific recruitment pool available for the project and had access to baseline data on those individuals.

Difficulty Obtaining Employment Data. One of the most significant limitations of the evaluations was difficulties obtaining wage data. Many third-party evaluators either had difficulty accessing wage records, or their access was limited to the treatment group only, precluding an impact analysis of employment outcomes.⁶⁰ Some evaluations could access averaged wage data for a cohort of students, which typically precluded an impact analysis of employment outcomes (e.g., Horwood et al.'s 2017, evaluation of the *Maine is IT!* Program). Problems obtaining wage records were compounded for consortia, which often had to navigate the process of obtaining wage records across multiple state data systems. Some grantees used survey data on employment outcomes as an alternative, but surveys were difficult to administer to comparison group members, who may not have a relationship with the grantee or have any incentive to respond. Generally, when wage records were difficult to obtain, evaluators

⁶⁰ Not all evaluations excluding wage impacts explicitly noted difficulties accessing wage records as a limitation, although evaluations that did face these difficulties include the Center for Applied Research's (2017) evaluation of BOOST, Price, Childress, Sedlack, and Roach's (2017) evaluation of the Northeast Resiliency Consortium, Woodke, Graf, and Driessen's (2017) evaluation of Pathways to Success, and Hong, Boyette, and Staklis's (2017) evaluation of RevUp. It is possible that evaluations that did not produce an employment or wage impact and did not cite difficulties obtaining wage records as a limitation nevertheless faced difficulties obtaining wage records.

simply omitted employment outcomes from their impact analyses. Similar to other issues, coordination with state agencies which maintain these data could help evaluators overcome these issues.

Short Follow-Up Periods for Estimating Impacts. Another constraint on the third-party evaluations was the limited follow-up time available to study the impacts of the program. Unlike variations in access to wage records across third-party evaluators, follow-up time constraints impacted all evaluators equally. Final evaluations were submitted at the end of the grant program (September 2017), so that there was not follow-up time available for evaluating the latest cohorts of participants. Earlier program cohorts of as comparison group members had a longer follow-up time, although this could limit the available treatment sample to those who participated earlier in the grant-funded project.

Education outcomes were less affected by the limited follow-up time than employment outcomes, as short program lengths typically ensured the possibility of program completion and credential attainment and the observation of most educational outcomes during the evaluation period. Limited observational periods for post-program employment activity raises the question of how to project short-term (i.e., less than a year or two) employment and earnings impacts into the future. A conservative assumption is that any impacts will decay over time. However, some research suggests that earnings gains can persist long into the future if they are associated with continued progress through a career pathway that participants access through training (Elliot and Roder 2017; Minaya and Scott-Clayton 2017). None of the evaluations attempted to resolve this problem by projecting or forecasting impacts into the future.

Small Sample Sizes. Small sample sizes affected the third-party evaluations in a few ways. Some evaluators only estimated the impact of selected grant-funded programs or colleges that had large enough sample sizes for analysis. Other evaluators indicated that the size of their treatment groups may have been too small to detect statistical differences in outcomes for treatment and comparison groups. Sample size concerns also matter because many evaluators may not have used any quasi-experimental methods at all due to the small size of the enrollment numbers for the grant. These evaluations are excluded from this synthesis, so the results reported here may not be generalizable to smaller grant projects, which may be in emerging fields of study. The implementation and outcomes studies for projects with smaller sample sizes could offer valuable information on promising strategies, as highlighted in the implementation syntheses for the national evaluation.

Failure to Use Diagnostic Tests for Quasi-Experimental Analyses. Another common issue of the third-party impact evaluations was a general failure to apply the proper diagnostic tests to ensure that the methods were successfully executed. Propensity score matching and weighting analyses are expected

to exhibit “covariate balance,” or equivalence between the treatment and comparison groups on observed characteristics (Rosenbaum and Rubin 1983; Caliendo and Kopeinig 2008). Covariate balancing between treatment and comparison groups is a necessary condition for a successful analysis. A strong example of a third-party evaluation establishing baseline equivalence of the observed covariates using balancing test is from Thomas P. Miller & Associates and The Policy and Research Group’s (2017) evaluation of the Bridging the Gap program. By including balancing tests, the Bridging the Gap evaluation is able to demonstrate to readers that their matching analysis successfully identified a comparison group that reflected the observable characteristics of participants. However, while balancing tests can help ensure that a particular quasi-experimental impact analysis effectively mimics random assignment with respect to observable characteristics, they may not be sufficient since it cannot guarantee balance on unobservable characteristics.⁶¹

⁶¹ Other quasi-experimental designs have similar diagnostic tests to validate comparable design assumptions. For example, difference-in-differences estimations require the demonstration of equal trends in the pre-treatment period, while regression discontinuity designs require no manipulation of the variable that assigns cases to treatment (McCrary 2008). The large majority of Round 3 third-party evaluations, though, are matching studies. Only one study (Hong, Boyette, and Staklis’s (2017) evaluation of RevUp, did not use matching although this evaluation did use a weighting method that is conceptually similar to matching. Negoita et al.’s (2017) evaluation of the Advanced Manufacturing, Mechatronics, and Quality Consortium used a difference-in-differences model to estimate the impact of the project on completion rates, but also used a matching design.

4. Conclusions

To build the evidence on career pathways approaches, the Round 3 TAACCCT third-party evaluations produced 23 final evaluation reports that estimated the impact of the grant-funded projects on participant outcomes using rigorous quasi-experimental designs (out of a total of 56 final evaluation reports). These impact findings offer insights into how well participants fared in increasing their educational attainment and improving their employment outcomes. This report synthesizes these findings to assess what we can learn from the third round of the grants to be useful for policymakers, practitioners, and researchers. This conclusion summarizes the key findings from the impact synthesis and implications for evaluation efforts developed for future community college and workforce initiatives.

4.1 Summary of Findings

The findings from the impact analyses in the Round 3 third-party evaluations indicate that:

- **TAACCCT projects had unambiguously positive impacts on educational (13 out of 22 evaluations) and employment (6 out of 11 evaluations) outcomes in most cases.** Only one program (*RevUp*) resulted in a negative outcome without any offsetting positive or statistically insignificant effects.
- **A non-trivial minority of the evaluations showed mixed or statistically insignificant results.** Five of the 22 evaluations of educational outcomes found mixed impacts and 3 of those 22 evaluations found no statistically significant impact on educational outcomes. Although none of the 11 evaluations considering employment outcomes found mixed results, 3 found no effect of the project on employment outcomes.
- **Strong positive impact estimates for educational outcomes such as credential attainment, program completion, and credit accumulation were achieved.** Grantees targeted projects at introducing or enhancing short-term certificates embedded in a career pathways model. This design was well suited to improving measured educational attainment, and similar findings have been produced in other studies.⁶²
- **The projects had a positive impact on employment outcomes in a majority of the evaluations that estimated these outcomes (6 out of 11 evaluations).** However, the findings for employment outcomes were somewhat less consistent than the educational impacts. Eighteen of the 22 evaluations looking at educational outcomes had either positive or mixed results, where “mixed” results indicate some statistically significant positive impacts, mixed with other

⁶² Schwartz, Strawn, and Sarna (2018) synthesize the results of 52 studies, 39 of which are for programs that use a career pathways model. Of those 39, the synthesis in particular highlights the Arkansas Career Pathways Initiative, the Career Advancement Academies (CAA) of the California Career Ladders Project, the Integrated Basic Education and Skills Training (I-BEST) program in Washington state, and the TAACCCT Health Professions Pathway (H2P) Consortium.

impacts. In contrast, the 5 employment impacts (out of 11 evaluations) without positive impacts had either null negative impacts (rather than mixed).

- **Four of the 23 evaluations showed positive educational and employment impacts of the grant projects on participants.** The key components of these four projects were not exceptionally different from other Round 3 projects, which used a similar combination of strategies.

Overall, the Round 3 synthesis suggests that a career pathways model that combines accelerated learning strategies, persistence and completion strategies, and connections to employment strategies results in consistently positive educational impacts. The 23 TAACCCT projects that had impact evaluations all used a similar set of career pathways strategies, with each project bundled multiple strategies together to serve their participants. Thus, a synthesis of these third-party evaluations cannot pin-point specific successful strategies. Less is understood about career pathways' impact on employment due to limitations of the evaluations but the positive employment findings, especially for the four projects with consistently positive impacts, offer some promise for improving employment outcomes for adult learners.

4.2 Implications for Future Community College and Workforce Initiatives

The 23 TAACCCT third-party evaluators whose findings were included in this report were able to produce impact estimates on educational and employment outcomes for participants but not without challenges, as highlighted in section 3.3. They used quasi-experimental methods rather than an experimental design with random assignment, which generally provides more reliable impact estimates but can be difficult to implement due to reluctance of community colleges and conditions for the intervention that are not suited to random assignment. In addition, the remaining 33 third-party evaluators did not conduct impact analyses using experimental or quasi-experimental designs. There are several implications for strengthening evaluation efforts as a part of future community college and workforce initiatives, based on the authors' review of the third-party evaluations and their evaluation experience:

The challenges experienced by the third-party evaluators suggest that providing additional evaluation support or enhancing grant evaluation requirements could make experimental evaluations more feasible for community colleges. For some federally-funded education and workforce grant initiatives, such as the Health Profession Opportunity Grant (HPOG) and the Investing in Innovation Fund (i3) grant programs, grantees must participate in rigorous evaluations, including experimental design, led by either a national evaluator (HPOG) or third-party evaluators (i3). Grantees receive significant evaluation technical assistance through their grants to help make rigorous evaluation feasible while implementing their programs as designed:

- evaluation technical assistance could help grantees and third-party evaluators develop recruitment strategies and identify target populations that could produce an oversubscription to program (e.g., more individuals are interested in and eligible for the program), making random assignment more palatable due to limited space and resources to enroll participants. and bring colleges that have used experimental designs before to help new grantees understand how to implement random assignment to minimize disruption and burden to staff and students and to understand the value of the evaluation findings for improving their programs.
- including a requirement or offering an incentive for experimental evaluation in the grant announcement could signal the importance of developing rigorous evidence on the grant-funded interventions and ensuring grantees understand what to expect (e.g., evaluation design plan review and approval, participation in a national evaluation using experimental design, and evaluation technical assistance), should they be awarded a grant.
- **Several conditions appear to create more opportunities for successful experimental and quasi-experimental evaluations.** Grantees and evaluators using these rigorous methods for estimating project impacts could benefit from grant requirements or guidance that require or encourage:
 - state community college offices and systems to support the evaluation by allowing evaluators access to data on students at other community colleges to develop comparison groups that are not exposed to the TAACCCT-funded intervention being tested. These commitments by state community college systems could be obtained earlier in the evaluation process, including through letters of support in initial grant proposals;
 - state agencies that house Unemployment Insurance wage records to provide individual-level records for treatment and control/comparison groups so employment histories can be included in matching strategies and employment outcomes can be measured. Again, these commitments could be obtained earlier in the evaluation process, including through letters of support in initial grant proposals; and
 - grant or program developers to allow for a long enough follow-up period for the evaluation to ensure outcomes such as credential attainment and postprogram employment can be measured. Follow-up periods will vary depending on the type of project. Working with evaluation experts within the funding agency or organization can help determine appropriate evaluation timelines to allow for measuring these outcomes.
- **Consumers of the evaluations may need assistance with interpreting evaluation results to understand what worked, what did not, and why.** Even after supporting a rigorous evaluation, consumers of the findings—policymakers, community college leaders, and others—may need assistance to be able to interpret and use the evaluation’s results. While technical information about the evaluation design and methods are needed, more accessible language about the findings can help consumers who may not have evaluation expertise understand the findings and what they mean. To support use and interpretation of the impact findings, evaluators can:
 - include information on the strengths and limitations of the analysis to provide important context for interpreting the impact findings, especially differences in experimental and quasi-experimental methods used. For example, when members of the comparison group are enrolled in a training program similar to a grant-

funded program provided to the treatment group, it may be difficult to detect effects unless the approach being tested has impacts that are large enough to be detectable statistically.⁶³ Saying a program is ineffective based on the results of the evaluation that compares similar interventions may be misleading; the grant-funded program may be help participants complete training or obtain a job but not substantially better than what would be available without the grant.

- set the impact findings for the evaluation within the context of findings from evaluations of similar community college or workforce interventions. It is helpful to understand how well participants fared in the intervention of focus relative to participants of similar interventions to consider did the intervention perform better or worse than expected. Implementation findings can help explain why the findings would be the same or different and what about the intervention did or did not work.

Replicating and improving on the strategies and experiences of the TAACCCT grantees across all rounds can inform future grant initiatives to build the capacity of community colleges to serve adult learners. A separate report synthesizing the Round 3 third-party evaluation implementation findings focuses on understanding how grantees implemented capacity-building efforts to change their systems to better serve adult learners.⁶⁴ A report synthesizing the Round 4 third-party evaluation findings will also examine systems change efforts by grantees, building on the findings from this report. Other publications from the national evaluation—a series of briefs providing an overview of the grant program, a synthesis of the Rounds 1 and 2 third-party evaluation findings, and reports examining the implementation of the Rounds 1 and 2 grants and the Round 3 grants—are also available. These reports are designed to support learning across the grant program to draw lessons and implications for future community college and workforce initiatives that support career pathways and capacity-building efforts at community colleges.

⁶³ The minimum detectable size of an effect is different for different sample sizes and different standard deviations of the outcome variable.

⁶⁴ All publications from the TAACCCT national evaluation are available on DOL's Chief Evaluation Office website, found at <https://www.dol.gov/agencies/oasp/evaluation/completedstudies>.

Appendix A. Workforce Innovation and Opportunity Act of 2014 (WIOA)

Definition of Career Pathways

The full WIOA definition of *career pathways* is “a combination of rigorous and high-quality education, training, and other services that—

- (A) aligns with the skill needs of industries in the economy of the State or regional economy involved;
- (B) prepares an individual to be successful in any of a full range of secondary or postsecondary education options;
- (C) includes counseling to support an individual in achieving the individual’s education and career goals;
- (D) includes, as appropriate, education offered concurrently with and in the same context as workforce preparation activities and training for a specific occupation or occupational cluster;
- (E) organizes education, training, and other services to meet the particular needs of an individual in a manner that accelerates the educational and career advancement of the individual to the extent practicable;
- (F) enables an individual to attain a secondary school diploma or its recognized equivalent, and at least 1 recognized postsecondary credential; and (G) helps an individual enter or advance within a specific occupation or occupational cluster” (29 U.S. Code § 3102 Definitions).

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